

The impact of AI on employment and productivity

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Introduction

1. Context: artificial intelligence (AI) is emerging as a General-Purpose Technology (GPT) with the potential to profoundly transform economies and labor markets, as happened with disruptive technologies of the past.

- AI technologies are impacting key sectors such as health, education, transportation and finance.
- Its effects on employment include the creation of new occupations, complementarity with existing roles, and the automation of tasks.
- The macroeconomic effects are still uncertain, but the potential for transformation is enormous.

2. Objective of this presentation: Assess the available evidence on the effects of AI on productivity and employment, highlighting opportunities and challenges associated with its adoption.

- How does AI affect productivity? Is it a complement to or a substitute for employment?
- Complement BBVA's internal evaluation of the AI adoption process with an aggregate analysis.
- Analyze the critical factors to maximize their positive impact: regulation, governance and infrastructure.

3. An update and natural extension of [Andrés and Doménech \(2020\)](#), focusing on recent advances in AI and their current and future implications.

Contents

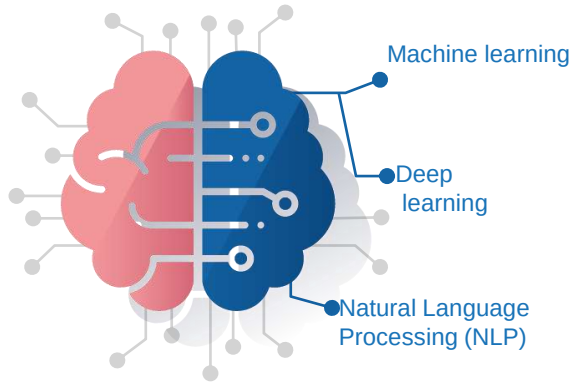
- 01 Artificial intelligence: potential General Purpose Technology (GPT)
- 02 An overview of AI
- 03 Impact on productivity and growth
- 04 Impact on labor: complement or substitute?
- 05 Factors influencing the scale and scope of AI
- 06 Regulation and governance
- 07 Conclusions: Designing the future of AI

01

Artificial intelligence: Potential General Purpose Technology (GPT)

What is artificial intelligence?

Artificial Intelligence (AI)



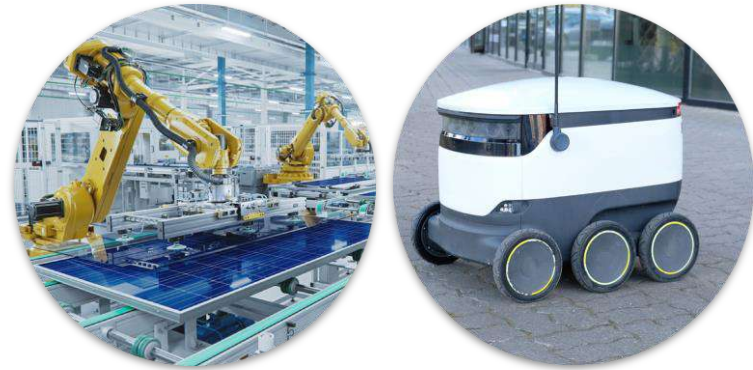
Systems that learn from data and improve their performance with experience

Based on multi-layered artificial neural networks, which simulate the functioning of the human brain

Methods that allow machines to understand, interpret and generate human language

Robotics and applied AI

Use of AI in physical systems, such as autonomous robots or industrial automation systems.



It is computer science that is dedicated to the design, development and application of systems and algorithms capable of performing tasks that normally require human intelligence. These tasks include, but are not limited to, perception, reasoning, learning, decision-making, problem-solving and language processing.

AI promises to be a General Purpose Technology (GPT)

AI as a General Purpose Technology (GPT)

AI is not limited to a single sector or function, but can be integrated into a wide range of activities and disciplines

Multiple Sectors

-  Healthcare
-  Education
-  Economy and finance
-  Agriculture
-  Transport
-  Energy

Multiple Competencies

-  medical diagnosis, drug discovery, medical imaging analysis
-  personalization of learning, educational materials
-  prediction, analysis, process automation
-  resource optimization, monitoring
-  self-driving vehicles, logistics

Multiple Technologies

AI is not an isolated technology, but a tool that **can be integrated with other technologies (such as IoT, robotics, biotechnology or augmented reality)** to enhance its capabilities.

Ability to constantly improve: continuous, automatic learning.

Like other GPTs, AI **has the ability to accelerate innovation, act as an engine of growth and structurally transform economies**, their markets (particularly labor markets), and how resources, productive factors, goods and services are created and distributed.

The GPTs of the twentieth century increased productivity and wages without increasing unemployment rates...

GDP PER CAPITA AND UNEMPLOYMENT

1900-2010



Source: [Andrés and Doménech \(2020\)](#) based on Maddison Growth Project (2018), Galeson and Zellner (1957) and AMECO

- Industrial revolutions have always brought about major structural changes: sectoral, spatial, in the organization of work or in employment
- In **the United States and Europe**, per capita income multiplied by nearly 9 from 1900 to 2018
- But **unemployment rates show no long-term temporal trend**. Employment growth has been similar to that of the labor force since 1900.
- In **Spain**, employment grew between 1900 and 2000 at an average annual rate of 1.1% (same as the labor force) while productivity grew at 2.2% and GDP at 3.3%.

... and allowing for a reduction in number of hours worked, thanks to its wealth effect

GDP PER CAPITA AND UNEMPLOYMENT 1900-2010

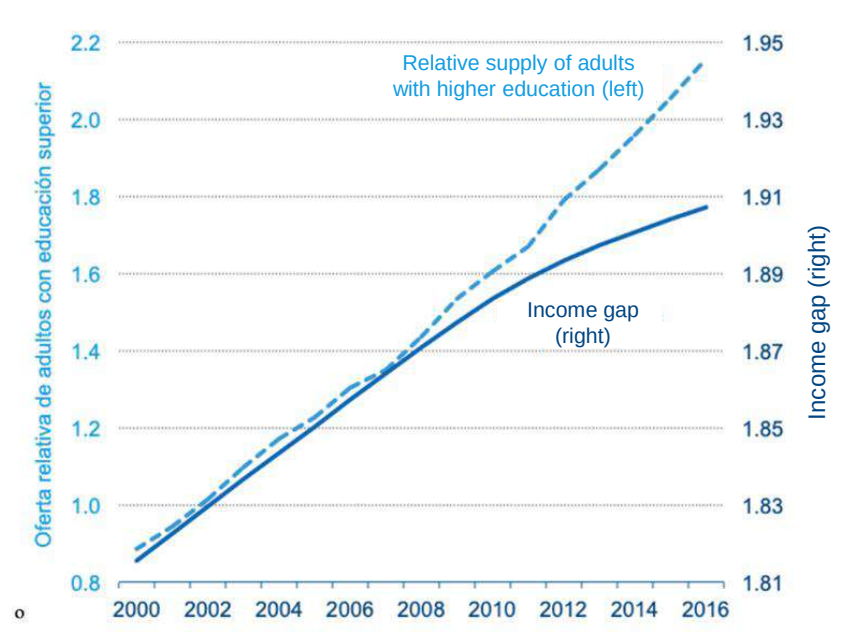


- Cross-sectional evidence among OECD countries points to a close relationship between productivity and hours worked.
- The most productive countries generally work fewer hours. Some countries, including the United States, show some deviation from the observed pattern.
- Alexander Bick, Nicola Fuchs-Schündeln and David Lagakos (2018) present very abundant evidence on the trends in hours worked by the population for a wide range of countries.

GPTs that generated these benefits in part because they were "skill-biased"

RELATIVE SUPPLY AND WAGE GAP

(ADULTS (25-64 YEARS OLD) WITH HIGHER EDUCATION VS. SECONDARY EDUCATION OR LESS)



- In OECD countries, despite the relative increase in the supply of skilled labor, the wage premium associated with a university degree increased.
- In other words, **Tinbergen's race** between the supply and demand of skilled labor has been won, for the time being, by demand.

02

Overview:
the development of AI
depends on the digital
ecosystem that sustains it

At the macro level, AI's progress depends on the digital ecosystem that sustains it

SIX DIMENSIONS OF DIGITALIZATION

(BBVA DIGIX INDEX)

Government Adoption

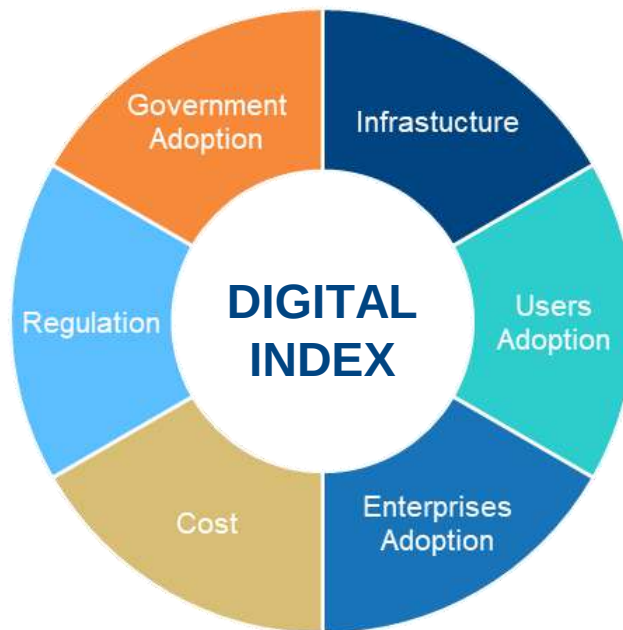
- E-Participation Index

Regulation

- Phishing incidence
- Control of corruption
- Government Effectiveness
- Political stability and absence of violence/terrorism
- Regulatory quality
- Rule of law
- Voice and Accountability

Affordability

- Low-usage data and voice basket
- High-usage data and voice
- Data-only mobile-broadband basket (2GB)
- Fixed-broadband basket (5GB)
- Device affordability



Infrastructure

- Population covered by a 5G network
- Download speed for mobile users
- Upload speed for mobile users

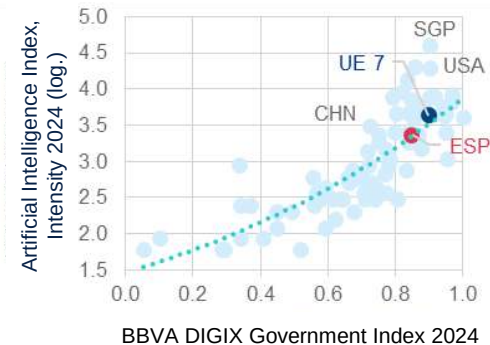
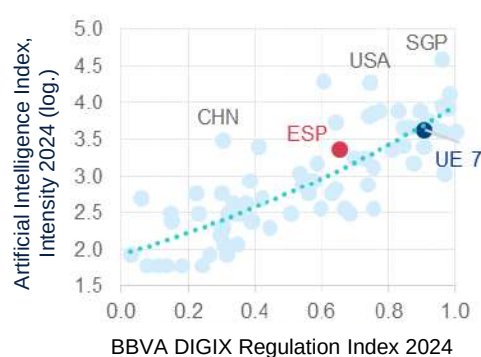
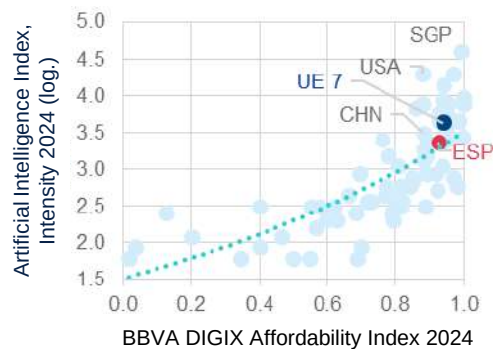
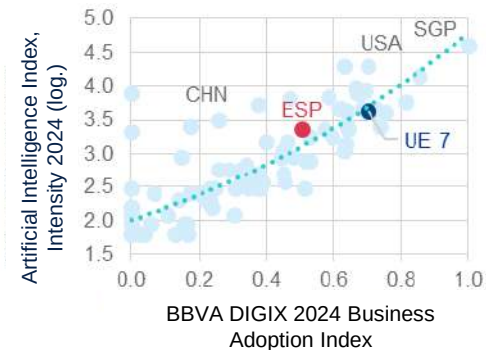
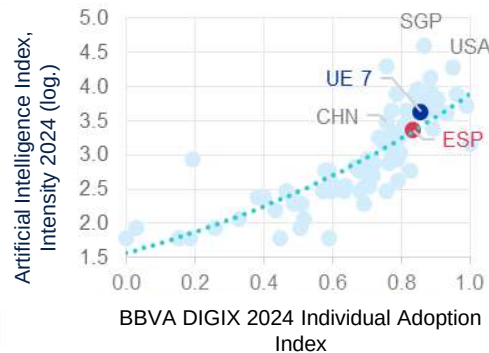
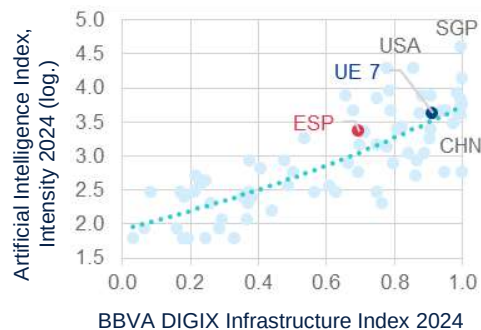
Users Adoption

