DESIGNED FOR YOUR WORLD

SDA Bocconi
SCHOOL OF MANAGEMENT

A.I. & PRODUTTIVITA’

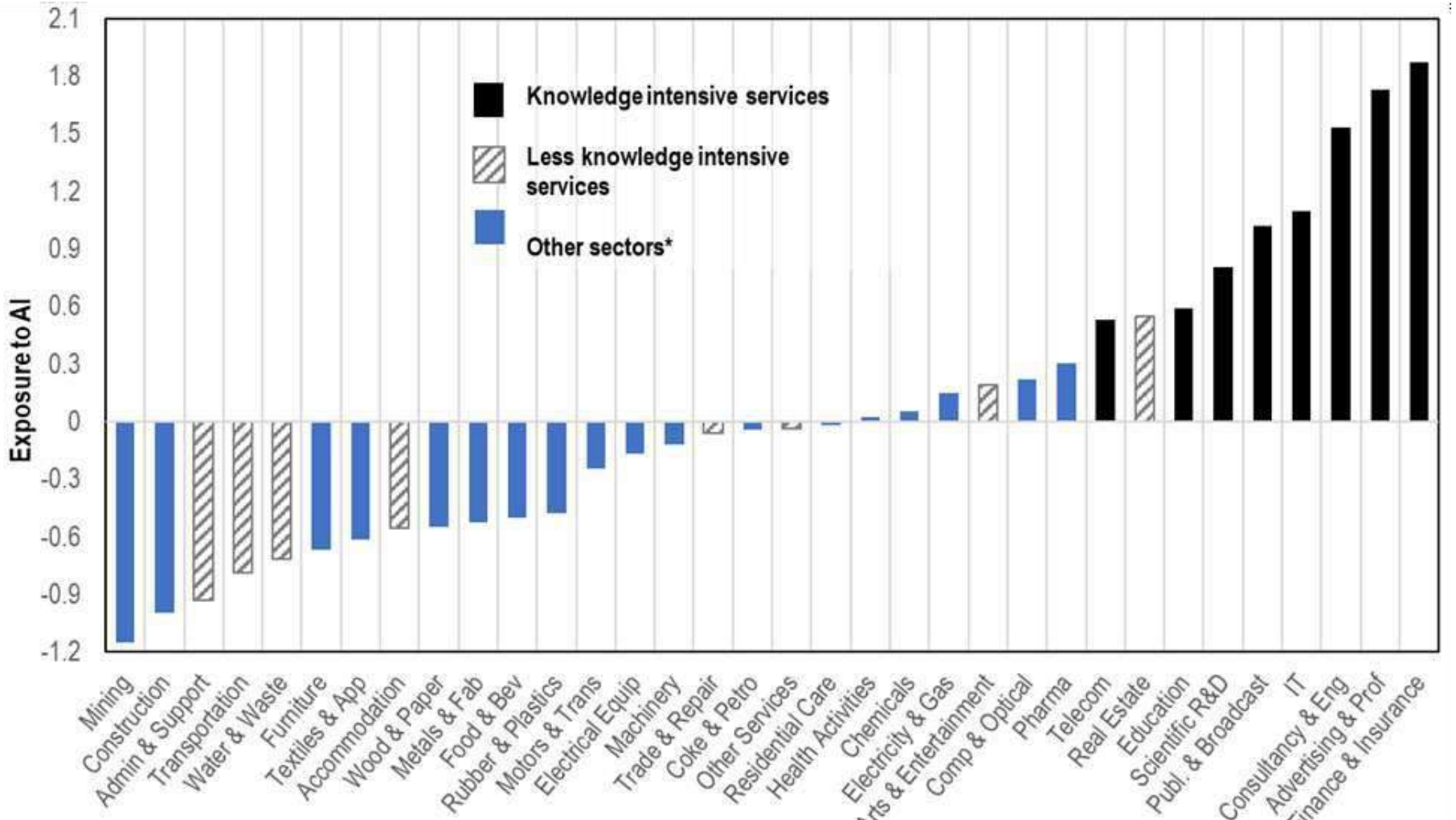
Come cambiano i modelli organizzativi nell’era del management artificiale

Prof. Carlo Alberto Carnevale Maffé – SDA Bocconi School of Management

Roma, 13 novembre 2024

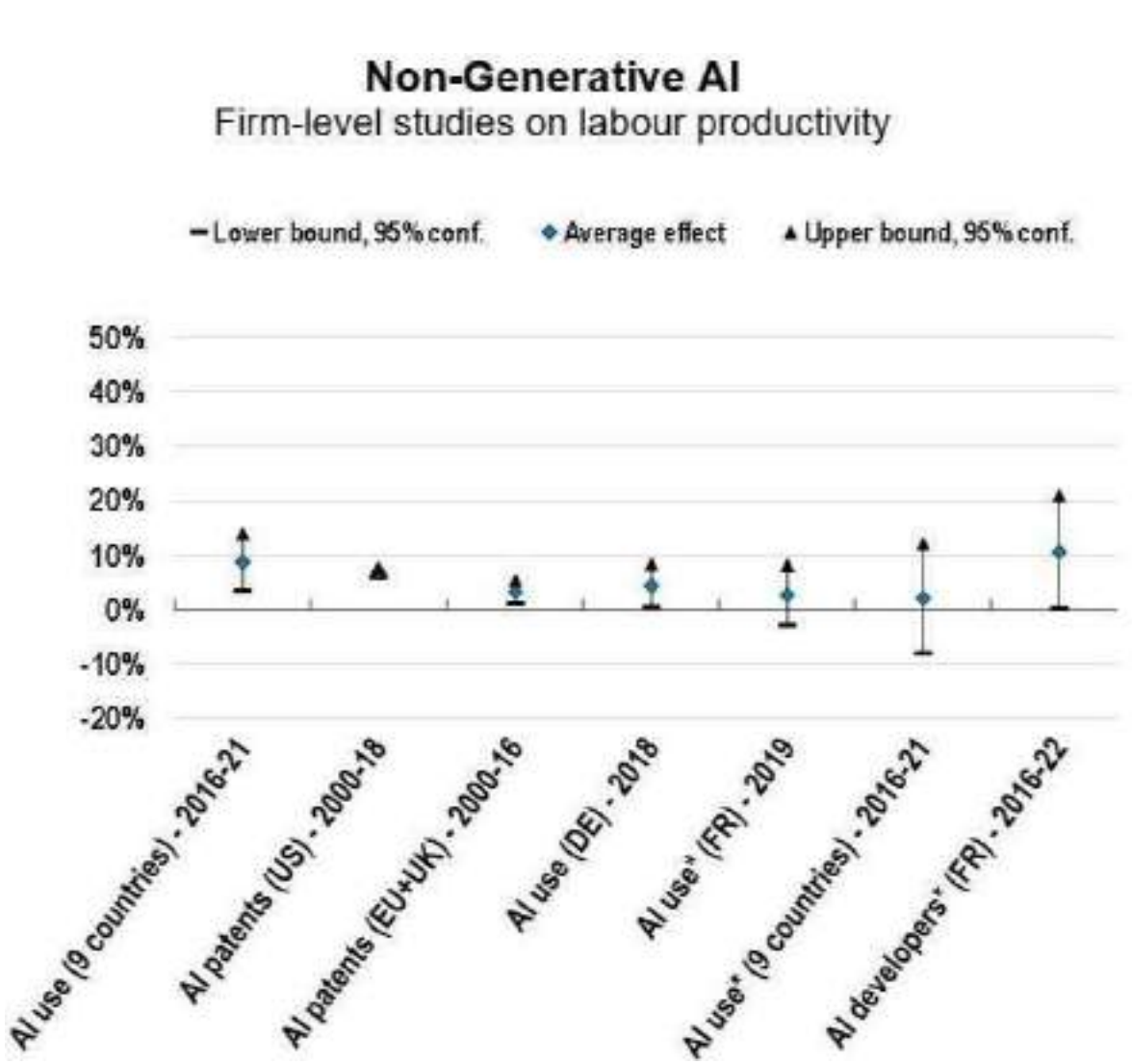
HIGH PRODUCI'IVII'Y AND KNOWLEDGE INI'ENSIVESERVICES ARE MOSI' AÏÏECI'ED BY GEN AI

