

The macroeconomics of artificial intelligence

Artificial intelligence (AI)'s trajectory to becoming the next *General-Purpose Technology* (GPT) remains steady and rapid, capturing all the attention. It has a dominant role not only in the narratives but also in the dynamics of financial markets, and is already making a visible economic impact on investment in the US. Its impact is not yet so evident on employment and aggregate productivity, and there are huge uncertainties about the magnitude and timing of its potential medium-term macroeconomic impact and differences among countries.



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When a technology becomes a GPT — such as in the case of engines, electricity, computers and the internet — it eventually reaches a widespread and versatile use, with ripple effects that enhance other technologies, affect jobs and sectors and, ultimately, bolster productivity and economic growth.

This article explores the early signs of this transition and what we may expect for the future from a macroeconomic point of view, analysing: the advance of AI technology capabilities; evidence of current macroeconomic outcomes; expectations for future macroeconomic outcomes, and factors driving the different levels of performance across countries.

The advance of AI capabilities

There is a certain dissonance about advancement in AI. On the one hand, it is advancing at an extraordinary pace. On the other, AI's applicability and impact on everyday domains seem to be developing more slowly. How are both these things possible?

The gap between AI capabilities and real-world deployment remains significant: benchmark progress is extraordinary, but reliability, consistency and safety still limit economic impact

Measuring what AI can do has proven difficult. The progression of AI capabilities is addressed by AI benchmarking. The latest benchmarks evaluate AI according to its ability to complete real tasks. One example is METR's[1] framework for measuring AI agents' capacity to perform long-duration software engineering and machine learning tasks. Results show that AI task-completion horizons have increased exponentially over recent years, doubling approximately every seven months.

However, benchmark performance does not necessarily translate into effective deployment in real-world environments. Many practical applications require not only high capability but also reliability, consistency and safety. Kapoor and Narayanan[2] argue that this gap between capability and reliability (consistency of performance,

[1] METR (2025), 'Measuring AI ability to complete long tasks'.
[2] Kapoor, S., & Narayanan, A. (2025), 'Towards a science of AI agent reliability'.

robustness under changing conditions, etc.) helps explain why the economic effects of AI have so far been gradual.

Current macroeconomic outcomes

AI adoption is accelerating, especially among large firms and knowledge-intensive sectors, but its diffusion remains uneven across companies, industries and countries

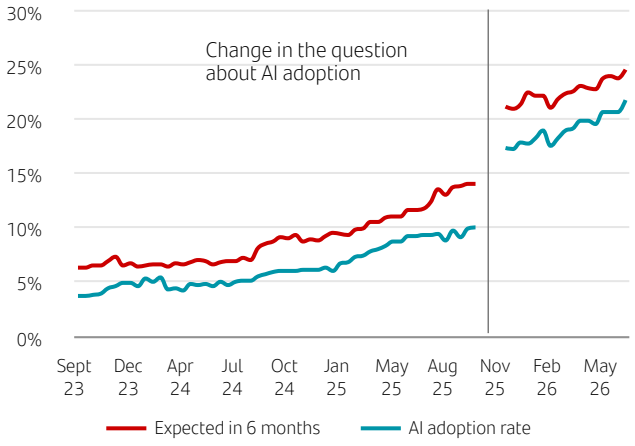
Identifying the current macroeconomic outcomes of AI requires an exploration of its adoption, investment and financing, labour-market performance and aggregate productivity.

AI adoption

AI adoption continues to accelerate, particularly among large firms and knowledge-intensive industries, although use remains far from universal.