- Active mobile-broadband subscriptions
- Fixed (wired)-broadband subscriptions
- Individuals using the internet
- Mobile ownership

Enterprises Adoption

- Top-level domains (TLDs) / pop. 15-69
- GitHub commits/mm pop. 15-69

At the macro level, AI's progress depends on the digital ecosystem that sustains it



Note: UE7: Austria, Belgium, Denmark, Finland, Germany, Sweden, Netherlands.

Source: [BBVA Research](#) based on the European Commission and [The Global Artificial Intelligence Index 2024](#).

Europe is betting heavily on strengthening this ecosystem ...

Country	Position in DiGiX Rank 2020	Position in DiGiX Rank 2022	Position in DiGiX Rank 2024	VARIATION 2020-2022	VARIATION 2022-2024
Denmark	1	1	3	0	-2
Netherlands	5	4	5	1	-1
Finland	7	5	6	2	-1
Sweden	10	9	7	1	2
Estonia	11	11	12	0	-1
Luxembourg	6	17	14	-11	3
Germany	14	12	15	2	-3
Austria	24	22	17	2	5
France	25	24	22	1	2
Ireland	21	16	23	5	-7
Belgium	29	29	24	0	5
Portugal	38	38	25	0	13
Lithuania	34	32	26	2	6
Czech Republic	37	35	28	2	7
Malta	32	31	29	1	2
Spain	35	37	30	-2	7
Cyprus	31	30	31	1	-1
Latvia	46	47	32	-1	15
Slovenia	33	34	33	-1	1
Greece	60	61	34	-1	27
Croatia	70	65	35	5	30
Italy	48	52	36	-4	16
Poland	39	36	38	3	-2
Hungary	65	59	40	6	19
Slovak Republic	55	55	43	0	12
Bulgaria	40	40	44	0	-4
Romania	43	43	49	0	-6
EU median	33	32	28	1	2
EU top quintile	11,6	12,8	14,2	2	▲ 12,8
EU bottom quintile	45,4	46,2	35,8	-0,8	-1,8
China	28	26	45	2	-19
United States	4	2	13	2	▼ -11

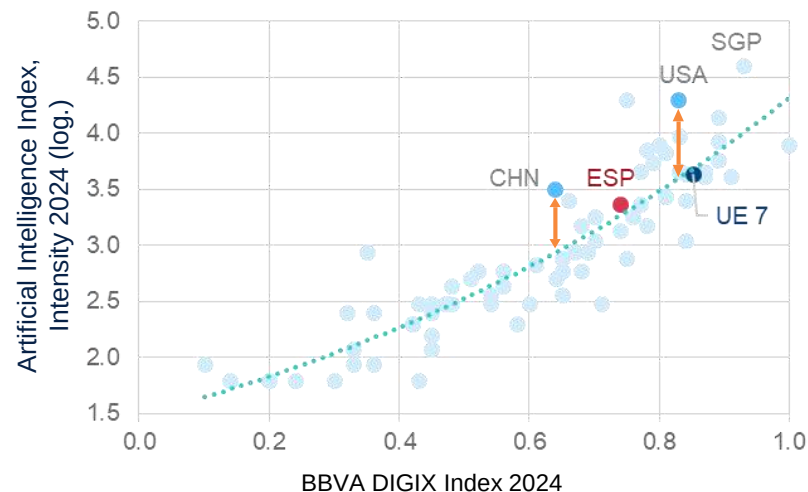
Digital development has been a fundamental pillar in the major European initiatives: From the NGEU to the Draghi report.

Note: Since digitization is a dynamic process, the components that make up each dimension of the [DiGiX](#) index change over time. For example, while in 2020 the index included 3G network coverage as part of the infrastructure dimension, in 2024 this indicator has been replaced by 5G network coverage.

Source: [BBVA Research](#).

... but the AI of the U.S. and China have a significantly higher level than would correspond to their digital ecosystem

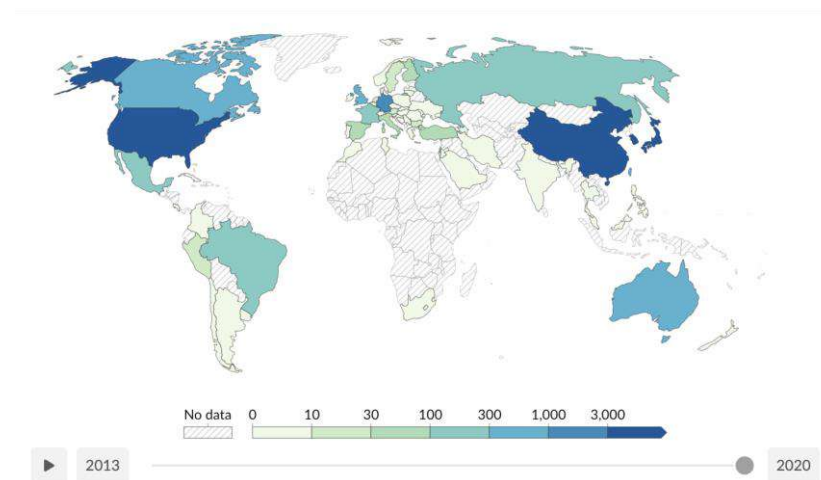
BBVA DIGIX AND ARTIFICIAL INTELLIGENCE INDEX (2024)



Note: UE7: Austria, Belgium, Denmark, Finland, Germany, Sweden, Netherlands.

Source: BBVA Research based on the European Commission and [The Global Artificial Intelligence Index 2024](#).

ANNUAL AI-RELATED PATENT APPLICATIONS 2020



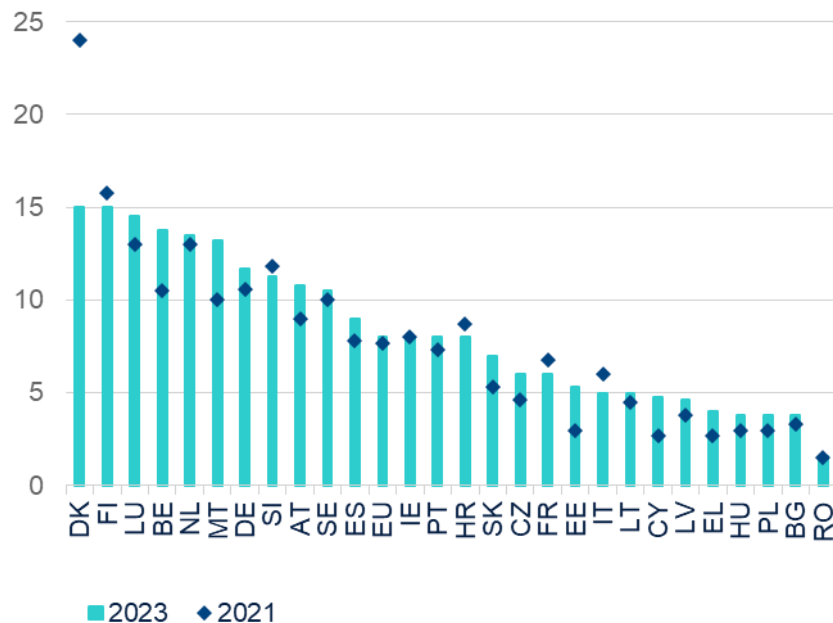
Source: BBVA Research based on [OurWorldinData](#), Center for Security and Emerging Technology (2024).

China and the U.S. are leading the way. Will AI development be characterized by “winner-takes-all” dynamics or by public good/competitive dynamics and the “late-mover advantage”?

High heterogeneity in AI adoption by European countries and sectors

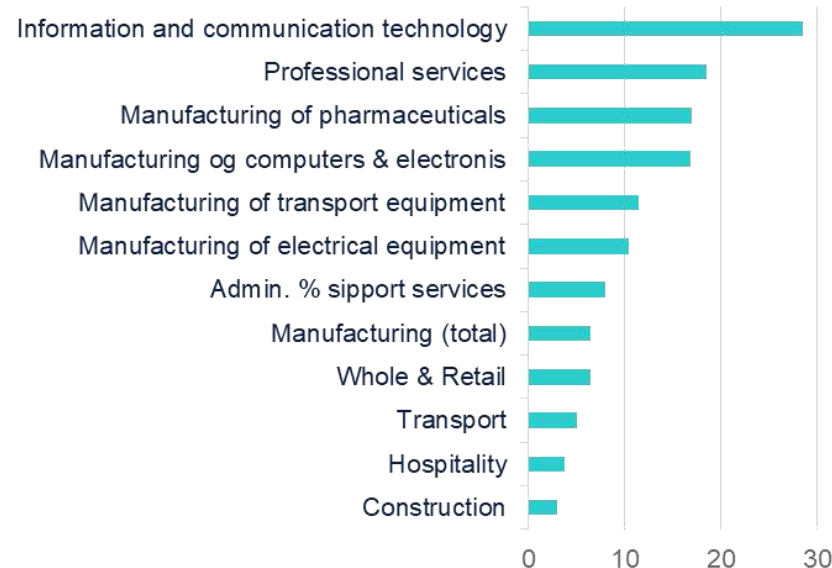
COMPANIES USING AT LEAST ONE AI TECHNOLOGY

(% OF COMPANIES WITH 10 OR MORE EMPLOYEES)



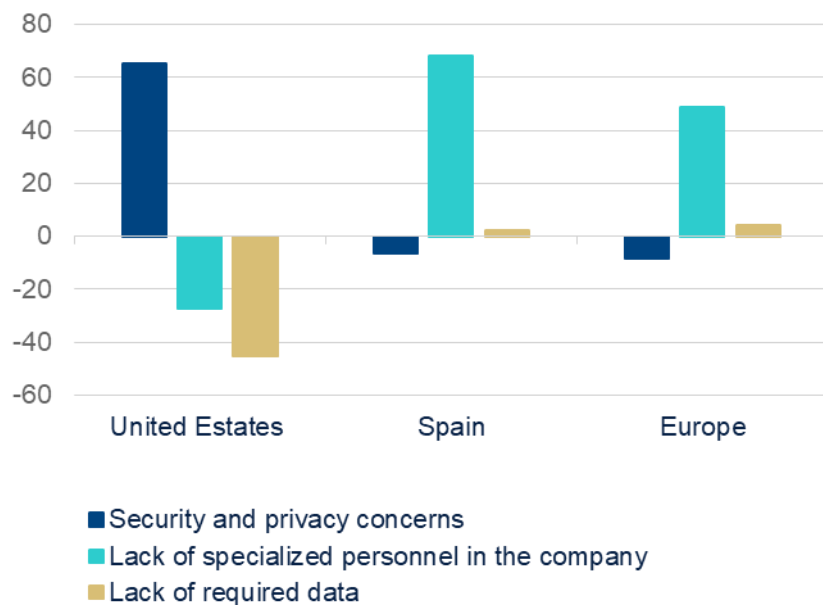
COMPANIES USING AT LEAST ONE AI TECHNOLOGY

(% OF EU COMPANIES WITH 10 OR MORE EMPLOYEES)



Microdata indicates that companies in the U.S. and Europe face different obstacles to AI implementation

BARRIERS TO AI ADOPTION (RELEVANCE RELATIVE TO THE "HIGH COST" BARRIER)



- While companies in the United States highlight the lack of **security and privacy** as their main concern, in Europe—especially in Spain—the main obstacle to AI adoption is the shortage of **specialized personnel**.
- For European companies, their initial human capital intensity accounts for a third of AI adoption 10 years later. The concentration (clustering) of university professionals would especially favor the adoption of technologies that automate processes and facilitate machine movements.