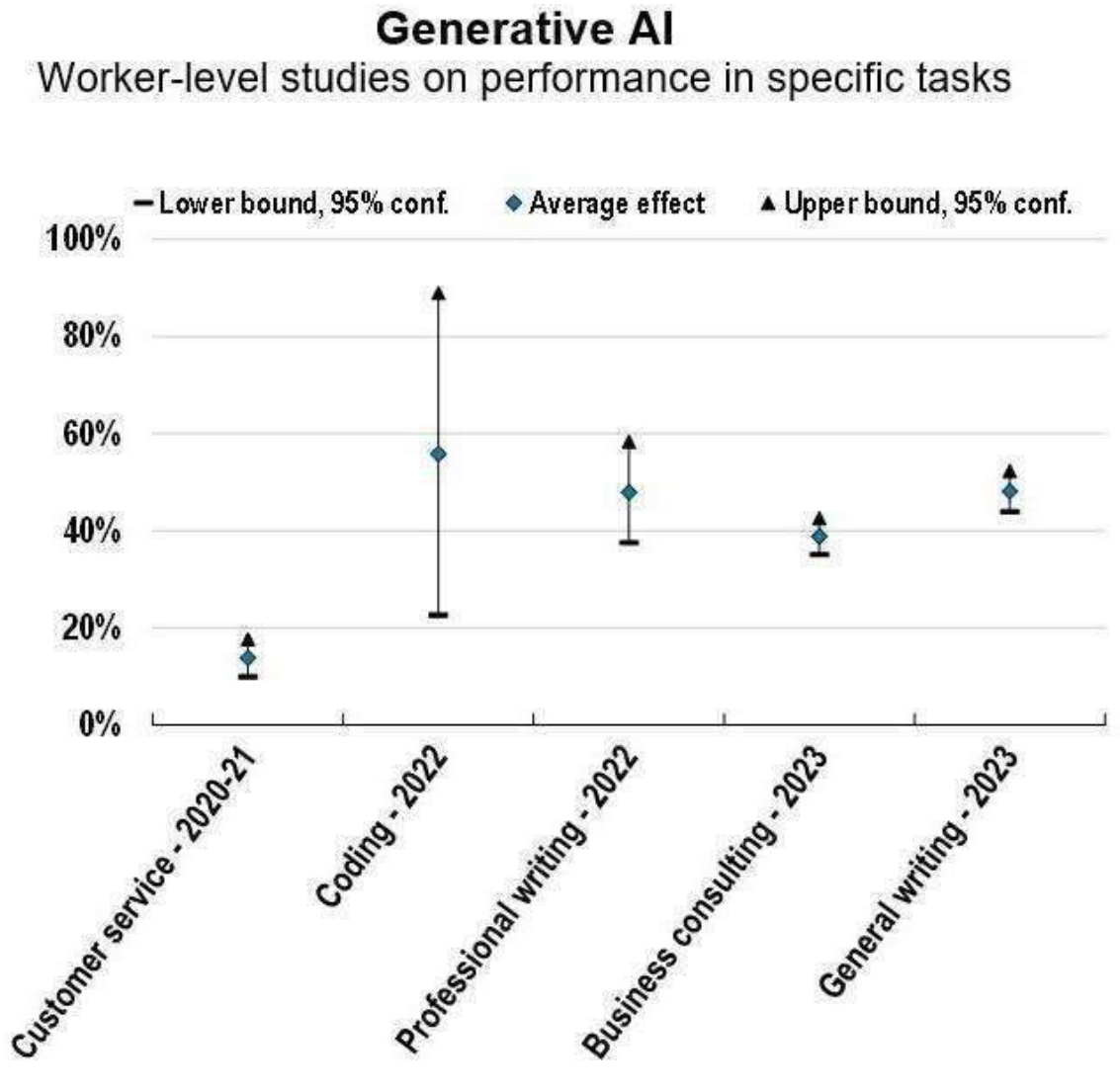
AI exposuíe of woíkeís by sectoí



Note: I'he index measuíes the extent to which woíkeí abilities aíe íelated to impoítant AI applications. I'he measuíe is standaídized with mean zeío and standaíd deviation 1 at the occupation level and then matched to sectoís. I'he figuíe does not yet include íecent Geneíative AI models.
*Including non-maíket seívices, manufactuíing, utilities, etc.
Souíce: Filippucci et al (2024) and OECD (2024) based on (Felten, Raj and Seamans, 2021).