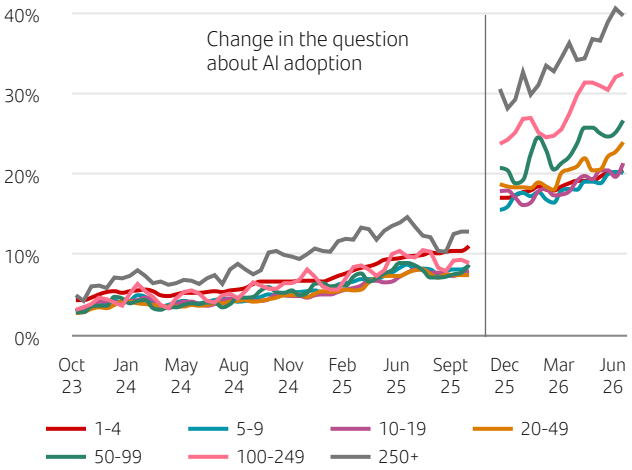
This is borne out in the United States, where Census Bureau[3] data indicate that around 22% of firms use AI, of which 40% are large companies operating in information-intensive sectors, most commonly sales and marketing, IT, strategy, finance and accounting.

AI adoption rate among companies



Sources: Census Bureau and BTOS.

AI adoption rate by number of employees

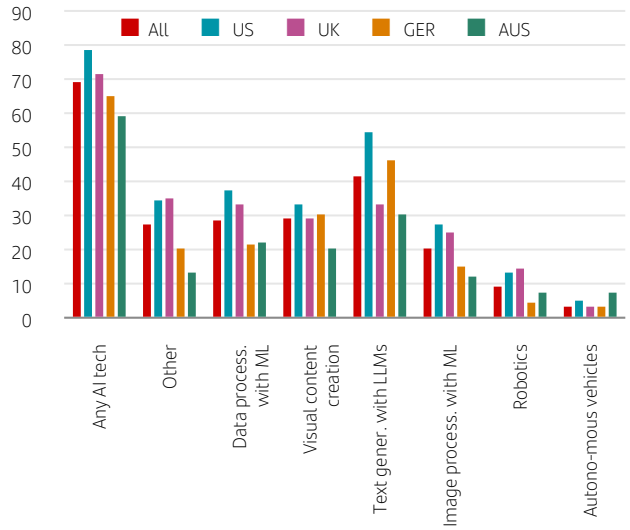


Sources: Census Bureau and BTOS.

International evidence, however, points to significant differences in AI adoption across countries. Surveys of business executives around the world[4] (data not comparable with those above) indicate adoption rates of around 78% in the United States, followed by 71% in the United Kingdom, 65% in Germany and 59% in Australia. Brookings[5] research similarly finds higher AI usage among American workers than their European counterparts. These differences are explained partly by worker characteristics and industrial composition, but also by management quality and firms' organisational capabilities.

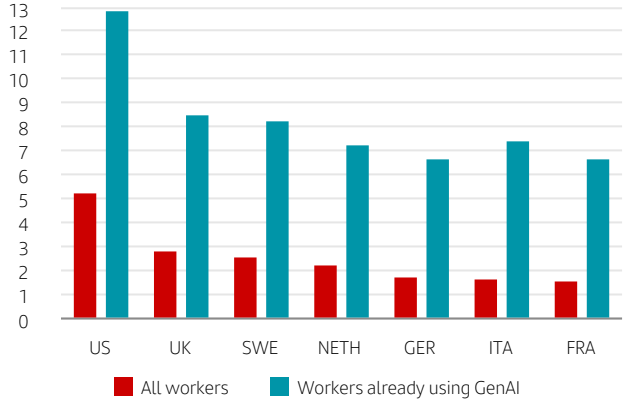
[3] U.S. Census Bureau (2025), 'Business Trends and Outlook Survey (BTOS)', U.S. Department of Commerce.
[4] Yatzov, A., et al. (2025), 'Firms predict an AI productivity boom is coming', Centre for Economic Policy Research (CEPR).
[5] Bick, A., Blandin, A., Deming, D. J., & Summers, L. H. (2025), 'Generative AI at work', Brookings Institution.

Which of the following AI technologies does your business currently use?
(% of business)



Source: Yatzov et al.