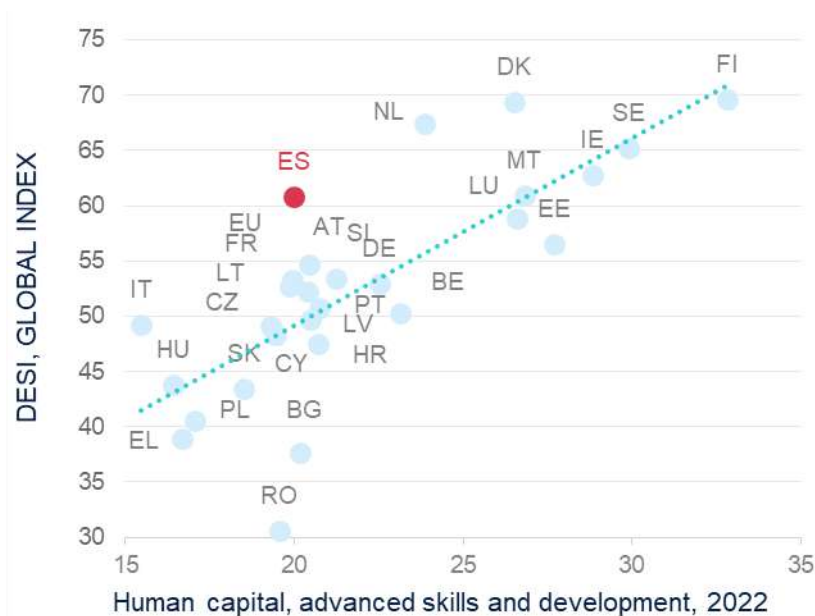
Note: In Spain, the data is representative of the companies that have considered using AI. In the United States, the data is representative of companies that plan not to use AI to produce goods or services in the next 6 months. In both countries, the data was collected between 2023 and 2024.

Source: BBVA Research based on data from [INE](#) and [BTOS \(U.S. Census Bureau\)](#).

Spain stands out in the DESI index, but not in its level of human capital

DESI: GLOBAL INDEX OF ADVANCED SKILLS AND DEVELOPMENT

(EU, 2022)



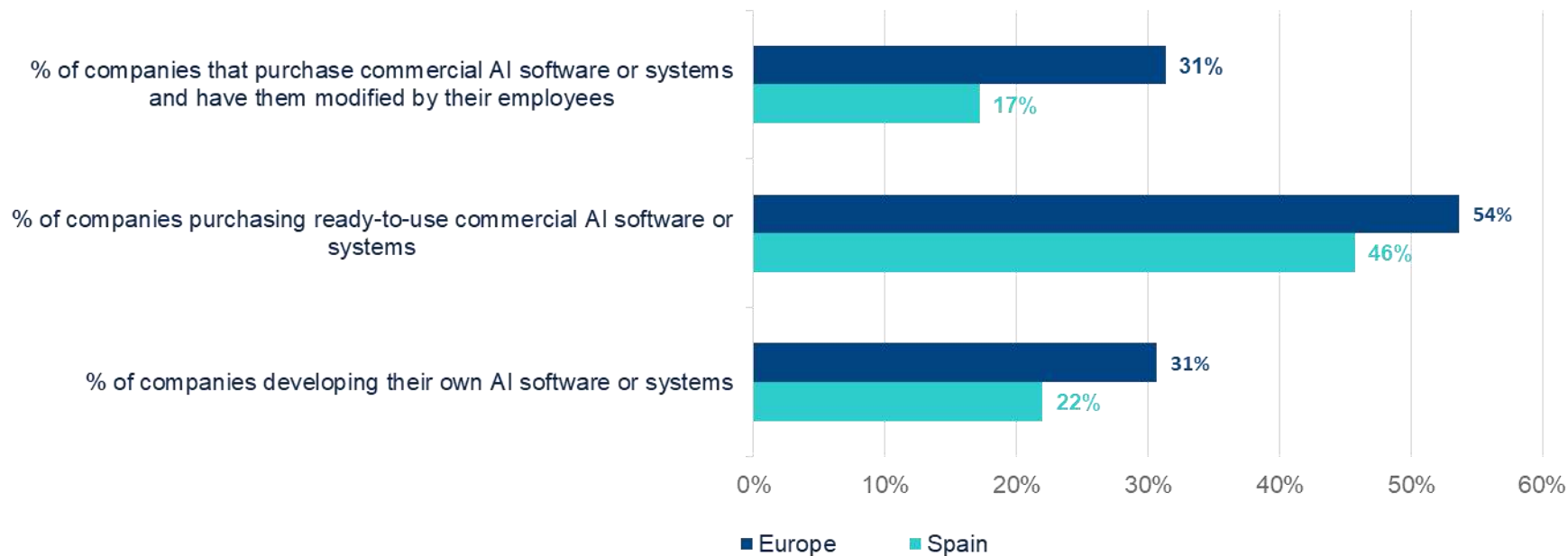
- Spain stands out in the EU 2022 Global Digital Economy and Society Index.
- Spain has high levels of connectivity, integration of digital technologies and digital public services...

... but it is average in terms of advanced skills and development of its human capital, which limits its use of digital technologies.

To what extent can outsourcing AI services fill the gap in skilled staff?

AI ADOPTION SURVEY

(% OF COMPANIES WITH 10 OR MORE EMPLOYEES WHO OPT FOR EACH OF THE FOLLOWING)



Takeaways



Digital infrastructure is decisive for the proper use of AI



Spain and Europe have made significant progress in their digital ecosystem compared to the U.S., with significant improvements since the pandemic



China and the U.S. have developed their AI beyond their digital ecosystems. Are there winner-takes-all dynamics in AI, or will the key be that Europe can take advantage of the full potential of AI in its economic structure?

03

Impact on productivity and growth

Multiplicity of notable use cases

Biomedicine

[AlphaFold](#) aiding in protein structure prediction for better biochemical syn protein folding in genetics.

Programmable hydrogels used in medical devices

Materials Science

Generative AI can visualize and design complex [crystal lattices](#), something that was nearly impossible without high-performance computing. This ability opens up opportunities in **semiconductors, solar cells**, and advanced coatings.

- use AI to discover adaptive architected materials for robotics
- eco-friendly ceramic materials for water filtration.
- smart materials, including:
 - Self-healing materials that repair cracks autonomously, used in infrastructure and aerospace.
 - Shape-memory alloys for robotics and medical devices that return to a programmed shape after deformation.
 - Programmable hydrogels for applications in drug delivery and soft robotics.

Connectivity and robotics

[Self-driving cars](#)

[High-performance computing](#).

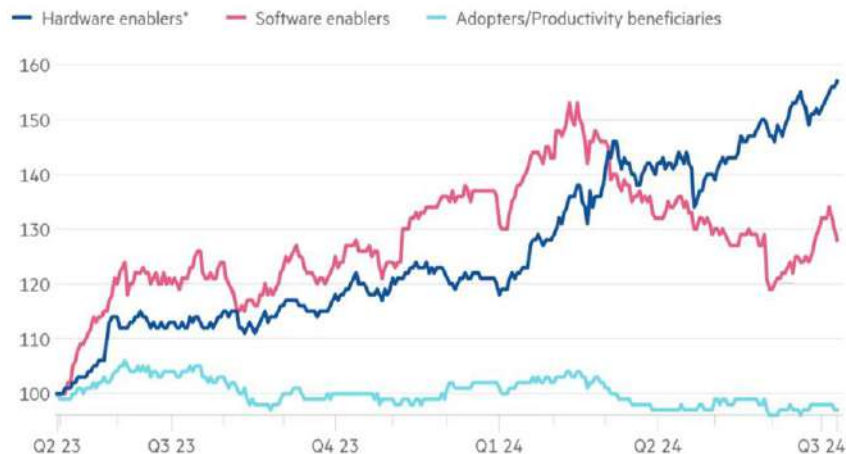
[Robotics](#)



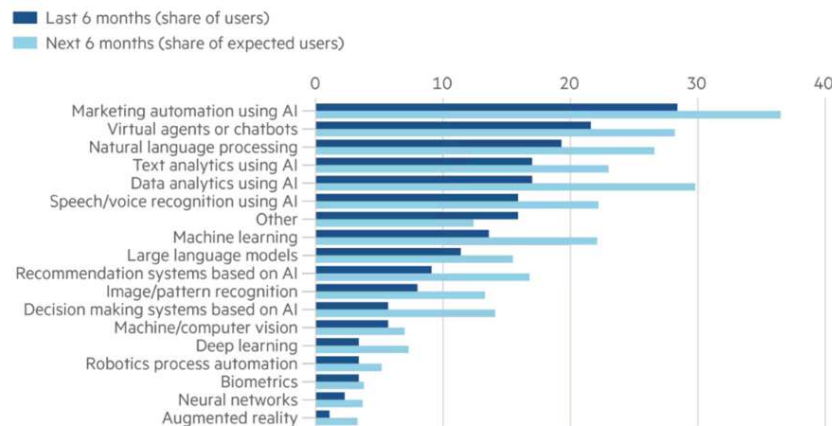
However, it is difficult to see the effects of AI on national accounts

In the words of Solow, AI has not resulted in increases in aggregate productivity, and many of its current applications do not necessarily add high value

COMPANIES EXPOSED TO AI: HARDWARE RALLY (RELATIVE RETURNS AGAINST THE EQUAL-WEIGHTED S&P 500)



AI ADOPTION AND ADOPTION PLANS, IN LOW-ADDED-VALUE ACTIVITIES (SURVEY BETWEEN DEC 2023-FEB 2024, % OF AI USERS)



* Excluding Nvidia.