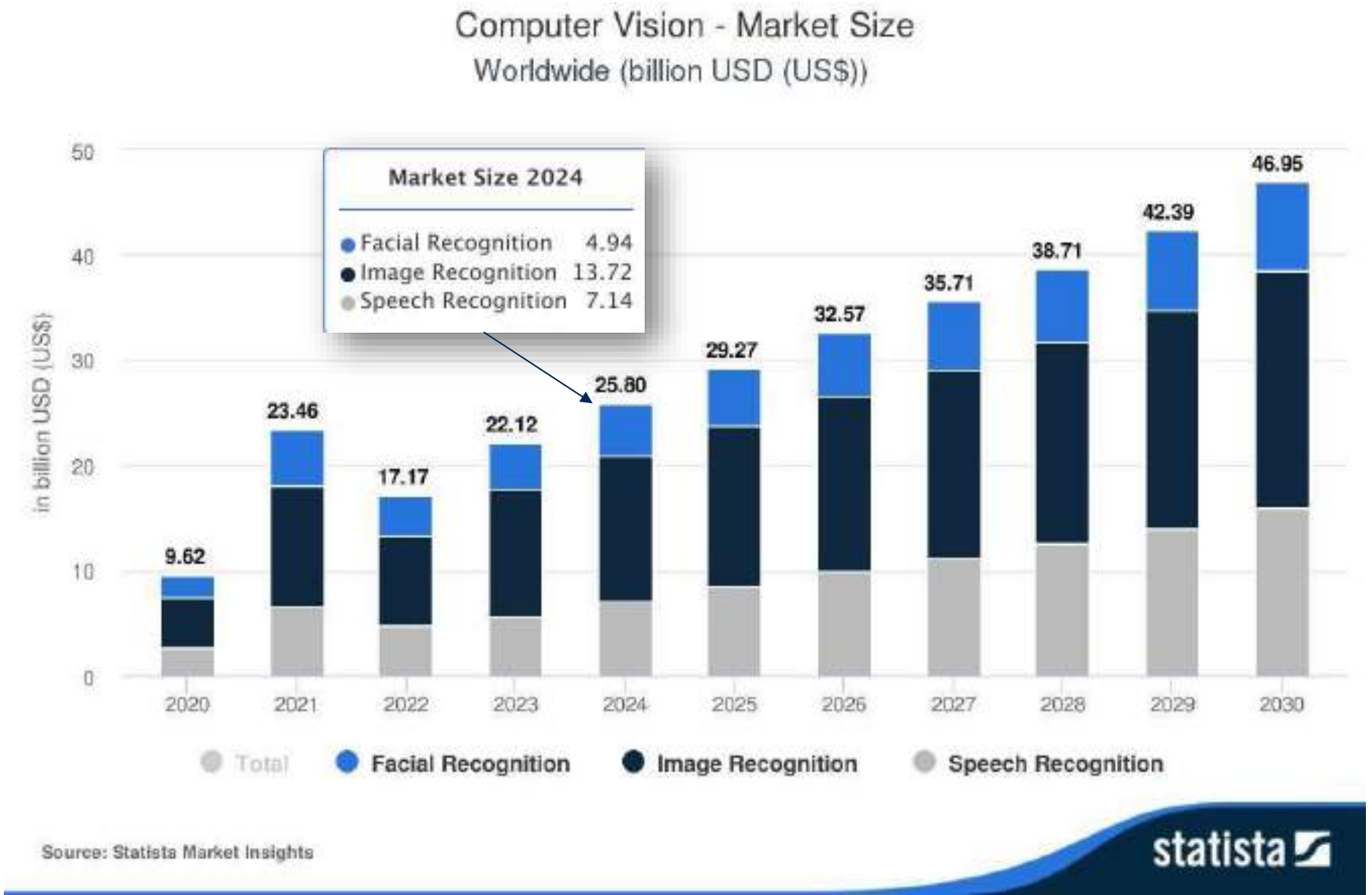
AI-BASED TASKS AND LABOUR PRODUCTIVITY



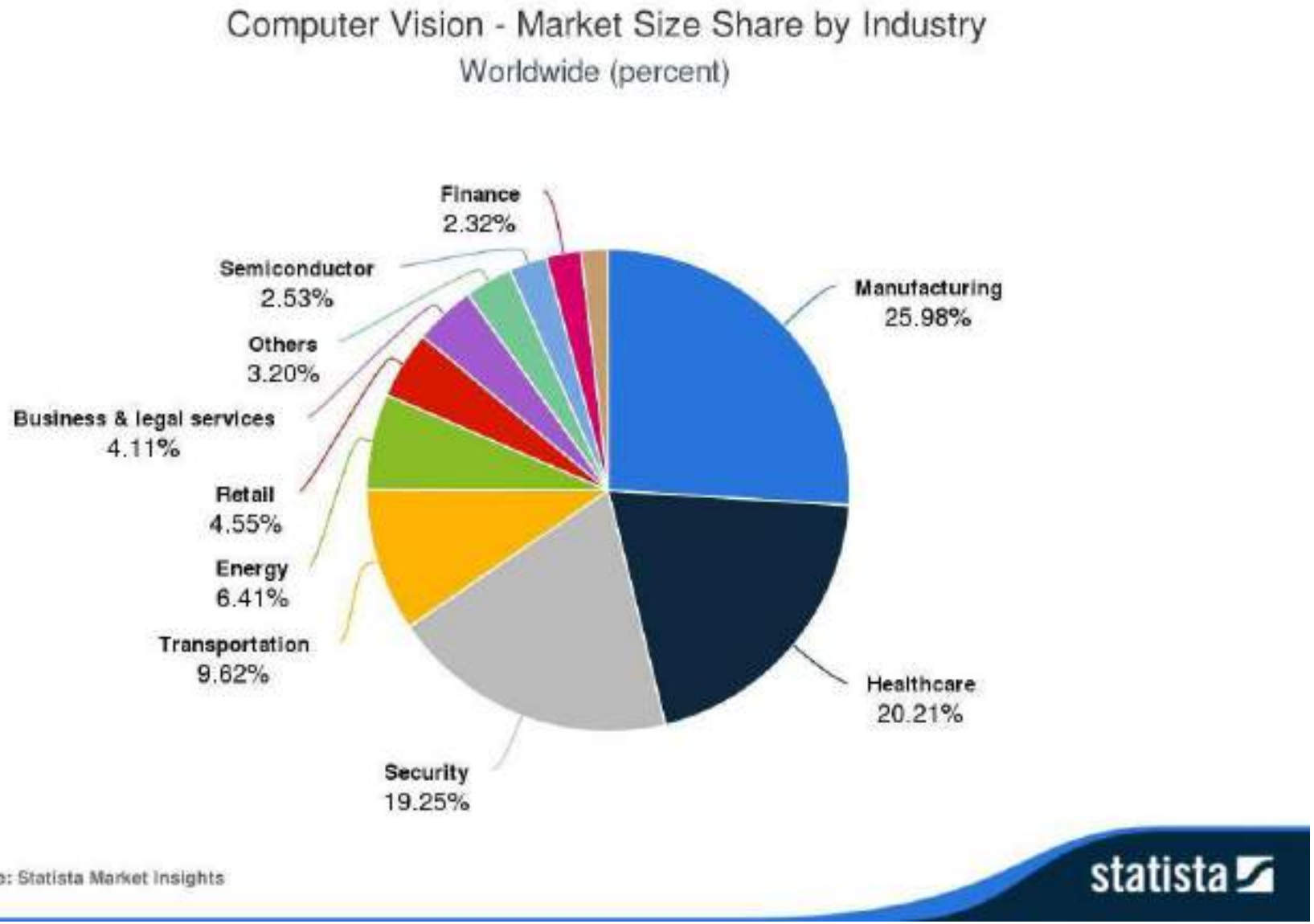


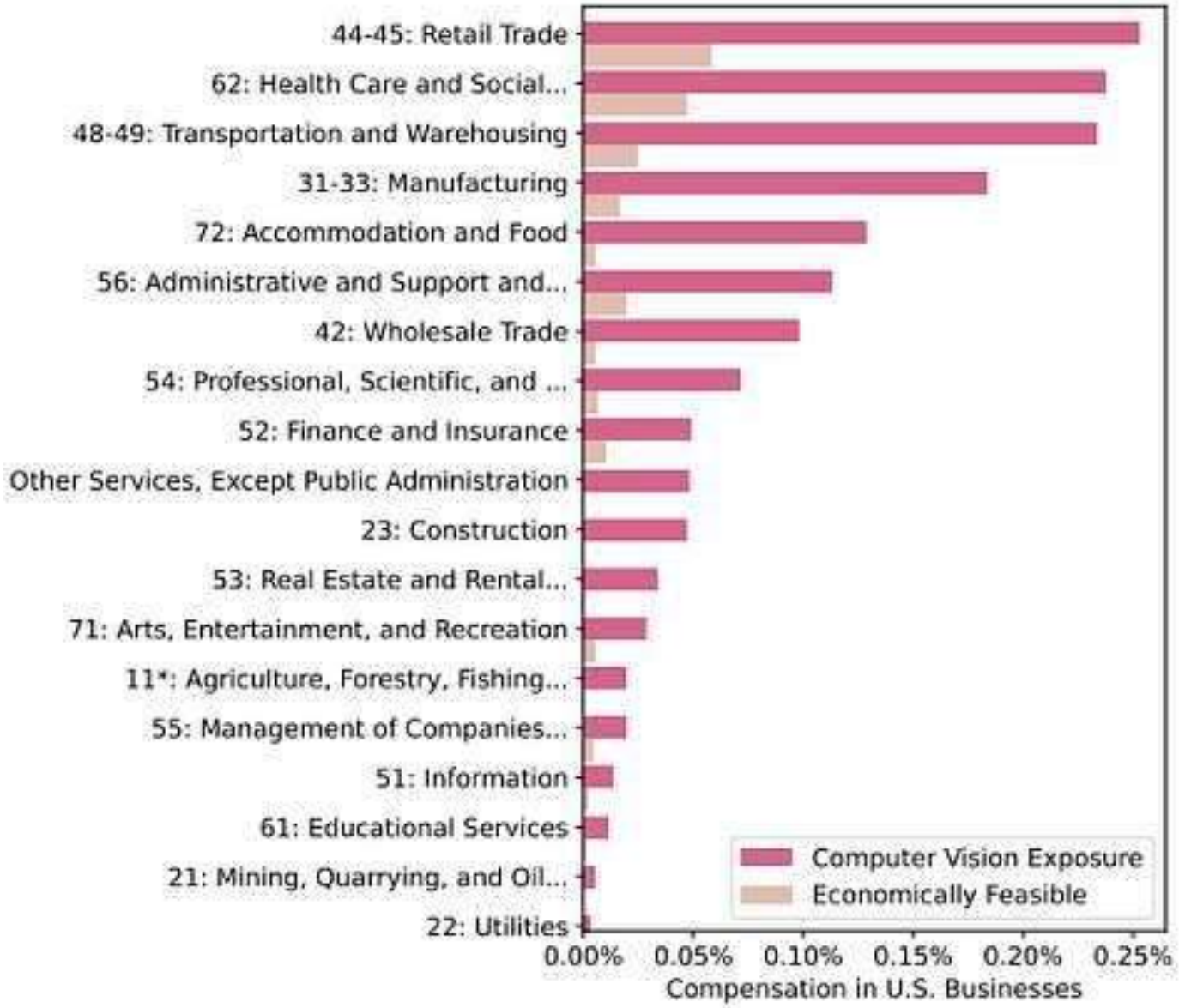
Souíce: Filippucci et al (2024) and OECD (2024) based on (Felten, Raj and Seamans, 2021).

IL MERCATO COMPUTER VISION/IMAGE PROCESSING OGGI VALE IL DOPPIO DELLO SPEECH RECOGNITION



I SETTORI APPLICATIVI PER COMPUTER VISION/IMAGE PROCESSING SONO COMPLEMENTARI A QUELLI DELLA GENERATIVE AI





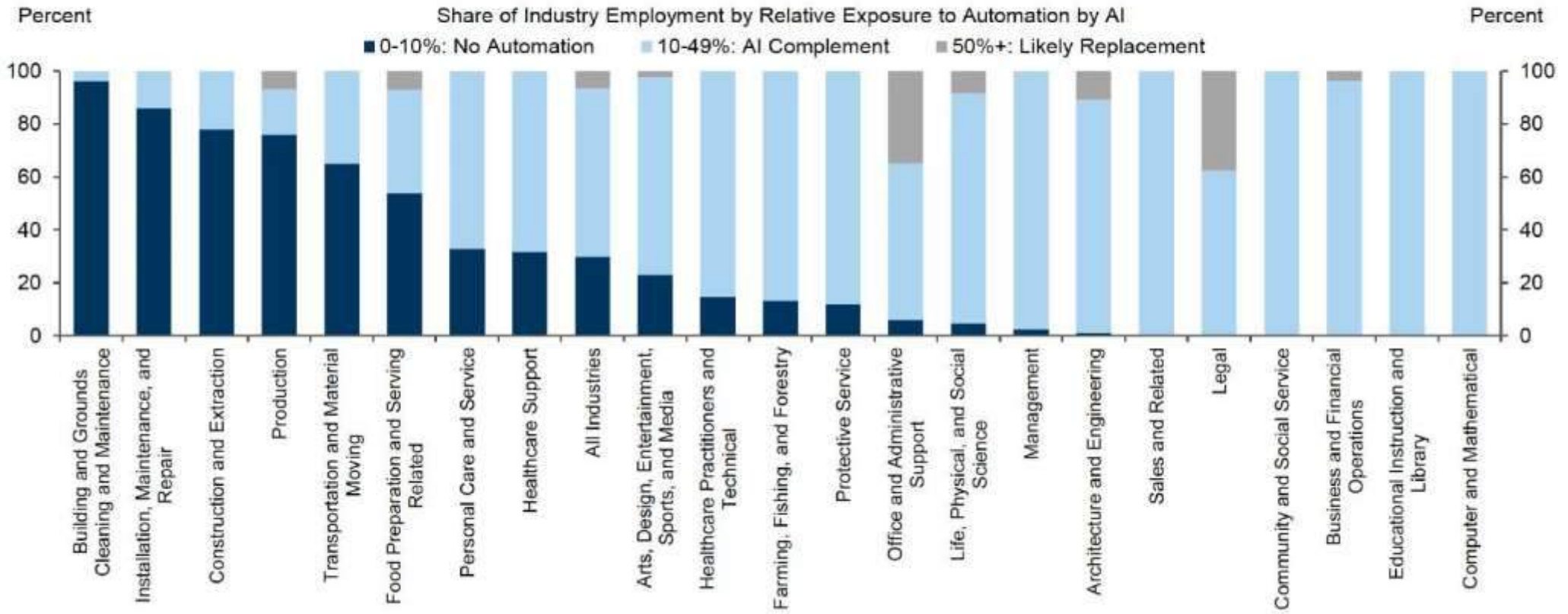
Computer vision exposure and economic feasibility for compensation within individual sectors