Share of work hours using Generative AI in 2026



Source: Brookings.

Investment and finance

AI investment has become a strong driver of current economic activity, particularly in the United States. Progress in AI depends not only on advances in algorithms but also on massive investment in physical infrastructure, including data centres, semiconductors, networking equipment, cooling systems, electricity generation and transmission.

The largest technology companies are expected to invest more than one trillion US dollars in AI-related capital expenditure during 2025–2026. This investment contributes directly to gross domestic product (GDP) growth, although some of its effects leak abroad through capital goods imports. AI-related investment may have added 0.5-1.0 percentage points, on average, to annualised quarterly US GDP growth since 2025.

Financial markets have also been heavily influenced by AI optimism. AI-related expectations have supported equity valuations, increased market concentration and generated positive wealth effects. Financing is gradually shifting from internal corporate cash flows towards a broader combination of public debt, private credit, leasing arrangements and project-finance structures. While this expands funding capacity, it also redistributes financial risks from equity markets to credit markets and financial intermediaries.

Labour market

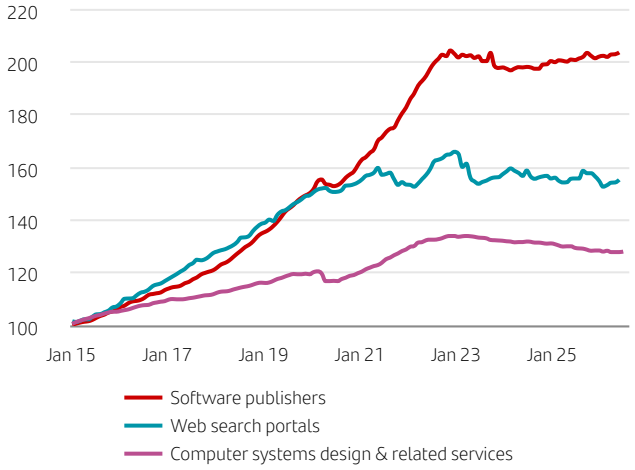
At the aggregate level, labour markets still show limited evidence of significant AI-related disruption, as unemployment remains moderate by historical standards.

Labour-market effects remain limited at the aggregate level, but early impacts are visible in specific occupations, especially coding and other AI-exposed knowledge-based jobs

Nevertheless, impacts are emerging in specific occupations. The clearest evidence[6] concerns software developers and programmers, whose employment growth has slowed markedly since the introduction of ChatGPT. Some studies[7] also suggest that AI primarily affects younger or less experienced workers through reduced hiring rather than increased layoffs.

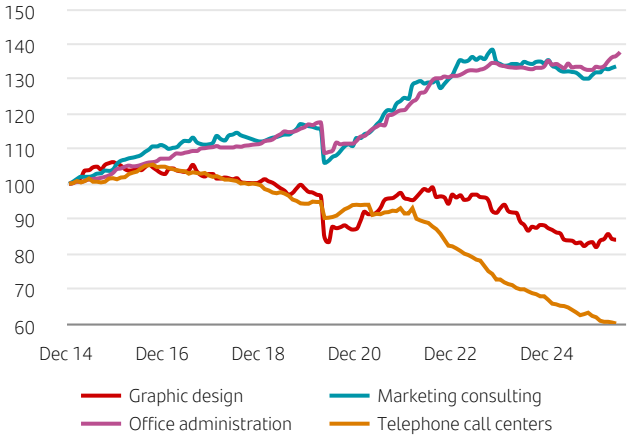
But this does not tell us about the net effects on the labour market. Further evidence[8] indicates that AI may substitute for junior workers while complementing more experienced employees, who benefit from higher productivity and wage growth. In addition, firms making substantial AI investments often continue expanding employment[9], suggesting that productivity gains may stimulate growth rather than simply replace the workforce.

Payroll data in some AI-exposed tech service sectors
(Dec 2014=100)



Source: LSEG.