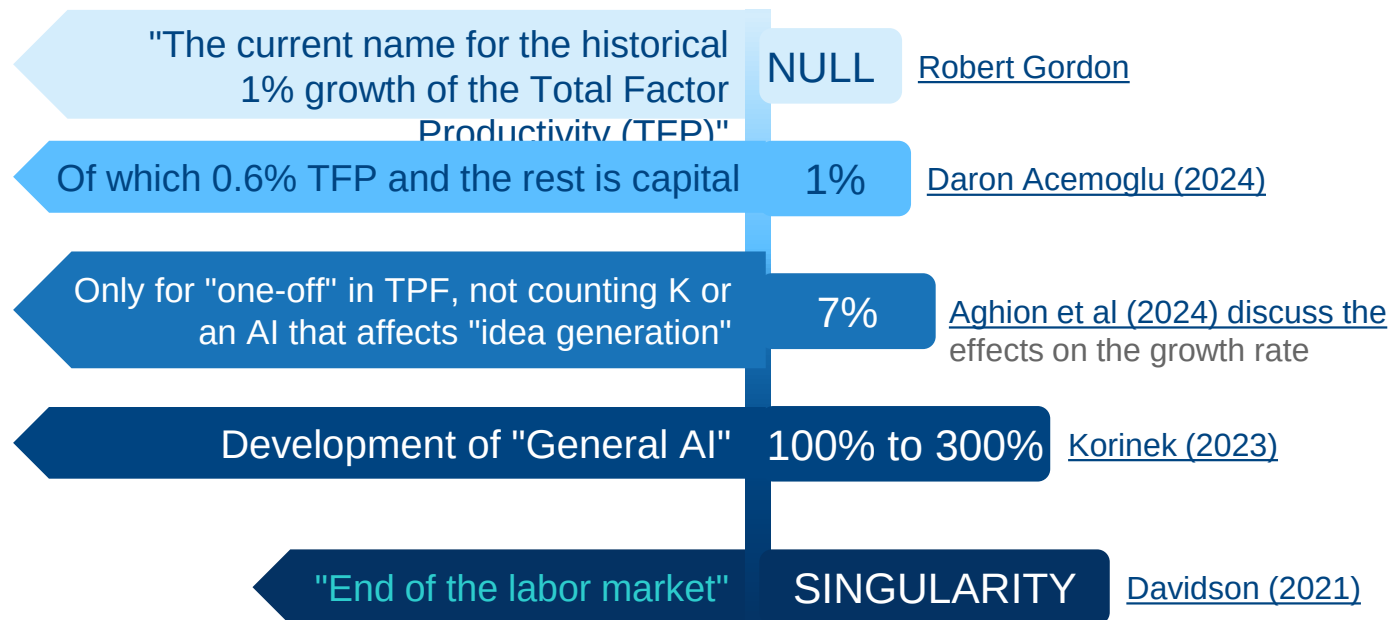
Source: [Financial Times](#) based on Goldman Sachs GIR, FactSet.

Source: [Financial Times](#) from the U.S. Census Bureau; Bonney et al (2024).

In the face of such great promises and still little realization, the debate on the economic impact remains extremely open

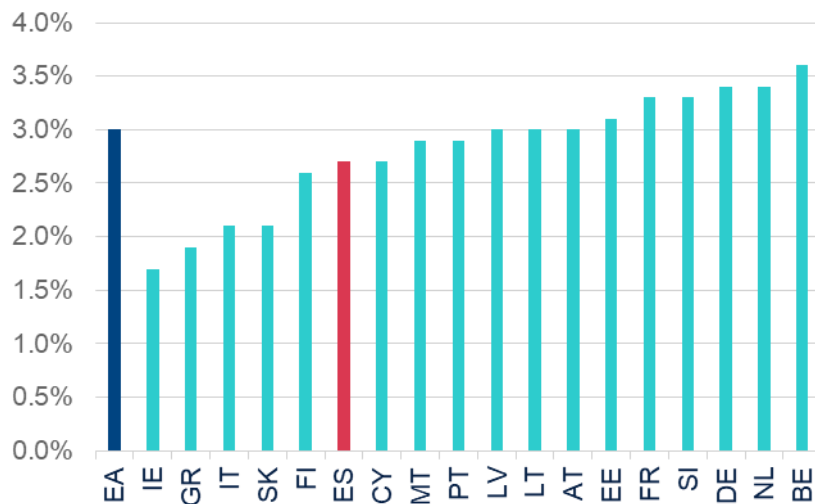
ADDITIONAL GROWTH EXPECTED FOR THE U.S. ECONOMY

(% ADDITIONAL ACCUMULATED IN THE NEXT 10 YEARS)



The Acemoglu approach (2024) shows an impact of around 3pp for Spain and Europe, limited but greater than the 0.6 of the U.S.

TFP GAINS THANKS TO AI (ESTIMATE FOR THE NEXT 10 YEARS IN %)



Spain's Total Factor Productivity would increase over **3 pp** the next 10 years, slightly below the average estimate for the euro area and similar to NGEU funds.

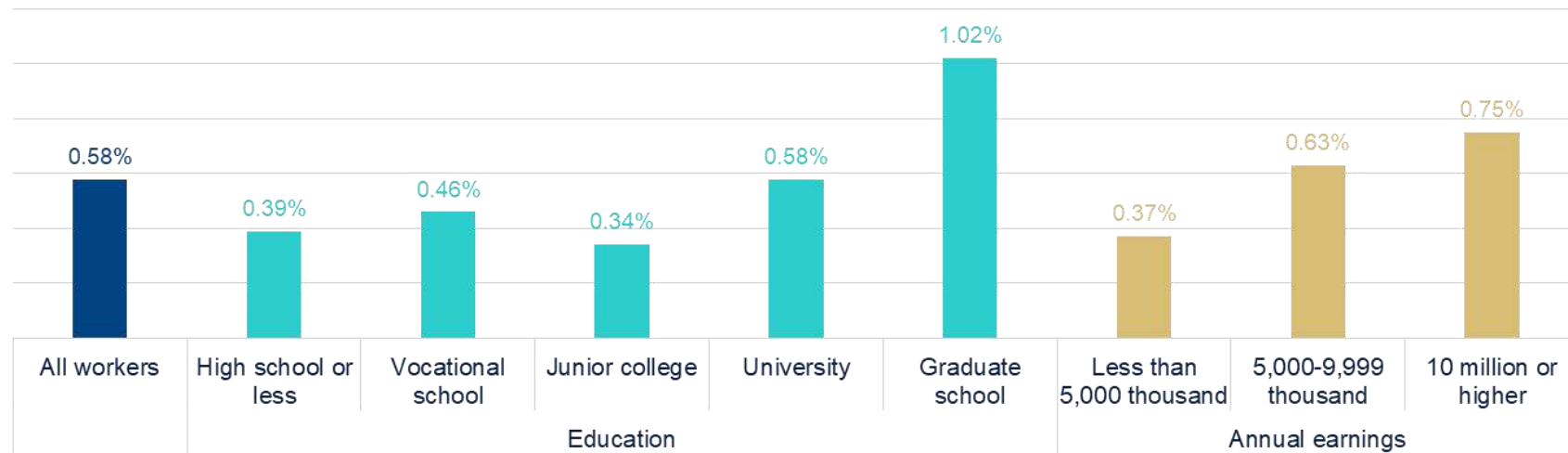
Using the same methodology (but dependent on a "more optimistic" meta-analysis of the impact of AI on the productivity of different tasks), [Aghion](#) estimates a productivity gain for France that could reach 14 percentage points in 10 years.

Notes: Bars present the central scenario of total TFP gains from IA through the automation channel by adapting Acemoglu (2024)'s model to European countries. This scenario uses a threshold of 0.8 to defined exposed task, considers that 40% of exposed tasks can indeed be feasibly automated and assumes a 35% higher productivity in these tasks. Lower bounds use respectively 0.85, 0.23 and 27% and upper bounds use 0.75, 0.45 and 40%. Source: BBVA Research from [Bergeaud](#) (2024) .

An increase in productivity of around 0.6% is estimated for Japan

JAPAN: LABOR PRODUCTIVITY GAINS THANKS TO AI

(AVERAGE ESTIMATE FOR THE NEXT 10 YEARS IN %)

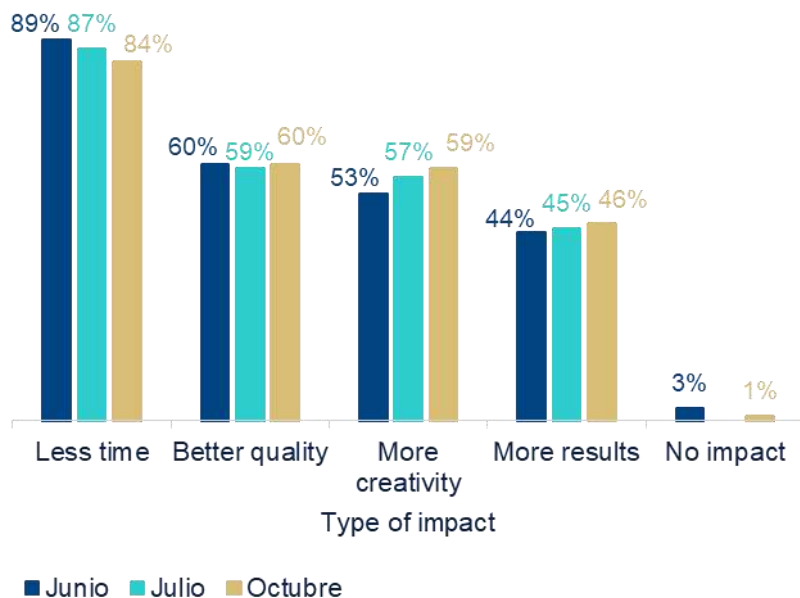


Source: BBVA Research based on [Morikawa \(2025\)](#).

It is possible that the impact on productivity will increase over time, although the study assumes that these increases would become progressively smaller.

The impact of AI on BBVA points to gains in productivity, quality and creativity

REPORTED IMPACT OF CHATGPT USE (PERCENTAGE OF RESPONSES)



- The survey of licensed users on the impact of their use of ChatGPT shows a Net Promoter Score (NPS) of 4.8 out of 5.
- The type of impact declared by the use of Chat GPT is mostly the reduction of time (more than 2 hours a week), but an increase is also seen in other impacts such as creativity or the quality of the work generated.

Note: Results of the 1391 responses to the survey conducted in 2024 among BBVA employees in Spain, Mexico, Turkey, Colombia, Peru, Argentina and Uruguay.

Takeaways



Promising technology in many fields of knowledge (potential GPT).



At the moment, the estimated low aggregate impact generates a wide debate about its future impact.



Given the transformation of scientific advances into commercial products may take many years or decades, productivity growth over the next decade will depend largely on the speed of AI adoption.