L'IMPATTO DEI SISTEMI DI COMPUTER VISION È MOLTO MAGGIORE IN AMBITI INDUSTRIALI, LOGISTICI E SCIENTIFICI

Source: MIT Initiative on the Digital Economy, 2024

GEN AI: SOSTITUZIONE IN AMBITO LEGALE E AMMINISTRATIVO, EFFETTI LIMITATI SU LAVORI MANUALI E OUTDOOR, INCREMENTO DI PRODUTTIVITÀ PER LE ALTRE ATTIVITÀ

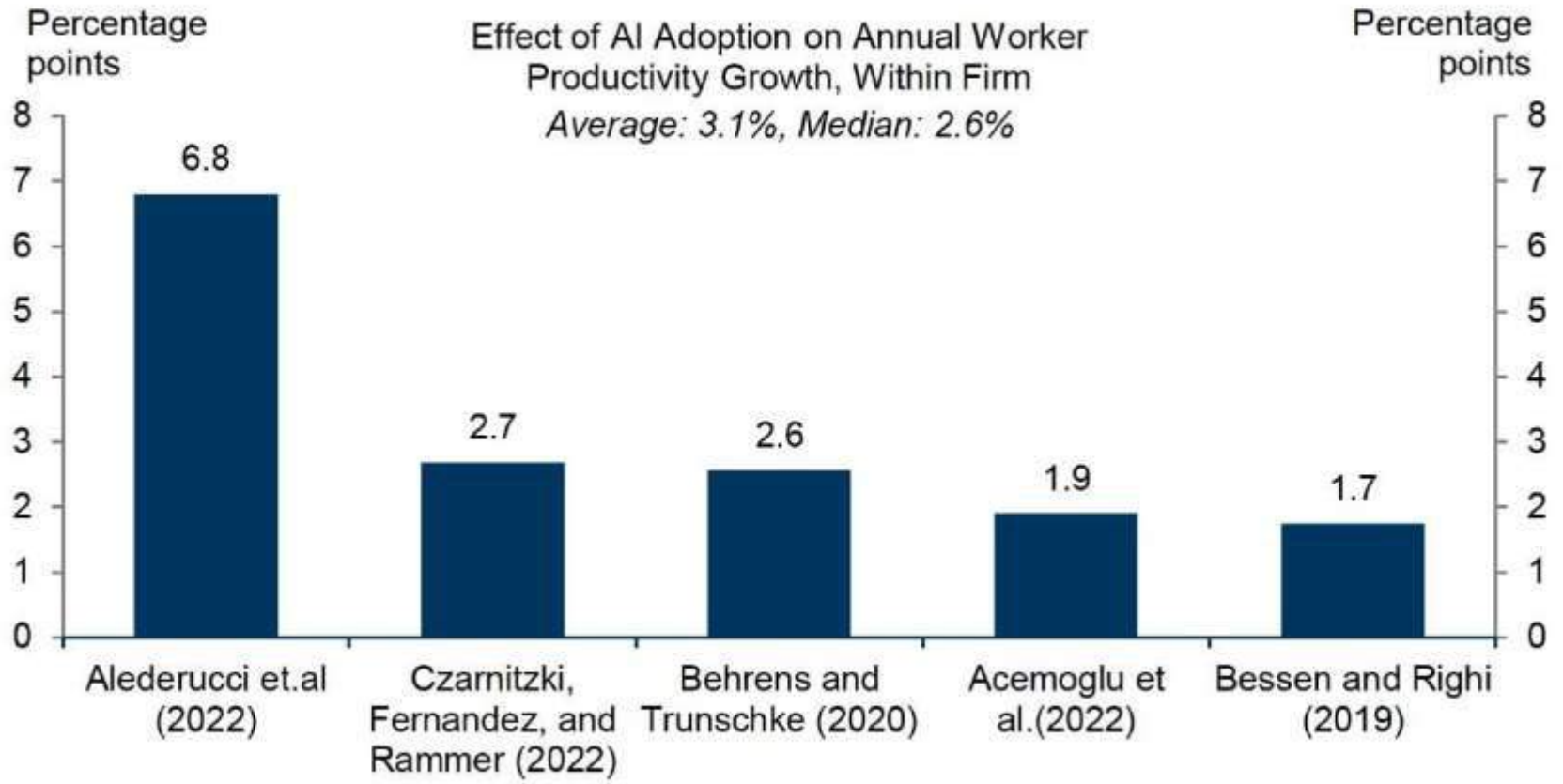
Exhibit 8: Replacement in Legal and Administrative Fields, Little Effect in Manual and Outdoor Jobs, and Productivity-Enhancement Everywhere Else



Source: Goldman Sachs Global Investment Research

EFFETTI DELL'AI SULLA PRODUTTIVITÀ DEI LAVORATORI

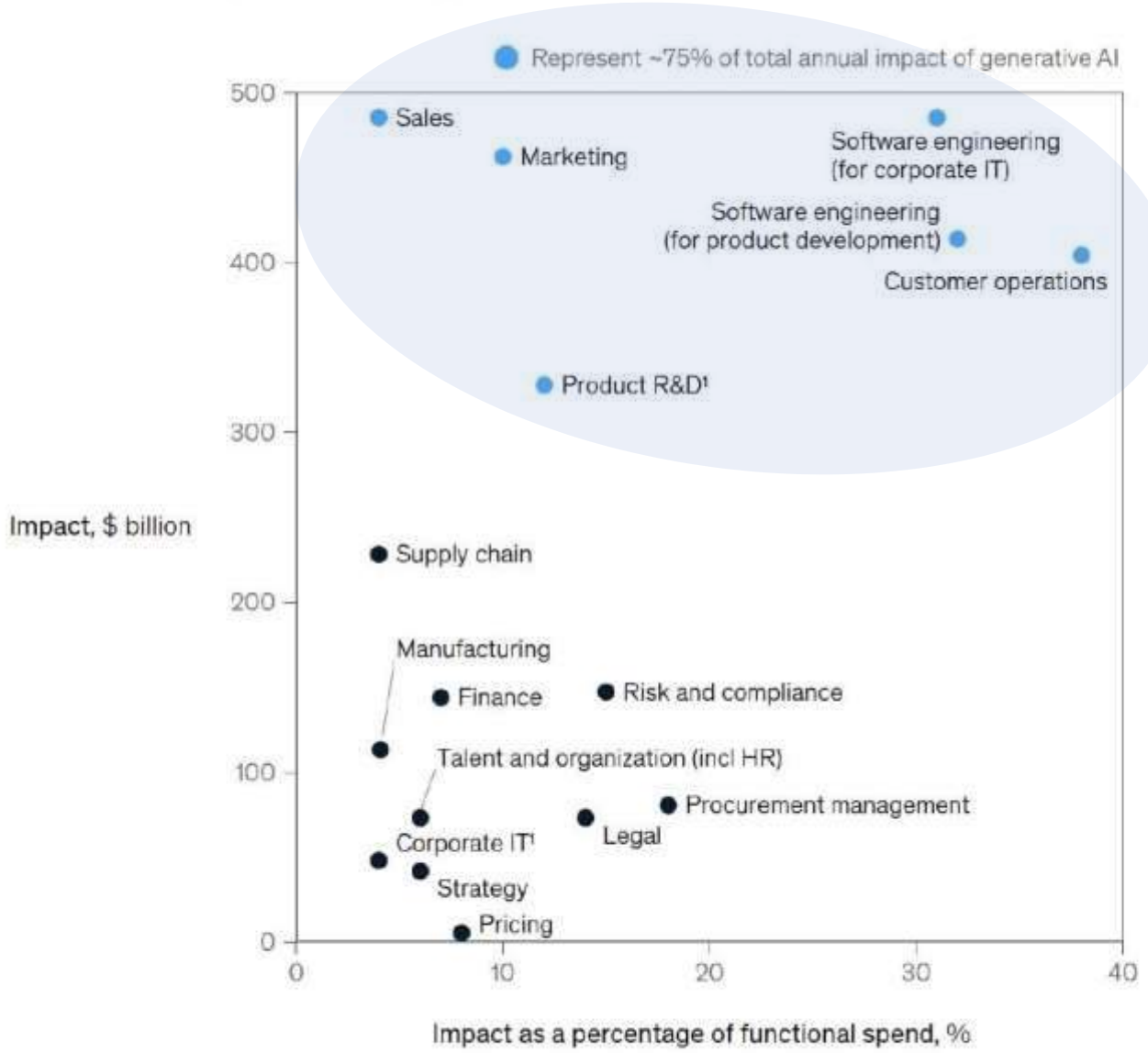
Exhibit 9: Academic Studies Generally Find That AI Adoption Increases Within-Firm Annual Worker Productivity Growth by 2-3pp