Payroll data in some AI-exposed non-tech service sectors
(Dec 2014=100)



Source: LSEG.

Micro-level studies show productivity gains from AI tools, but translating task-level improvements into aggregate output remains constrained

Productivity

The emerging empirical record suggests that some groups of workers and some occupations may already be experiencing measurable productivity gains from AI, but the aggregate macroeconomic signs remain difficult to isolate from typical fluctuations in a dynamic economy.

There are many examples of micro-level research finding productivity gains from AI tools[10]. Similarly, a recent study[11] uses the Anthropic Economic Index (which samples Claude AI conversations, mapping them to occupational tasks) to estimate labour cost savings by combining observed reductions in task completion times with country-

[6] Gittleman, M. (2025), 'AI and coder employment: Compiling the evidence'.
[7] Lichtinger, J., & Hosseini Maasoum, S. (2025), 'Artificial intelligence and hiring outcomes', SSRN Working Paper.
[8] Federal Reserve Bank of Dallas (2025), 'AI is simultaneously aiding and replacing workers, wage data suggest'.
[9] PwC (2025), 'A new look at AI's impact on jobs'.
[10] Brynjolfsson, E., Li, D., & Raymond, L. (2025), 'Productivity effects of generative AI in the workplace'; Cui, R., et al. (2026), 'Productivity gains from artificial intelligence: Evidence from field applications'.
[11] Anthropic (2025), 'Aggregate gains from AI and their distribution: Global evidence from usage data'.

specific wage levels. Based on assumptions regarding AI diffusion, the research says that these gains could represent labour cost savings equivalent to approximately 3.4% of GDP across the countries analysed.

But are these micro gains translating into aggregate productivity growth? A Fed[12] analysis shows that while the sectors with higher AI exposure appear to have higher labour productivity growth, productivity trends across sectors have been relatively consistent over time, suggesting micro-level productivity gains are not adding up in aggregate. Why?

One explanation is that most empirical studies measure improvements at the task level rather than at the level of firms or entire production processes. Productivity gains achieved in individual tasks are often diluted by organisational bottlenecks, coordination costs and other constraints that limit their translation into final output. Research[13] on software development illustrates this effect. While AI dramatically increases the amount of code produced, much of this is filtered through subsequent stages of review, integration and deployment, translating into much smaller improvements in actual software releases and even lower increases in final demand or product usage.

Expectations for future macroeconomic outcomes

Future productivity effects could be substantial, yet estimates vary widely and current projections may understate the role of agentic AI, physical AI or more advanced systems

As we have seen above, businesses and economies are undergoing a process of technological reorganisation, with measurable effects concentrated in some sectors and occupations, rather than being visible across the macroeconomy.

But the absence of a large aggregate effect as of 2026 does not invalidate future productivity impacts, given the shallow adoption thus far and the fact that historically, productivity gains from GPTs lag investment by years. And even if we can be confident that if AI becomes a GPT it will have a significant macroeconomic effect, there is a large degree of uncertainty about the size, nature and the timing of its impacts. Estimations of the potential impact on productivity — the key area in which AI will impact the economy — range from lows of a 0.7% increase over 10 years (Acemoglu[14]) to 6.8% (Aghion and Bruel[15]) and a significantly more optimistic, but still plausible, 10-15% for other public and private institutions.

Importantly, nearly all existing estimates focus on the expected effects of current AI, including machine learning and generative AI, but generally do not take into consideration the potential contributions of agentic AI, physical AI or AGI (recursive self-improving systems, etc.), which could fundamentally alter future productivity dynamics.

[12] Board of Governors of the Federal Reserve System (2025), 'The AI buildout and the economy: Publicly available data to assess AI's impact'.
[13] Dell'Acqua, F., et al. (2025), 'Writing code vs. shipping code: Productivity effects across generations of AI coding tools', NBER Working Paper.
[14] Acemoglu, D. (2024), 'The simple macroeconomics of AI', NBER Working Paper No. 32487.
[15] Aghion, P., & Bunel, S. (2024), 'AI and growth: Where do we stand?', Federal Reserve Bank of San Francisco.