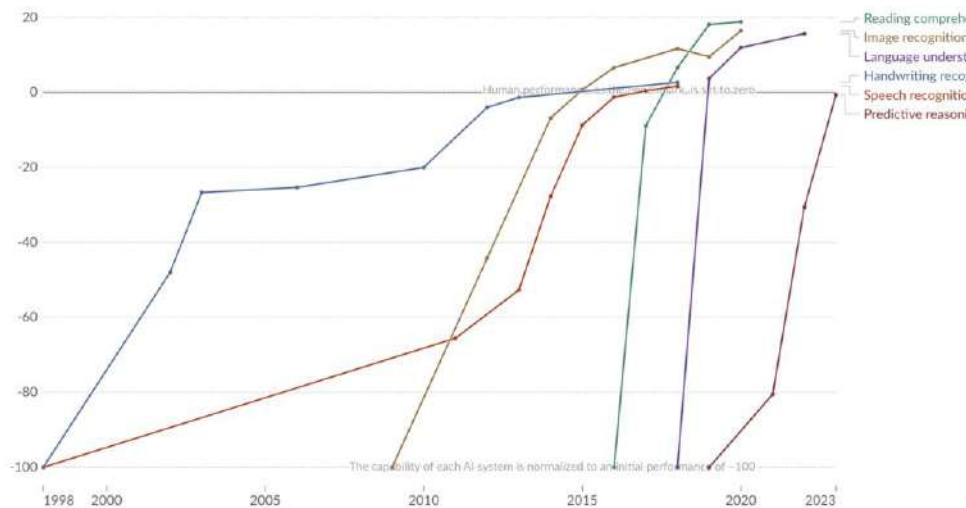


04

Impact on the labor market

AI is impacting a wide spectrum of routine *cognitive tasks*

RESULTS OF TESTS CARRIED OUT BY AI (DIFFERENT SKILLS, HUMAN RESULTS = 0)



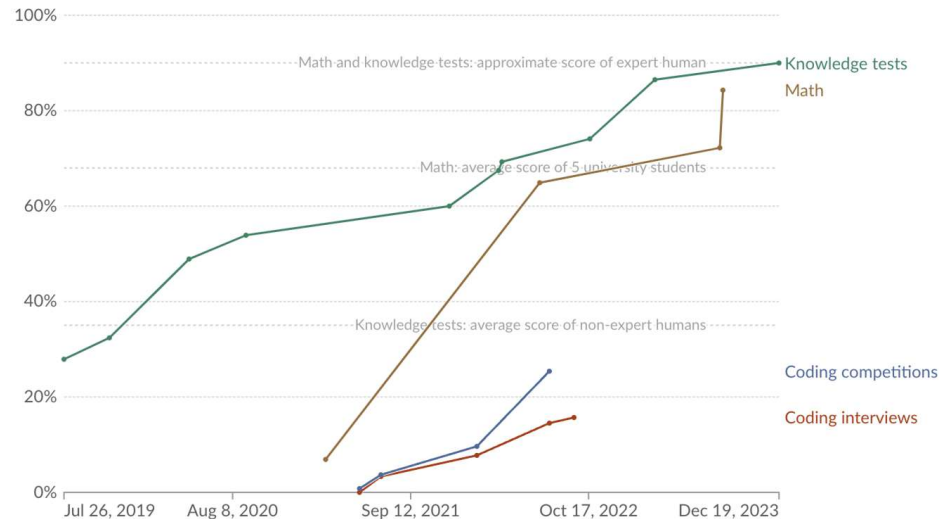
- According to [this study](#), AI is already performing better than humans in **controlled tests** of reading comprehension, image recognition, and language comprehension.
- Moreover, its development is very rapid, so the improvement in 2024 will likely be enormous.

Note: Performance on these benchmarks should not be compared directly as they use different performance metrics and test different skills.

Source: Kiela et al. (2023), [OurWorldinData.org](https://ourworldindata.org)

AI is impacting a wide spectrum of routine *cognitive tasks*

RESULTS OF TESTS CARRIED OUT BY AI (AREAS OF KNOWLEDGE, MAXIMUM=100%)



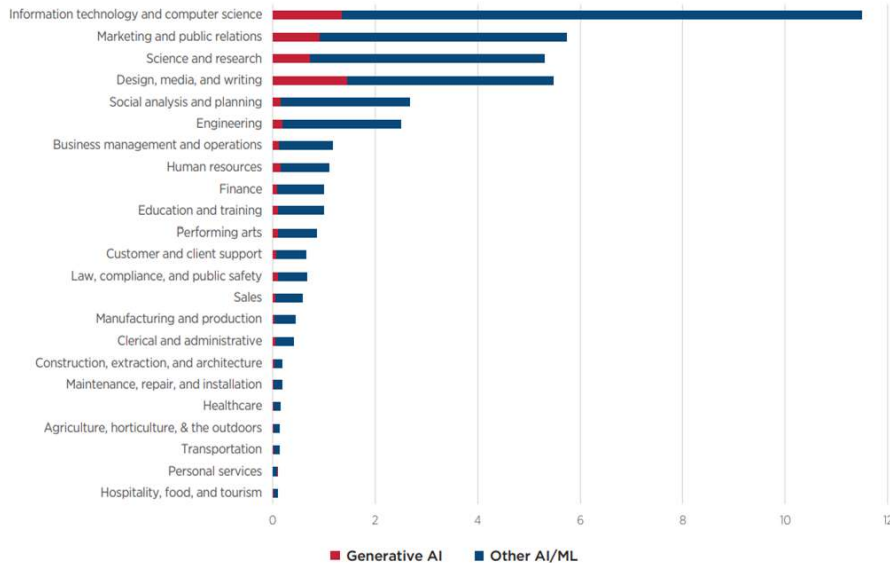
- The same study indicates exceptional return in language-based knowledge, mathematics and programming.
- But the same study indicates that *“Outside of tests, AI models can fail in surprising ways and do not reliably achieve performance comparable to human capabilities.”*

Note: Performance on these benchmarks should not be compared directly as they use different performance metrics and test different skills.

Source: Papers with Code (2024). [OurWorldinData.org](https://paperswithcode.com)

Increasingly impacting occupations that require more specialized skills

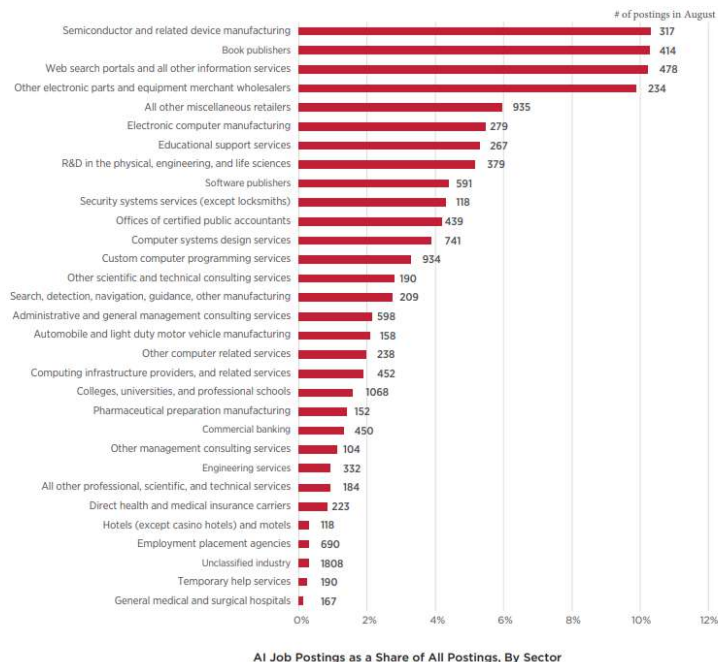
OCCUPATIONS IN THE U.S. THAT REQUIRE ARTIFICIAL INTELLIGENCE (% OF COMPANIES BY OCCUPATION)



- The lack of reliability still keeps the implementation in the production chain limited, as [previously pointed out](#).
- But the future potential is immense: being able to automate knowledge routines associated with higher value-added work.

As a result, it is beginning to impact all industrial sectors, especially those most intensive in skilled labor

AI-RELATED JOB OPENINGS (% OF TOTAL JOB OPENINGS, UNITED STATES)



The demand for AI knowledge is already becoming evident, especially in those sectors more closely related to the digital realm.

Will AI constitute a "skill biased" technological change like the great technologies of the past?

THREE WAYS AI COULD IMPACT THE LABOR MARKET

- 1 **Creation** of new occupations
- 2 **Complementarity** (enhancement) of occupations
- 3 **Replacement** (automation) of occupations

Brey and van der Marel (2024) indicate that for **European companies**, the human capital available 10 years ago explains a third of the current adoption of AI.

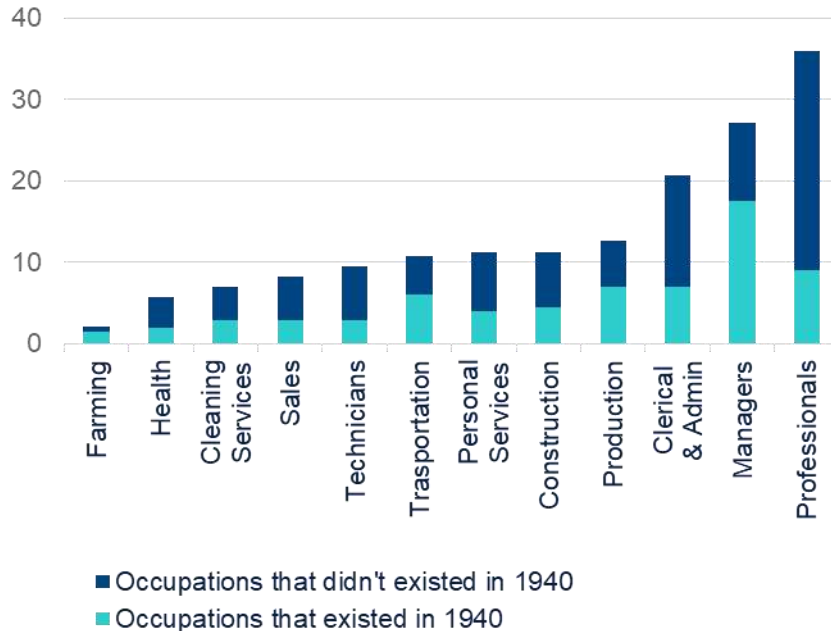
Despite this automation, we found no evidence of high- or low-skilled job losses for 2021.

1. Creation of new occupations

Key aspect of past technologies and an emerging process for AI

CURRENT OCCUPATIONS

(WEIGHTED BY NUMBER OF JOBS, U.S.)

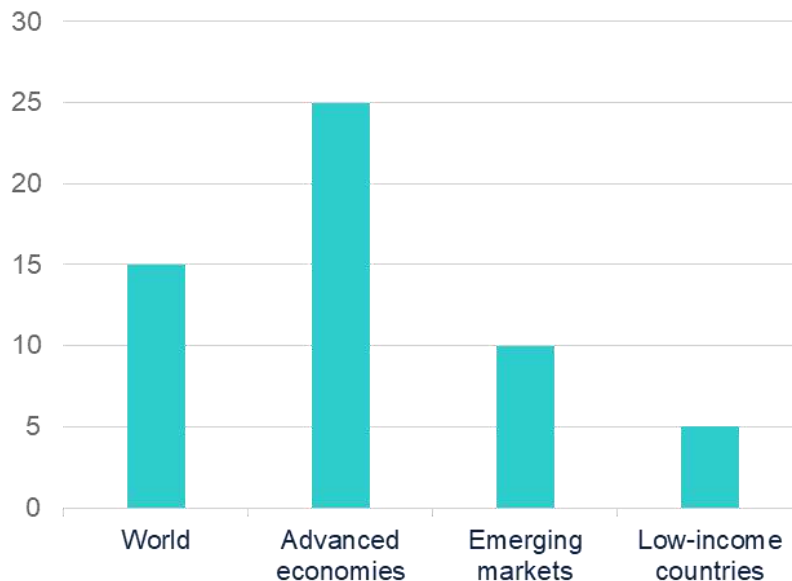


- Machine Learning Engineer
- AI Ethicist
- AI Trainer
- Prompt Engineer
- NLP Processing Specialist
- Data Scientist
- Computer Vision Engineer
- AI Product Manager
- AI Specialist for the Healthcare Sector
- Self-driving Vehicle Engineer
- AI-Powered Marketing Specialist
- AI Generative Artist
- AI-Powered Content Moderator
- Digital Twin Specialist
- AI-powered Financial Analyst
- AI-powered Cybersecurity Specialist
- Human-AI Collaboration Specialist

2. Complementarity with existing occupations

Preliminary evidence from the IMF (2024) shows complementarity of AI with current jobs, especially in the labor market of developed countries

OCCUPATIONS WITH HIGH COMPLEMENTARITY
(% OF JOBS)



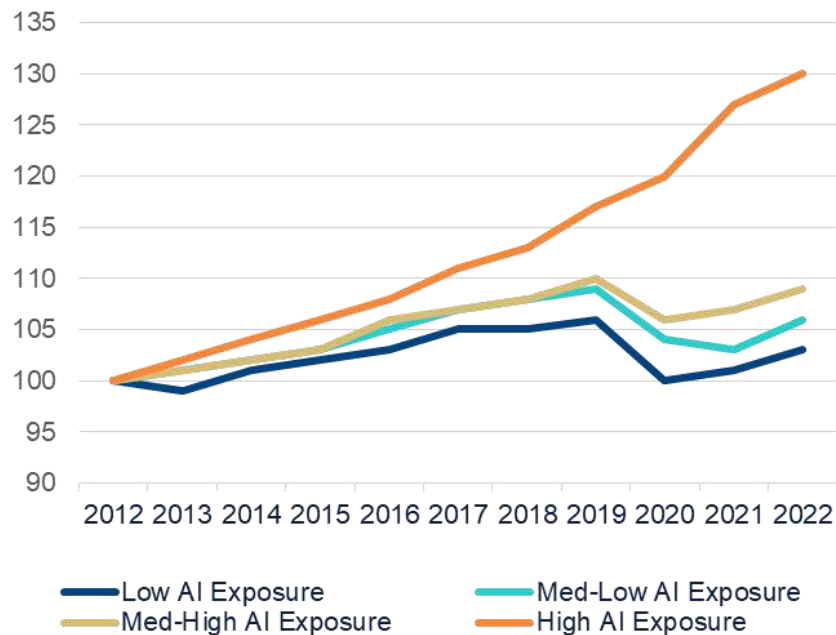
Source: [IMF \(2024\)](#).