Source: Goldman Sachs Global Investment Research

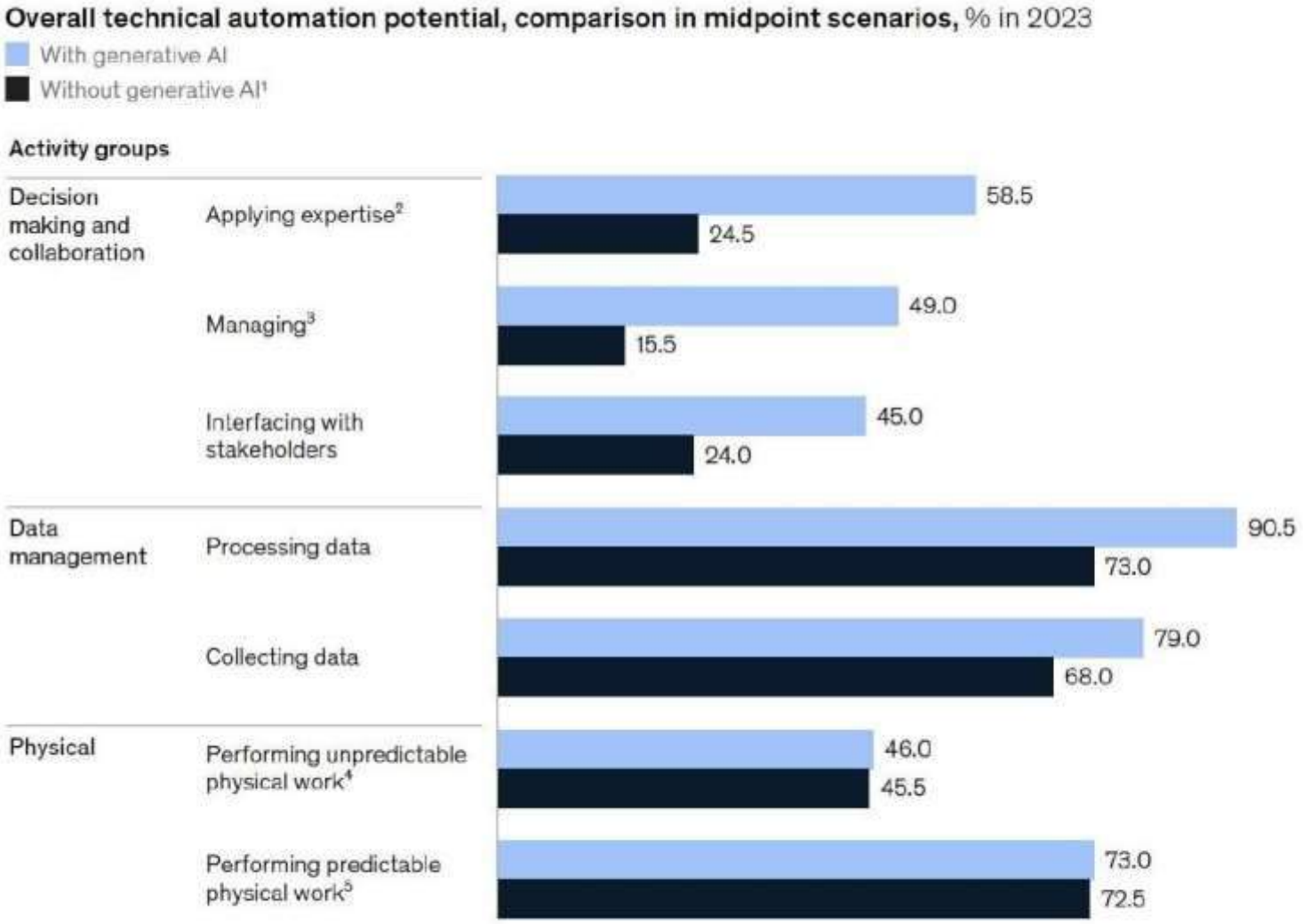
L’AI avrà un impatto molto elevato su specifici processi di business

Using generative AI in just a few functions could drive most of the technology's impact across potential corporate use cases.



Note: Impact is averaged.
¹Excluding software engineering.
Source: Comparative Industry Service (CIS), IHS Markit; Oxford Economics; McKinsey Corporate and Business Functions database; McKinsey Manufacturing and Supply Chain 360; McKinsey Sales Navigator; Ignite, a McKinsey database; McKinsey analysis

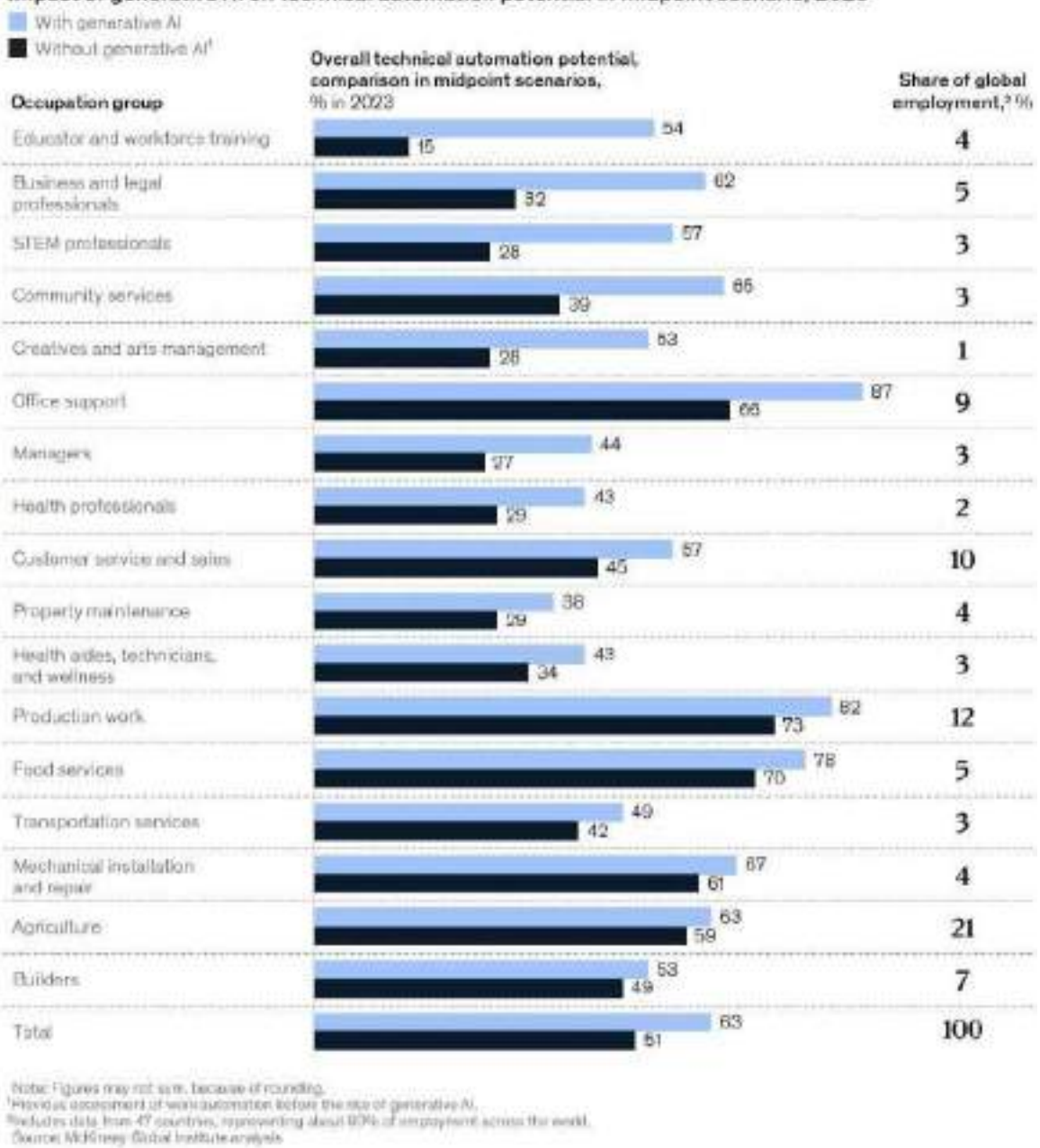
Generative AI could have the biggest impact on collaboration and the application of expertise, activities that previously had a lower potential for automation.