The competition for global AI leadership

Another source of uncertainty is the difference in the impacts that AI will have across countries.

If AI becomes the next GPT, it will not be only transformative, but will underpin the mutually reinforcing pillars through which power is built. The leading countries in AI will gain advantages in other technologies simultaneously, and their leadership will translate into geopolitical influence and agency over the direction and impacts of AI for the rest of the world, as countries that lead technological revolutions typically capture a large share of both their short- and long-term economic benefits.

AI leadership is becoming a strategic race: countries that dominate talent, research, infrastructure and models may capture both economic gains and geopolitical influence

The state of the competition for global AI leadership

The competition for global AI dominance is akin to a multi-tournament championship, with different races, each representing a different pillar of the AI ecosystem, and no clear finish line, but an ongoing contest for advantage[16]. To analyse the current state of play, a combination of performance indicators measuring different aspects such as talent availability, research intensity and technological and innovation capabilities is needed.

Available information shows that the United States is currently the leading force in AI, followed by China. But both countries have distinct advantages. The US has the strongest private sector, talent and technology. But China's research, scaling capacity and rapid progress mean that it could catch up. Other regions like South Korea, Europe and the Middle East are increasingly becoming serious AI players with significant AI intensity (for example, boasting a large number of relevant AI companies in relation to the size of the economy), but are still far behind the leaders, as scale and size play a key role in power.

The US currently leads in frontier models, private investment and data centres, while China is closing gaps through research scale, patents, energy capacity and open-source models

AI human capital. Innovation starts with people.

- The US leads in attracting top talent. According to the MarcoPolo Global AI Talent Tracker[17], 38% of elite AI researchers were educated in China (24% in the US, 10% in India, 5% in South Korea), but 59% of the world's top AI researchers work in US organisations, with higher salaries, more flexible environments, and talent inflows from China and India.

AI research. The main source of new AI knowledge.

- China now leads in research output, producing 23.2% of global AI publications[18] and 22.6% of citations in 2023. However, the US still dominates the most influential work, accounting for 64 of the top 100 cited papers in 2021, 59 in 2022, and 50 in 2023, although China is narrowing the gap. China also dominates AI patenting, receiving 70% of AI patent grants in 2023 versus 14% for the US.

[16] Anthropic (2025), '2028 AI leadership'.
[17] Stanford Institute for Human-Centered Artificial Intelligence (2026), 'AI Index Report 2026', chapter 'Research and development'.
[18] Stanford Institute for Human-Centered Artificial Intelligence (2026), 'AI Index Report 2026', chapter 'Technical performance'.

AI technology and innovation. Leadership depends on model performance, investment, infrastructure and computing power.

Model performance

- The US is still the leading developer of frontier AI models[19], producing 40 notable models in 2024, compared with 15 for China and 3 for Europe (all in France). Yet Chinese models are approaching parity. China also promotes adoption through an open-source strategy.

Model costs

- Cost has become a major competitive factor[20]. Companies increasingly adopt Chinese AI models to reduce expenses, while some European firms have pivoted away from US providers following US trade measures and export controls.

Finance and investment

- Private AI investment[21] continues to be heavily concentrated in the US, which attracted 285.9 billion US dollars in 2025 — 23 times China's 12.4 billion US dollars and 48 times the UK's total. However, official figures likely underestimate China's spending, as government funds invested an estimated 184 billion US dollars in AI firms between 2000 and 2023. The US also led in new AI companies (1,953 in 2025 versus 172 in the UK and 161 in China) and captured nearly three-quarters of global private equity and venture capital investment.