2. Complementarity: employment increases in sectors exposed to AI

Estimated increases of 2.6% to 4.3% in labor force participation as one moves from the 2nd to the 3rd quartile of exposure to AI.

EMPLOYMENT DYNAMICS

(EU 27, 2012 = 100)



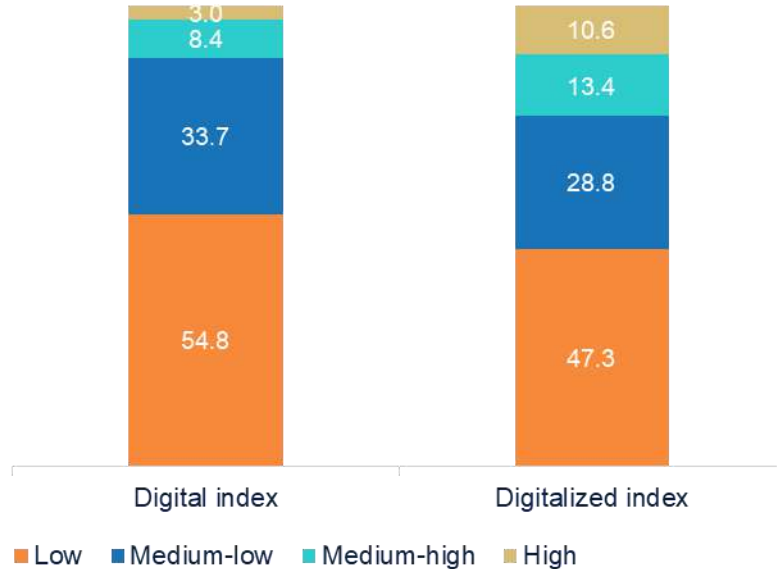
Source: [Guarascio & Reljic \(2024\)](#).

2. Complementarity: preliminary evidence in Spain as well

Income on the rise in those occupations that are directly digital (e.g., programmers)... but a negligible increase in occupations more exposed to digital (e.g., radiologists)

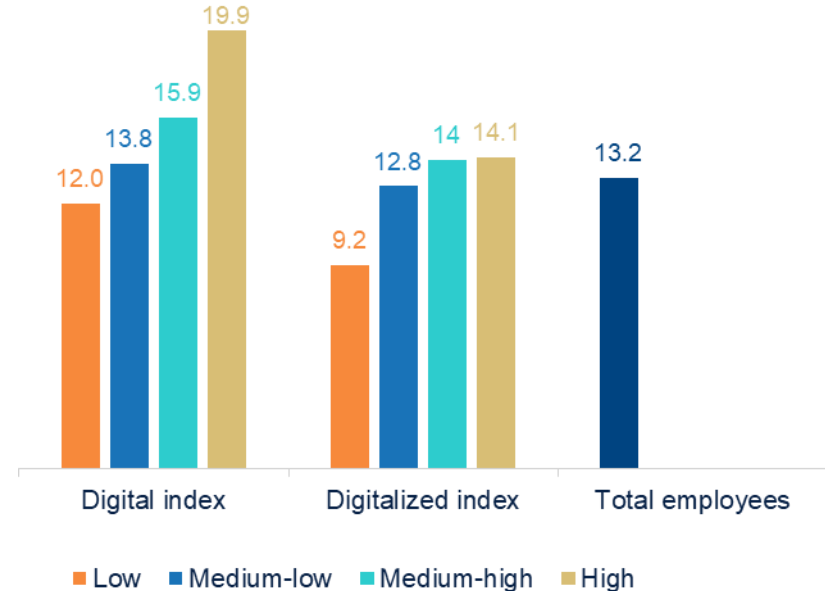
OCCUPATIONS ACCORDING TO THE DIGITAL SKILLS AND DIGITIZED COMPETENCIES INDEX

(% OF EMPLOYEES, SPAIN 2023)



AVERAGE PROFIT PER HOUR WORKED

(EUROS, SPAIN 2022)

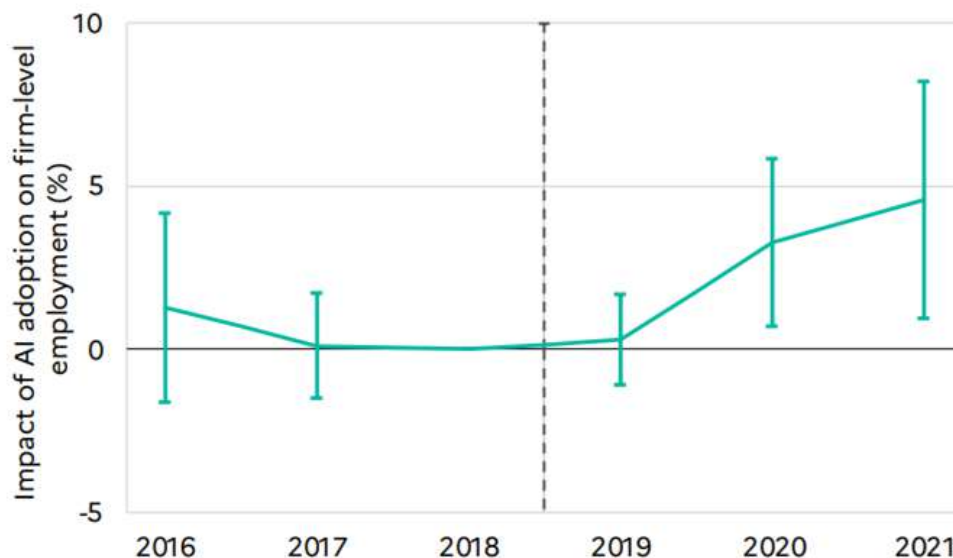


2. Complementarity: effects documented in official reports

Official reports already point to a significant impact of aggregate synergies. Jobs Rising in AI-Intensive Sectors

EMPLOYMENT IN COMPANIES THAT ADOPT AI

(FRANCE, RELATING TO EMPLOYMENT IN OTHER COMPANIES)

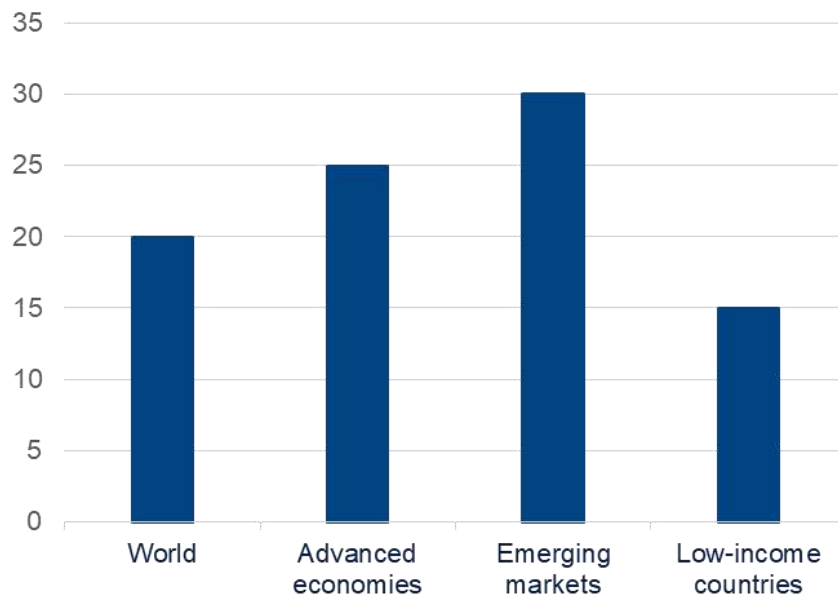


- In France, in recent years, companies adopting AI employ more people than the rest of the companies, despite the fact that they behaved in a similar way in the previous three years.
- Companies that adopt AI are predominantly larger and more productive, suggesting that those that are already more developed will be the biggest winners of the AI revolution.

3. Replacement/automation of existing occupations

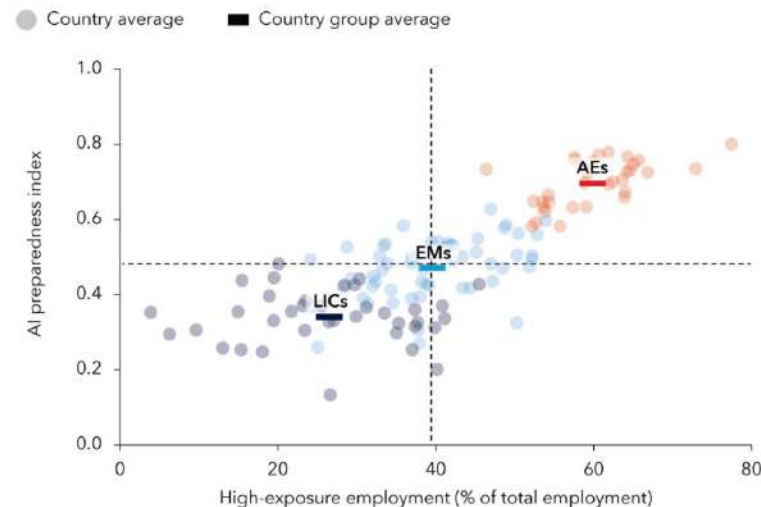
Preliminary evidence points to the need for good governance to deal with potential disruptions to income, gender or age inequality

LOW COMPLEMENTARITY (% OF JOBS)