Note: Figures may not sum, because of rounding.
[1]Previous assessment of work automation before the rise of generative AI.
[2]Applying expertise to decision making, planning, and creative tasks.
[3]Managing and developing people.
[4]Performing physical activities and operating machinery in unpredictable environments.
[5]Performing physical activities and operating machinery in predictable environments.
Source: McKinsey Global Institute analysis

LA GENERATIVE AI IMPATTERÀ SOPRATTUTTO SULLE ATTIVITÀ CHE IMPLICANO SCELTE GESTIONALI E RELAZIONI TRA PERSONE

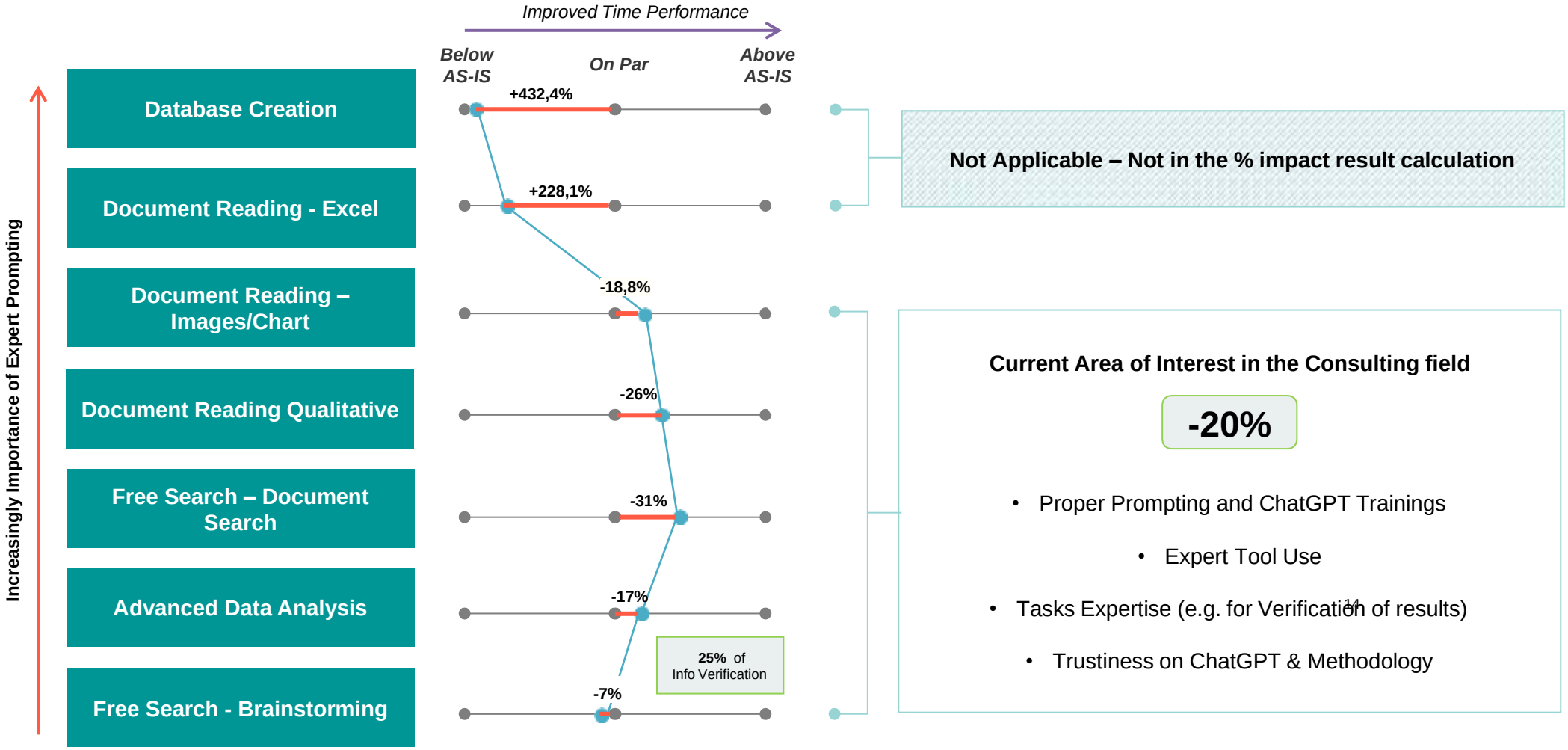
Advances in technical capabilities could have the most impact on activities performed by educators, professionals, and creatives.



UNO DEI SETTORI PIÙ «IMPATTATI» DALLA AI GENERATIVA SARÀ QUELLO DELL'EDUCAZIONE

DETAILED ANALYSIS OF TIME SAVINGS FOR EACH TASK AND KEY ASSUMPTIONS TO ACHIEVE A 20% REDUCTION IN OPERATIONAL TIME

Comprehensive framework of efficiency improvement



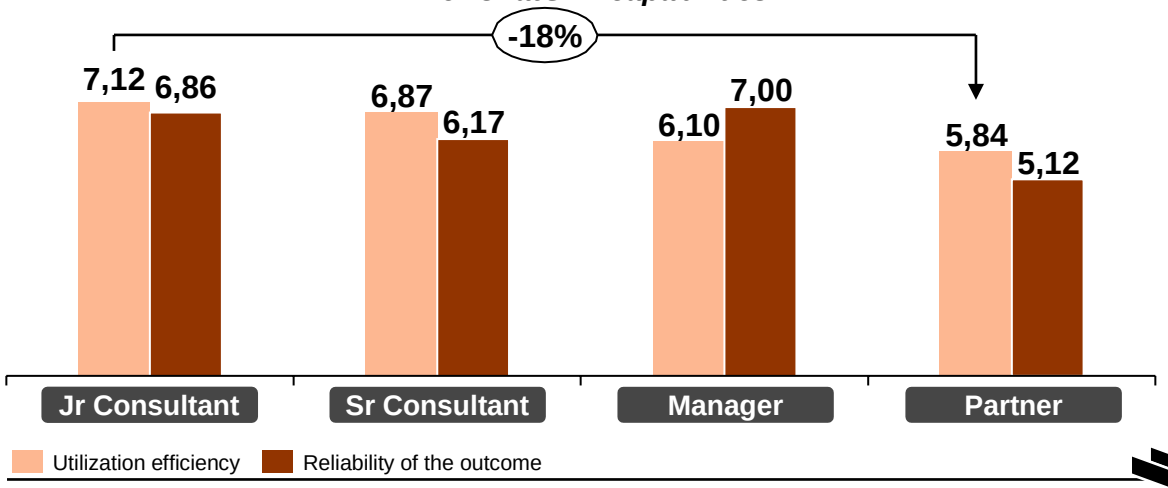
Source: M. Rencricca – J. Zanobini, 2024

PROMPT ENGINEERING AS THE RECIPE FOR EFFECTIVE OUTPUTS IN THE CONSULTANT AND AI COLLABORATION

Trasformative impact of ChatGPT on efficiency – Management consulting

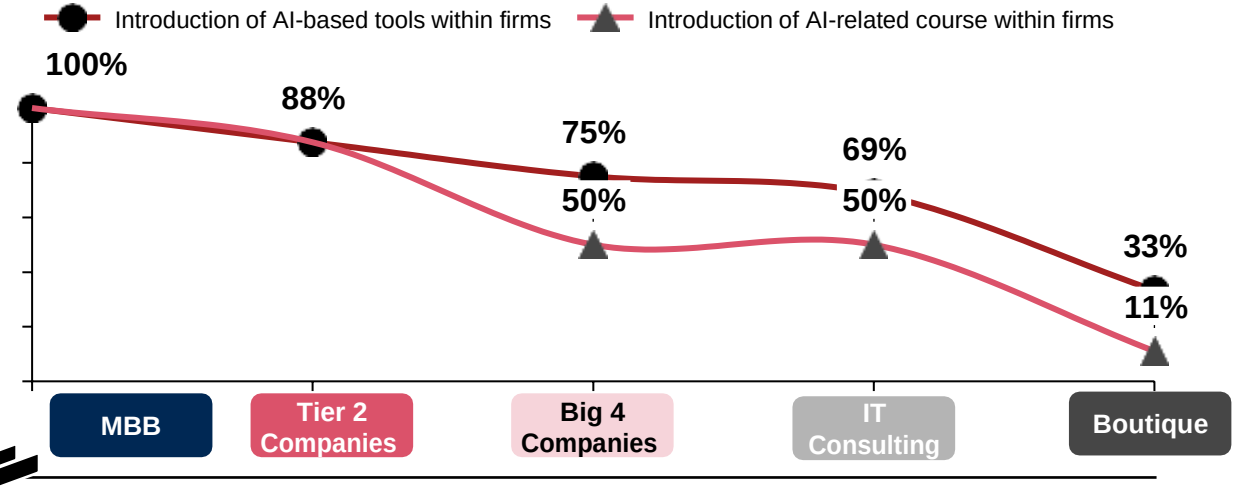
Consultants' Self-Assessment of Tool Proficiency and perceived effectiveness