Infrastructure and computing power

- AI development relies on data centres, energy and advanced chips. The US hosts about half of the world's data centres (5,427), compared with 529 in Germany, 523 in the UK and 449 in China. China invested nearly 900 billion US dollars in energy[22] in 2024, versus 600 billion US dollars in the US and over 400 billion US dollars in Europe, while also leading in energy production and nuclear expansion. The US seems to maintain its leadership in advanced chip design[23] and model development through export controls, although Chinese labs have continued advancing despite these restrictions[24]. China also benefits from a vast domestic data ecosystem.

Business landscape

- The AI corporate landscape[25] mirrors the technological state of affairs. Among the 1,246 AI companies valued above 500 million US dollars, 696 are based in the US and 244 in China, followed by the UK with 40. Israel (42) and Taiwan (20) also have notable AI ecosystems. AI firm density is positively associated with economic size, research and development (R&D) expenditure and venture capital inflows.

[19] Financial Times (2025), 'Companies turn to Chinese AI models to cut costs'.
[20] Stanford Institute for Human-Centered Artificial Intelligence (2026), 'AI Index Report 2026', chapter 'Economy'.
[21] International Energy Agency (2025), 'World energy investment 2025'.
[22] Mackintosh, M. (2024), 'The chip design landscape today', JSTOR Daily.
[23] Anthropic (2025), '2028 AI leadership'.
[24] Crunchbase (2025), 'The geography of AI firms'.
[25] International Monetary Fund (2025), 'AI Preparedness Index (AIPI)'.

Expectations for future cross-country macroeconomic outcomes

Although technological leadership will influence future economic outcomes, AI is expected to generate benefits well beyond the borders of the countries that develop frontier technologies (as the presence of AI companies around the world suggests). The magnitude of these gains relies fundamentally on the productivity gains that in turn will depend primarily on each country's ability to adopt and integrate AI effectively throughout its economy. Following Acemoglu's framework, differences in impact across countries are expected to be determined by AI adoption rates, occupational and sectoral exposure to AI and labour-cost savings.

AI preparedness and adoption

AI's benefits will extend beyond technological leaders, but countries' gains will depend on preparedness, adoption capacity, sectoral exposure and labour-cost incentives

The International Monetary Fund (IMF)'s AI Preparedness Index[26] provides a useful framework for assessing countries' ability to benefit from AI adoption. The index evaluates four broad dimensions: digital infrastructure; innovation and economic integration; human capital and labour-market policies; regulation and ethical frameworks.

Advanced economies generally perform better across all four dimensions of the index, particularly in digital infrastructure and regulatory readiness, making them better positioned to adopt AI rapidly. These differences are consistent with current adoption patterns (see section 2) and suggest that existing gaps may persist unless substantial investments are made.

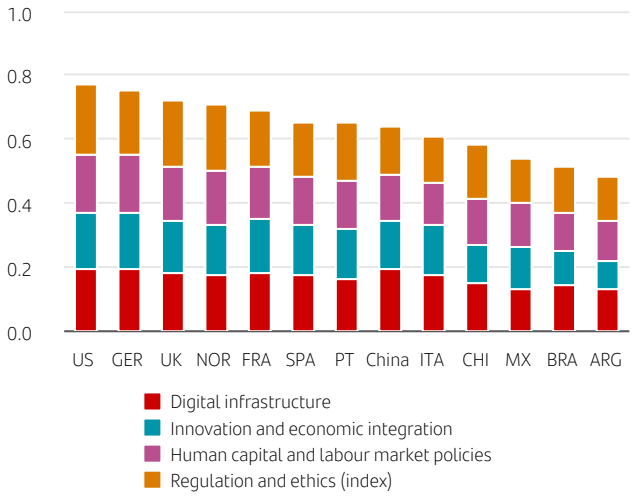
Sectoral exposure and wages

The economic impact of AI will also depend on the sectoral composition of activity. Research[27] consistently shows that AI exposure is concentrated in high-skill, knowledge-intensive activities. Consequently, countries with a larger share of these sectors — and a greater proportion of highly skilled workers — are expected to capture larger productivity gains while also potentially facing greater labour-market adjustments.