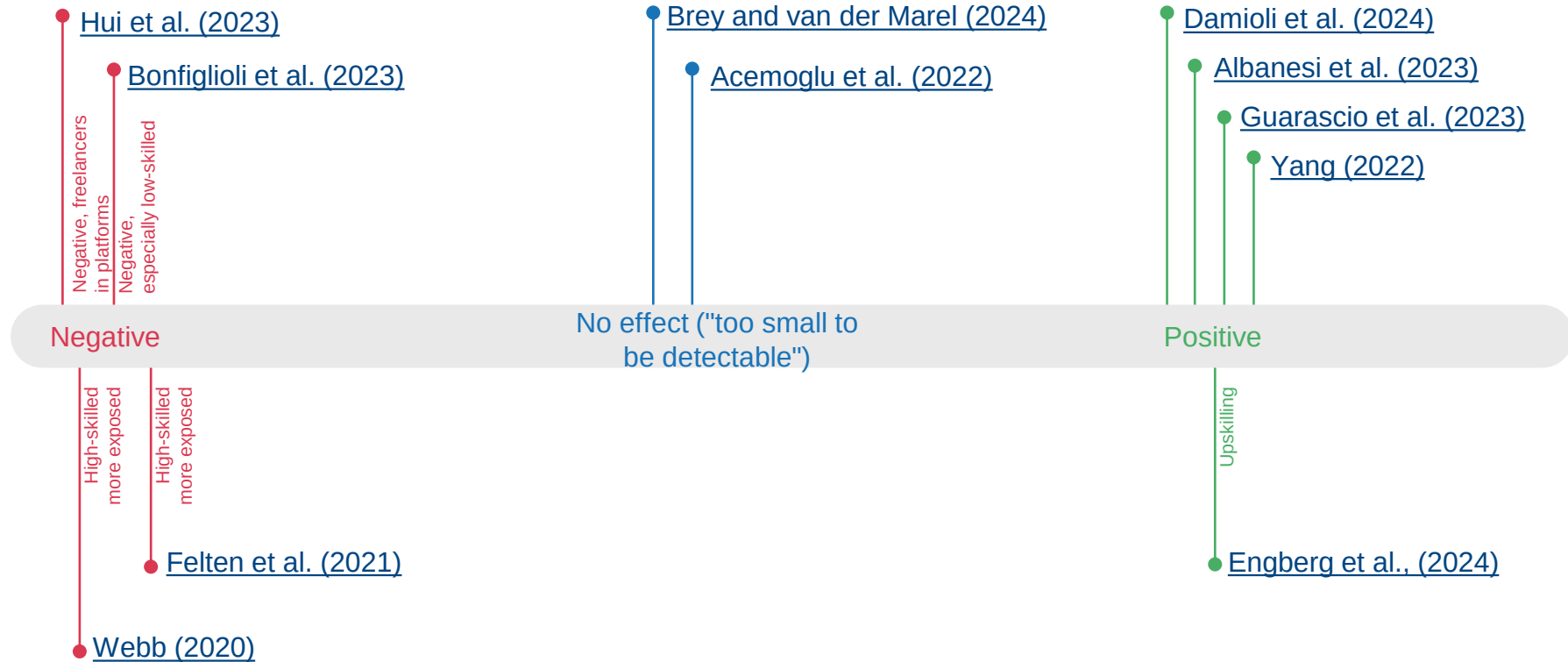
Source: IMF.

AI READINESS INDEX AND EMPLOYMENT STAKE IN HIGH-EXPOSURE OCCUPATIONS



Source: Fraser Institute, ILO, International Telecommunication Union, United Nations, Universal Postal Union, World Bank, World Economic Forum, and IMF staff calculations.
Note: Plot reflects 32 advanced economies, 56 emerging market economies, and 37 low-income countries. Dotted reference lines are derived from AI Preparedness Index median values and high-exposure employment.

There is also an open debate on the impact of AI on employment



05

Determinants for the scope and impact of AI

Five key factors to consider



Climate change



Geopolitics



Safety



Financial stability



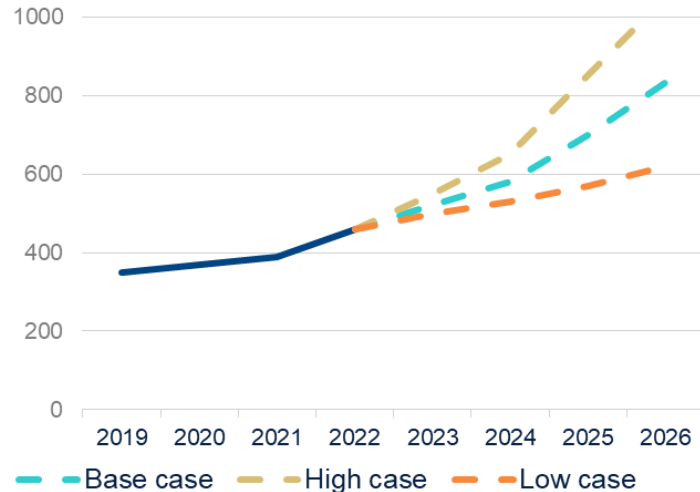
Inequality

AI and climate: disruptive potential, but also increasing demand for resources

Artificial intelligence (AI) has the potential to increase the productivity of the economy and promote climate action. However, it also puts increasing pressure on energy and water resources

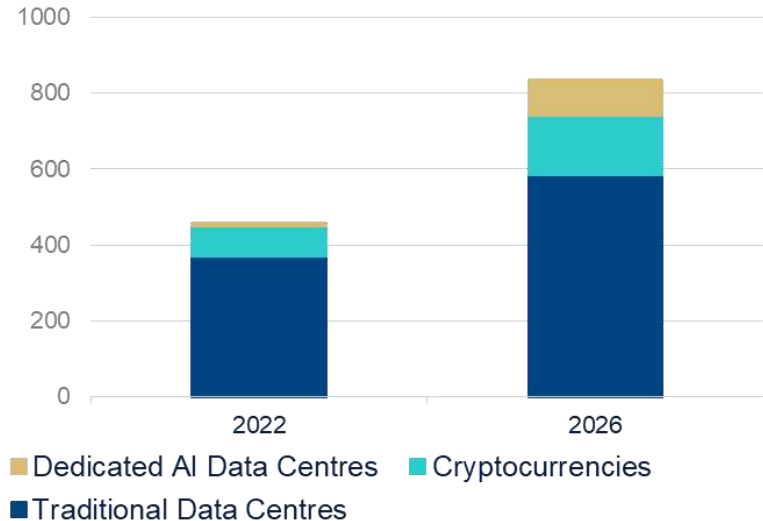
According to estimates from the [IEA](#), data centers, cryptocurrencies and AI consumed almost 2% of the global electricity demand in 2022.

GLOBAL DEMAND FOR DATA CENTER ELECTRICITY, AI AND CRYPTOCURRENCIES, 2019-2026 (TWH)



Source: BBVA Research based on [Electricity 2024 Analysis - IEA](#)

ESTIMATED ELECTRICITY DEMAND, BASELINE SCENARIO 2022 AND 2026 (TWH)

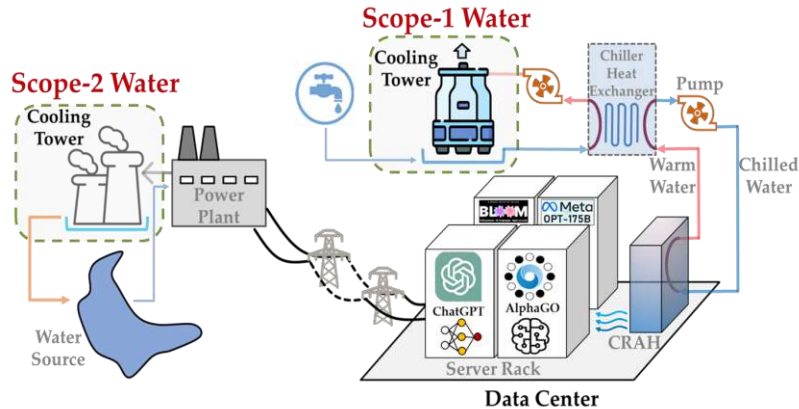


Source: BBVA Research based on [Electricity 2024 Analysis - IEA](#)

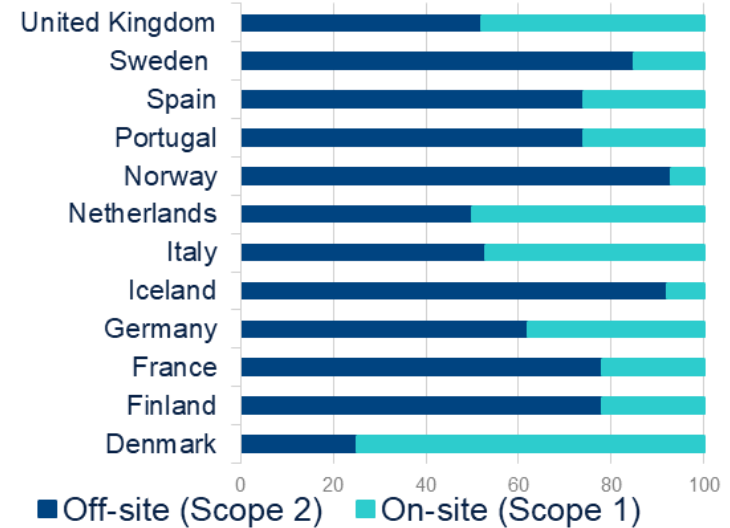
AI and climate: disruptive potential, but also increasing demand for resources

The water footprint of data centers is not limited to cooling, the majority is attributed to energy consumption

ILLUSTRATION OF WATER USE IN SCOPE-1 IN SITU (SERVER COOLING) AND SCOPE-2 OFF-SITE (POWER GENERATION)



PERCENTAGE OF CONSUMPTION IN THE TOTAL ANNUAL WATER CONSUMPTION FOR DATA USE (%)



AI and climate: disruptive potential, but also increasing demand for resources

AI supports advances in clean energy, sustainable finance, and climate policies, contributing to both mitigation and adaptation efforts

OVERVIEW OF AI'S CONTRIBUTION TO CLIMATE ACTION

Issue	AI contribution	Environmental impact
Climate Modeling	Collects large datasets for more accurate predictions	Mitigates natural disasters by improving forecasting and response
Emissions Tracking	Tracks real-time emissions data and models their impacts	Helps policymakers develop effective strategies for reducing emissions
Carbon Capture Optimization	Optimizes both nature-based and technology-based carbon capture methods	Reduces emissions by making carbon capture more efficient
Energy Transition & Management	Predicts energy demand and stabilizes energy grids	Enhances the integration of renewable energy sources
Climate Resilience & Adaptation	Forecasts vulnerabilities and supports early warning systems for climate hazards	Builds resilient infrastructure and improves preparedness for climate-related disasters
Sustainable Finance	Analyzes ESG (Environmental, Social, Governance) data for sustainable investment	Increases investment in green projects and supports the development of climate-related initiatives

AI and geopolitics: AI innovations become strategic assets in the tech war involving the U.S. and China. Where is Europe?

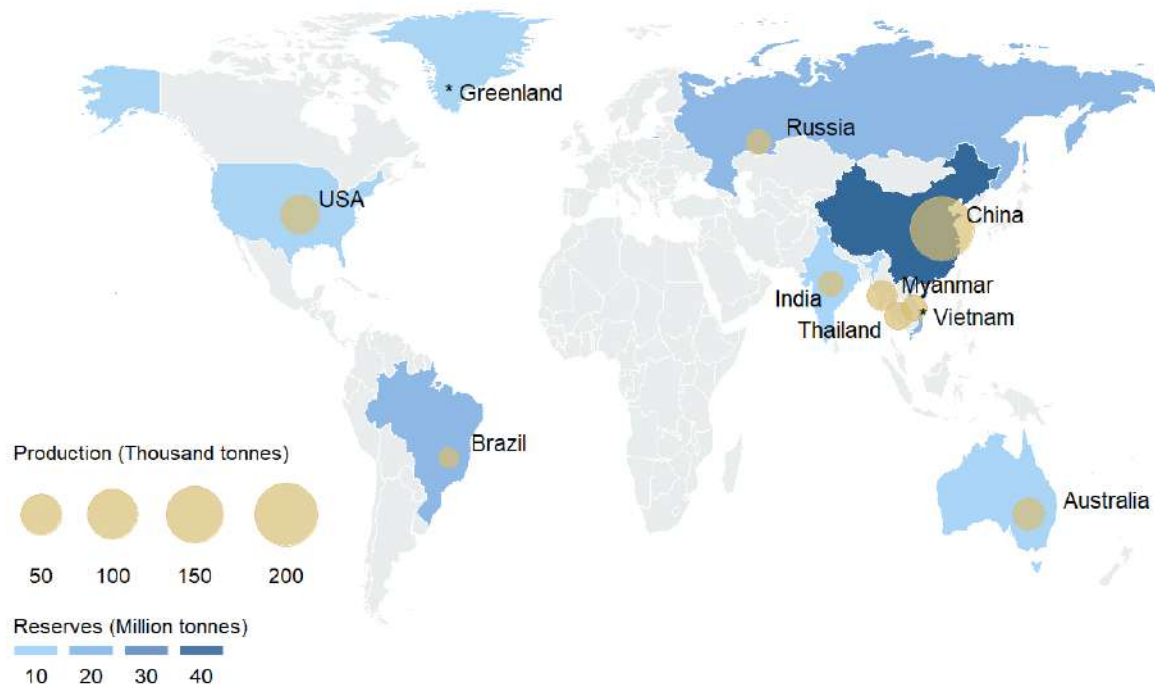
AI-driven innovations—from TikTok to the development of humanoid robots—are an emerging area of competition between the two countries. The U.S. Congress is concerned about these types of AI-supported technologies created in China that could pose a risk to personal safety due to the data they collect and could gather information about their environment and the people they interact with.