*A potential direct relationship between the **ability to use the tool** and the **perception of ChatGPT capabilities***



Introduction of Ai-based tools and training courses within firms, by category

Only in half** of the cases is a ChatGPT use accompanied by **on-the-job training



Prompt engineer skills

Results oriented **Sensitivity** **Results oriented**

Risks and Limitations

RANDOMNESS IN OUTPUT

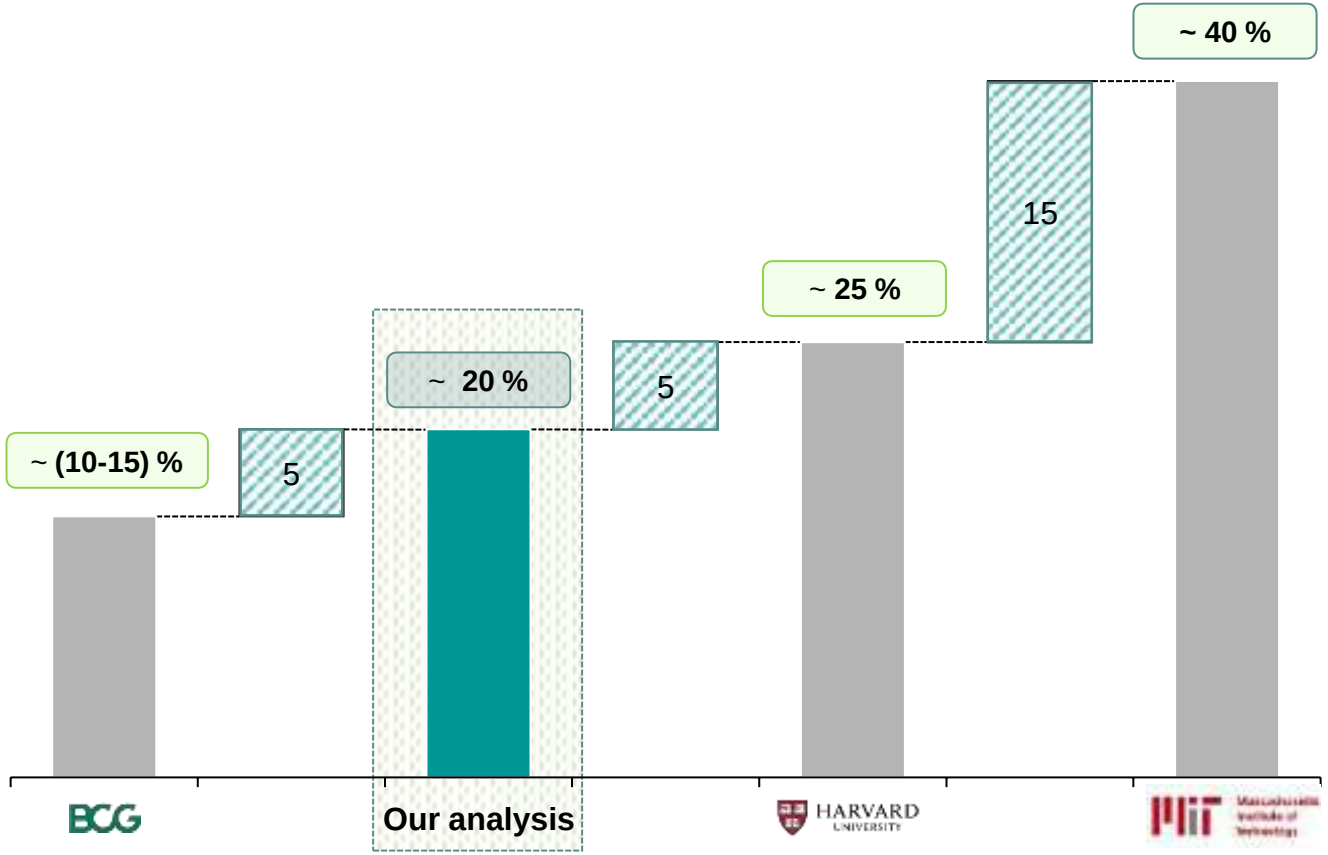
1. **New extensions to Pattern Prompting** (E.g. *Deductive pattern*)
2. **Management consulting adaptions** (E.g. *Template pattern*)
3. **New Prompting Model** (E.g. *Stramlining*)

Source: M. Rencricca – J. Zanobini, 2024

RENOWNED RESEARCH CENTERS HAVE HIGHLIGHTED THE CURRENT PERFORMANCE EFFICIENCIES DUE TO THE INTEGRATION OF AI WITHIN FIRMS

AI performance efficiency improvement – A comparative view

AI performance efficiency improvement in a comparative view



Main Topics

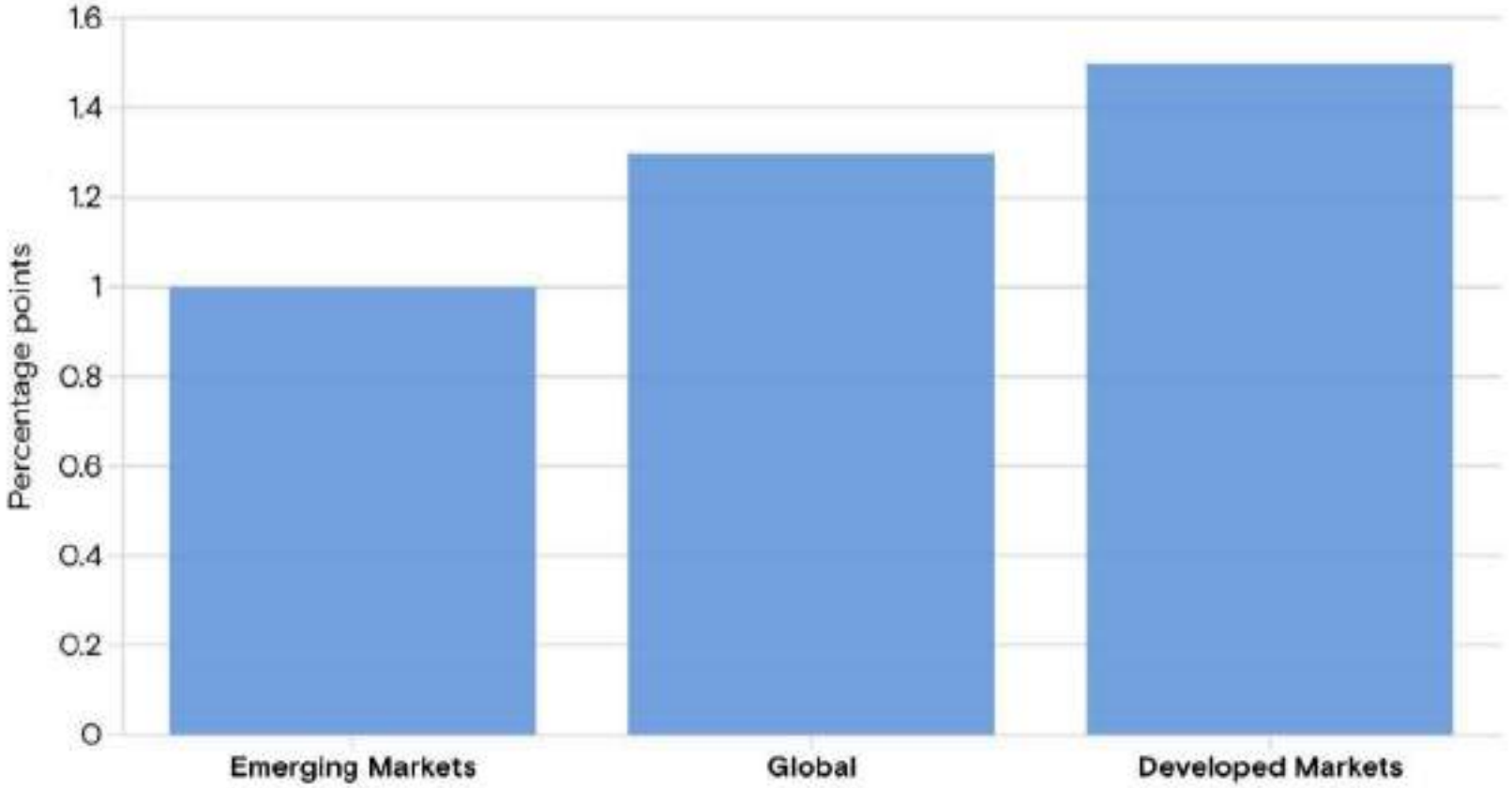
- ✓ The **BCG (2024)** article highlights how **71%** of the companies nowadays are in pilot AI stages, with the goal of integrating GenAI for **(10-15)%** productivity gains, invent new business models to secure long-term competitive advantage;
- ✓ A recent **Harvard (2024)** study shows how GPT-4 usage led to **25,1%** faster **task completion** and a **12.2%** increase of **completed tasks** for those trained in prompt engineering. However, tasks beyond GPT-4's capabilities resulted in a **19% accuracy drop**, underscoring the need for proper AI use
- ✓ A **MIT (2023)** study shows how AI enhances performance by up to **40% within its capability set**, but misaligned use causes a **19% drop** in performance