Labour costs represent another important driver of AI adoption. Evidence[28] suggests that firms operating in high-wage countries have stronger incentives to automate tasks or enhance worker productivity using AI. This partly explains why adoption rates tend to be higher in the United States than in Europe, where average wages are generally lower.

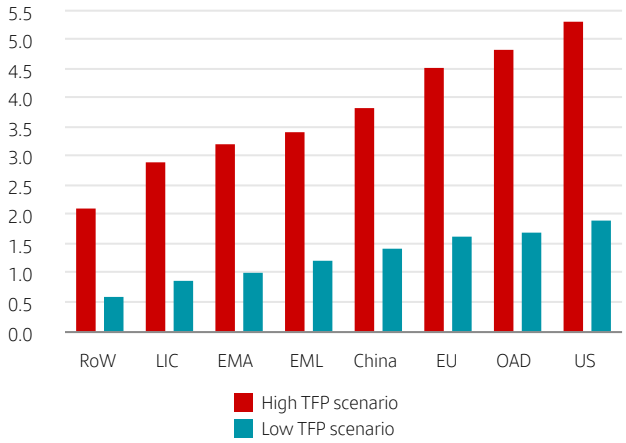
[26] Organisation for Economic Co-operation and Development (2025), 'Gen-AI: Artificial intelligence and the future of work. A sectoral taxonomy of AI intensity'.
[27] McKinsey Global Institute (2025), 'AI and productivity in Europe'.
[28] International Monetary Fund (2025), 'The global impact of AI: Mind the gap', Working Paper No. WP/25/76.

AI preparedness index



Source: IMF.

GDP impact after 10Y
(%)



Sources: IMF - RoW = rest of the world; LIC = low-income countries; EMA = emerging Asia; EML = emerging Latin America; Middle East; OAD = other advanced economies.

Estimated macroeconomic impacts

Although considerable uncertainty remains, existing research provides useful reference scenarios. Studies combining differences in AI preparedness, sectoral exposure and technology diffusion consistently conclude that advanced economies will experience the largest long-term economic gains.

AI's macroeconomic impact remains highly uncertain: future outcomes will depend on business choices, regulation, energy, other technologies and geopolitical dynamics

IMF[29] estimations show that gains in Europe are expected to be slightly smaller than those in the US but will still be substantial. Within Europe, however, important differences are likely to emerge. Countries with stronger digital infrastructure, higher AI preparedness and more knowledge-intensive economies — such as Sweden, Switzerland or Israel — may experience impacts that are comparable to, or even exceed, those of the United States. In contrast, many emerging and low-income economies are expected to benefit less from AI because of weaker preparedness, lower adoption rates and smaller shares of AI-intensive sectors.

Some conclusions, many uncertainties

AI will impact economies through potentially large productivity gains, which research suggests will be higher in advanced and some emerging economies.

But, as with prior technological revolutions, AI brings uncertainty. Future outcomes will depend on business decisions and the policy and regulatory environment adopted in each country. In this area we are already seeing the emergence of intercountry differences that may affect AI adoption and performance in ways we cannot yet foresee. And we mustn't forget to add to our cocktail shaker of future outlooks the impacts brought by the alignment of specific AI trends with other technologies

[29] International Monetary Fund (2025), 'The global impact of AI: Mind the gap', IMF Working Paper No. WP/25/76.

(quantum computing, robotics, biotechnology) and broader global trends (the energy transition, demographic changes, geopolitical shifts). Once we do that, we will have a delicious and complex cocktail of possibilities to enjoy.

That uncertainty need not be paralysing. Instead we can take it as a source of focus: how we address AI should be seen as a question of how we choose to manage unknowns, and which tools and principles we adopt to harness risk and maximise opportunities for the best results.