The U.S. military is exploring ways to incorporate humanoid robots into modern warfare, and according to members of the U.S. Congress, China has already deployed armed robots on the battlefield.

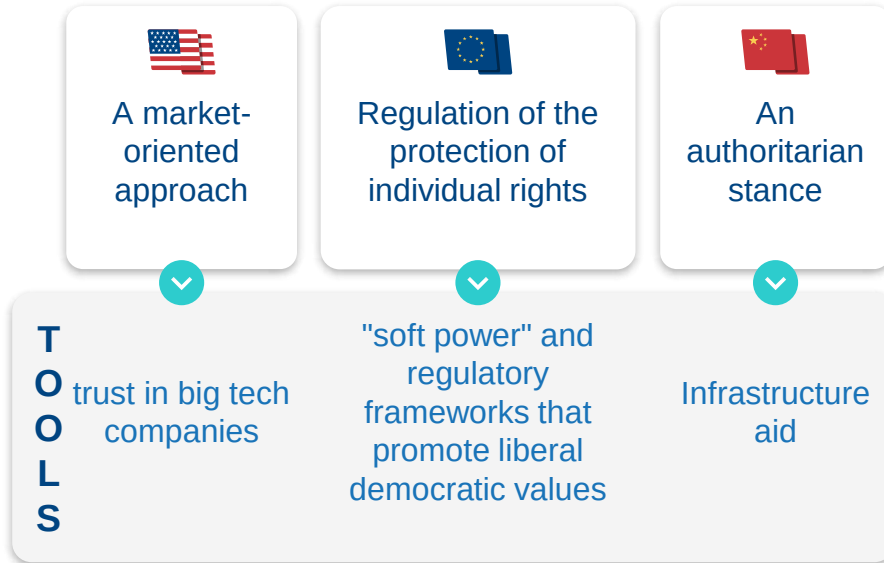
AI and geopolitics: Europe does not have the minerals needed to make chips ... except in Greenland

RARE EARTH RESERVES



AI and geopolitics: the development of the digital age is increasingly intertwined with the future geopolitical order

THREE DIGITAL BLOCKS IN COMPETITION VYING FOR GLOBAL INFLUENCE (KEY MESSAGES FROM PROFESSOR BRADFORD)



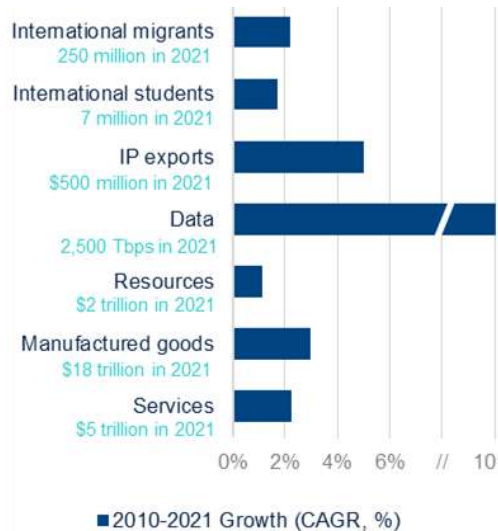
- Europe's approach is gaining ground among liberal democracies amid a backlash against Big Tech's reputation. Meanwhile, China consolidates its influence in several emerging economies.
- In vertical battles, the West faces the recurring challenge of enacting regulation that is enforceable and compatible with innovation.
- The possible existence of countries not aligned with any of the aforementioned "iblocs" (for example, India), which may constitute a fourth pole of attraction.

AI and security: growing need to safeguard security in all its dimensions

DATA BETWEEN COUNTRIES DOUBLES EVERY TWO YEARS, WHILE INTERNATIONAL COORDINATION REMAINS FRACTURED

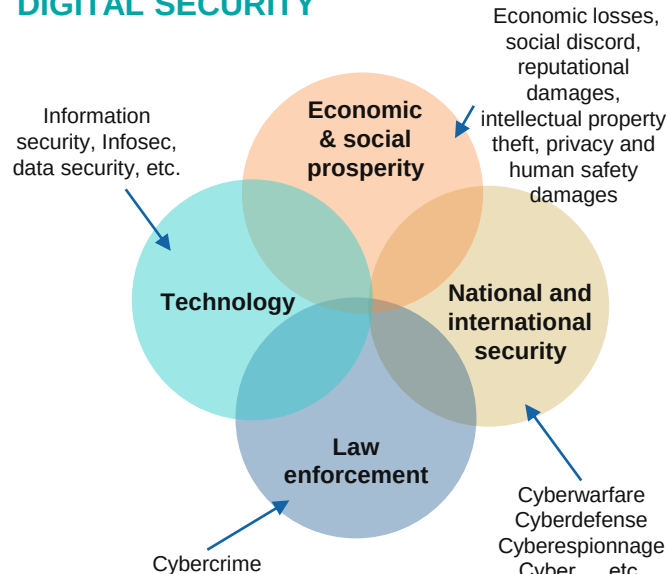
GLOBAL FLOWS

(2021 VOLUMES AND GROWTH RATIOS 2010-2021 CAGR %)



Source: [McKinsey \(2022\)](#)

FOUR HIGH-STAKES PILLARS: DIGITAL SECURITY



Source: [OECD](#)

Some of the main multilateral organizations that address the different dimensions of digital security:

1. The OECD addresses the security of economic and social prosperity, Standardization organizations such as ISO/IEC, IETF, ETSI or ITU-T Study Committee 17 develop technical standards. The Council of Europe, the United Nations Office on Drugs and Crime (UNODC) and Interpol (at a more operational level), focus on cybercrime, the United Nations Group of Governmental Experts (GEG) and the Open-ended Taskforce (OEWG) address international security issues.

AI and financial stability: A growing concern

CONSIDERATIONS INCLUDED IN THE AI REPORT FOR THE G7



Widespread reliance on similar AI systems in finance could lead to correlated **failures and amplified crashes**.



Automated herd-like behavior could also emerge, increasing market volatility and cyclicity.



In addition, AI's ability to process large amounts of data could enable sophisticated **forms of manipulation, algorithmic collusion, or even cyberattacks**.



Finally, a gap between leading and lagging countries in AI could lead to **financial imbalances, capital flows, and exchange rate volatility**.

However, AI in finance could also generate opportunities, such as greater efficiency in financial markets, **better risk management, identification of fraud**, and an improved ability to quickly identify and **respond to cyber threats**.

AI and inequality: The outcome will depend on the orientation and use of AI, and the public policies applied

Two possible usage strategies :

CO-PILOT AI (NON-AUTONOMOUS AI)

mainly benefits people with less knowledge, as it provides them with a tool to solve problems of greater difficulty. Aimed at reducing wage gaps.

COLLABORATIVE AI (AUTONOMOUS AI)

offers greater advantages to highly skilled people, amplifying the value of their expertise and shifting humans toward specialized problem-solving. Aimed at increasing wage gaps.

will be decisive in guiding AI toward lower inequality and better working conditions.

06

Regulation and governance

G7 REPORT: Public Policy Recommendations for the Advancement of AI

THREE ROLES OF GOVERNMENT

- 1 **Promoting AI**
(R&D, education, infrastructure and financing)
- 2 **Promoting AI in government administration**
- 3 **Enactment of laws and regulations** ensuring the objectives of growth, stability, equity and well-being

TEN POLICY STRATEGIES

1. Proactive and flexible policies
2. Trade-off analysis for all policies
(both technical and incentives)
3. Fostering AI expertise
4. Continuous exploration of new AI capabilities
5. Consistent strategy for public acquisitions of AI tools
6. Adoption of modern government data management tools;
7. Continuous improvement of cybersecurity
8. Creating guidelines for using AI tools
9. Monitoring labor market impact
10. Cross-border cooperation.

Draghi report: AI is key for Europe

Europe still has a chance to change course. With the world now on the cusp of another digital revolution, driven by the spread of artificial intelligence (AI), **a window has opened for Europe to correct its shortcomings in innovation and productivity** and regain its manufacturing potential

Keeping trade barriers low on goods, services and digital infrastructure with the U.S. will be key to ensuring access to the latest AI models and processes

The EU has a unique opportunity to **reduce the costs of AI deployment by increasing IT capacity** and making its network of high-performance computers available

Europe holds a strong position in autonomous robotics, hosting around 22% of global activity, and in AI services, hosting around 17% of activity

Need for a capital markets union: 61% of global funding for AI start-ups goes to U.S. companies, 17% to those in China and only 6% to those in the EU.

The EU should promote **cross-sectoral coordination and data sharing** to accelerate the integration of AI in European Industry.

HispanIA: official report on AI in Spain

PENETRATION OF AI IN THE PRODUCTIVE SECTOR OF SPAIN AND EUROPE, 2023

(% OF COMPANIES WITH MORE THAN 10 EMPLOYEES USING AI IN SOME WAY)

BRANCH OF ACTIVITY	SPAIN	EUROPEAN LEADERS
 Manufacturing industry	9%	15%
 Energy supply	13%	19%
 Construction	5%	6%
 Trade	7%	12%
 Transport and storage	7%	12%
 Hospitality	6%	6%
 ICT	32%	41%
 Real estate and professional activities	15%	26%
 Administrative activities	9%	12%

07

Conclusions

Conclusions

1. AI as a General-Purpose Technology (GPT): cross-sector transformation in multiple sectors.

- Acceleration of innovation and structural reconfiguration of production processes (potential rate effect)

1. Productivity and Growth: limited aggregate impact for the moment, but potentially disruptive. It is still too early to conclude changes in trends

- Estimated increase for Europe of between 3% and 7% in productivity over the next decade... and potential long-term shift in trajectory.

1. Employment: AI will create new occupations, it is a complementary force that will increase the productivity of many others, but it will also destroy jobs that it can replace at a much lower cost.

- For the moment, most of the empirical evidence points to a positive effect on the labor market in terms of jobs and wages, as has happened with previous GPTs

1. Challenges: the ecosystem in which AI operates (infrastructures, regulations, and skills) is essential for its deployment to be as successful as possible in terms of productivity, employment, and inequality.

- Application in productive sectors is as important as the development and improvement of AI models
- Governance of the digital adoption and the development and use of AI: crucial to maximizing benefits and mitigating risk
- International cooperation in cybersecurity and minimum ethical standards are necessary.

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The impact of AI on employment and productivity

Rafael Doménech, Alejandro Neut and David Ramírez

Workshop "Artificial Intelligence, Natural Capital and Productivity"
Bank of Spain, 23 January 2025