- ❑ Effective use of AI requires strong **prompt engineering** knowledge
- ❑ Chat-GPT's utility is **task-dependent**
- ❑ AI reduces time but also boosts **quality and task simplicity**
- ❑ Future consulting success is **closely tied to GenAI advancements** ("*Consulting 2.0*")

Source: M. Rencricca – J. Zanobini, 2024

AI has the potential to be a major driver of labor productivity growth

Estimated effect of widespread AI adoption on annual productivity growth



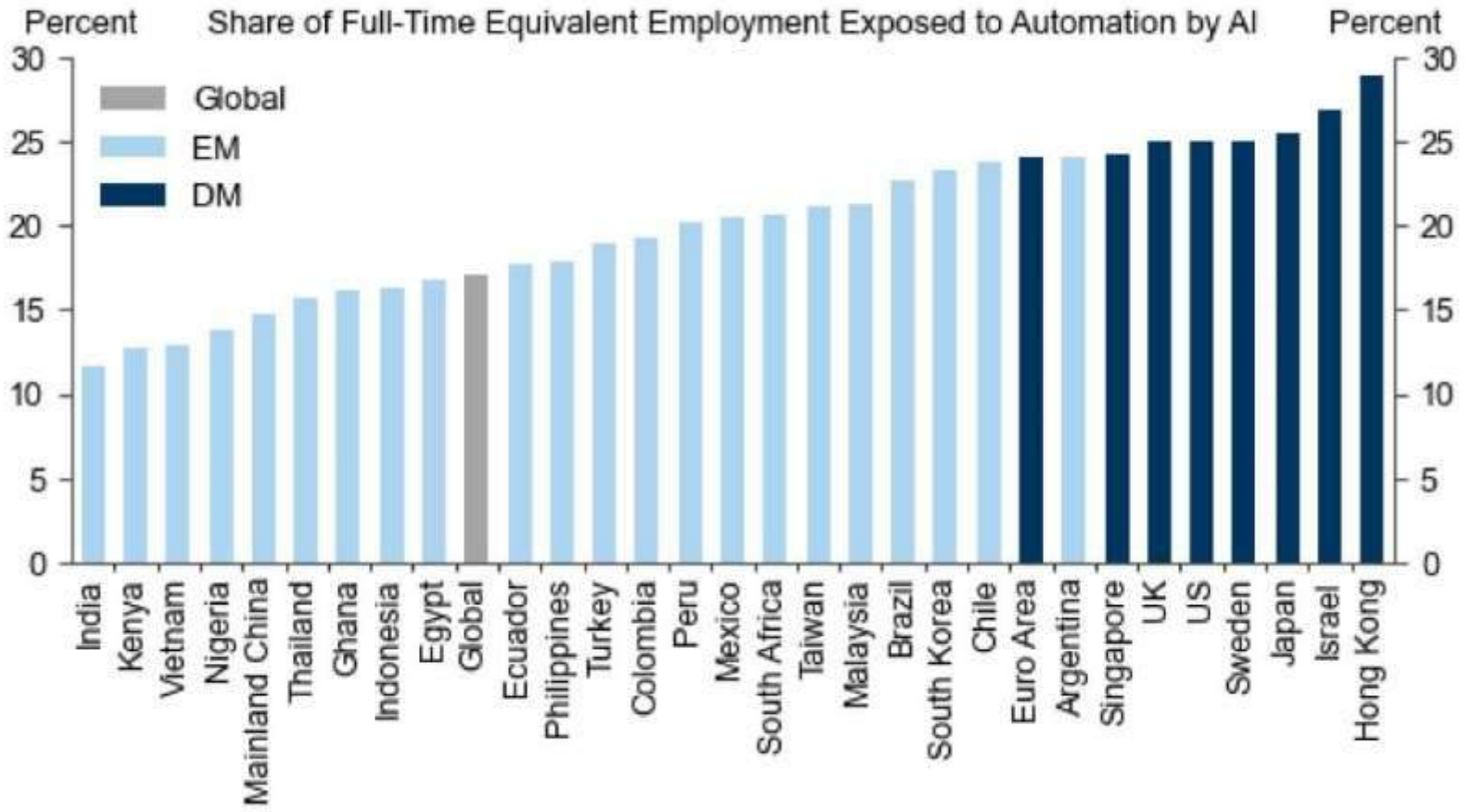
Source: Goldman Sachs Research
Composites based on market FX GDP country weights. Estimates are not forecasts and represent stylized scenarios in which AI productivity gains are realized over a 10-year period following widespread adoption.

Goldman Sachs

La GenAI avrà un impatto asimmetrico sulla produttività globale, beneficiando maggiormente le economie data-rich

GLOBALMENTE, IL 18% DEL LAVORO POTRÀ ESSERE AUTOMATIZZATO DALL'AI, CON IMPATTI SUPERIORI NEI PAESI SVILUPPATI RISPETTO A QUELLI IN VIA DI SVILUPPO

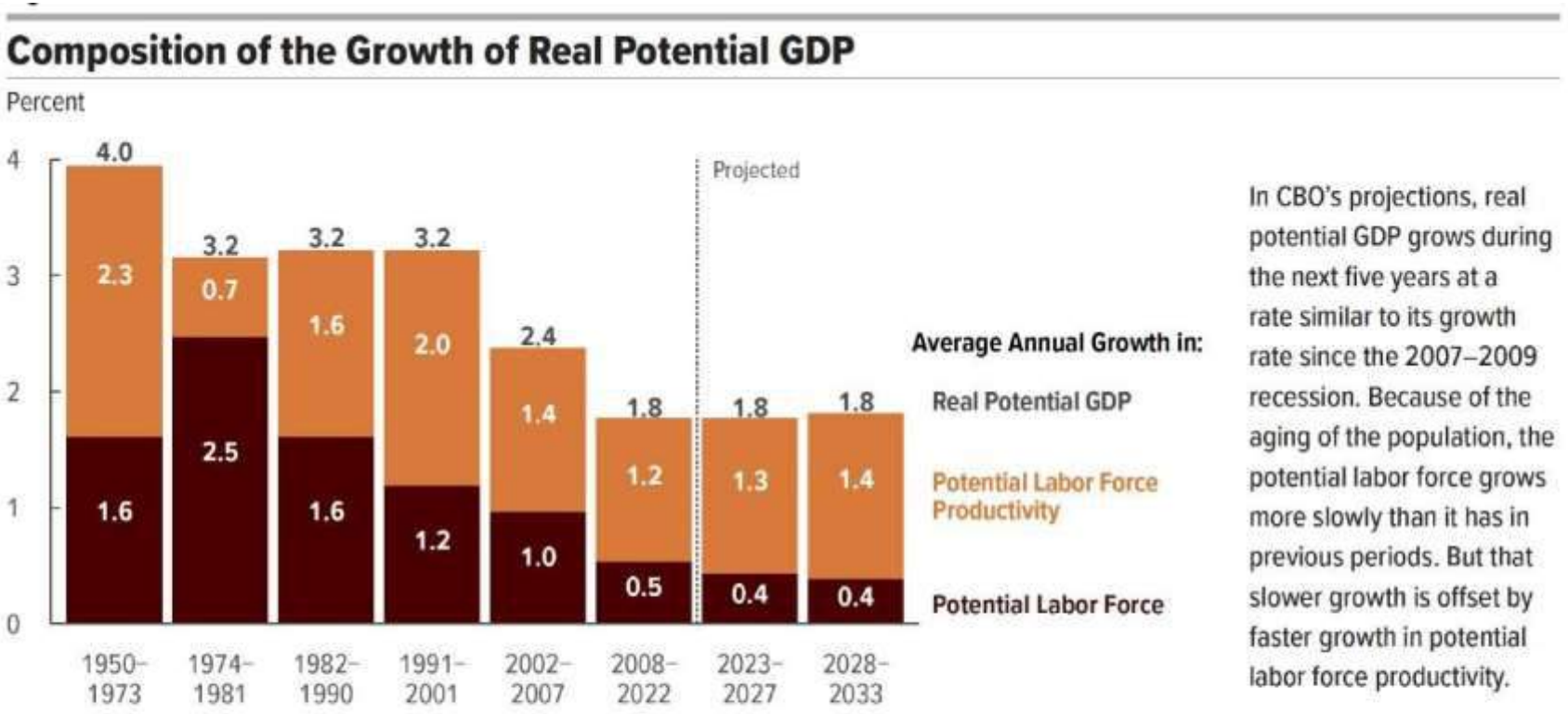
Exhibit 6: Globally, 18% of Work Could be Automated by AI, with Larger Effects in DMs than EMs



Source: Goldman Sachs Global Investment Research

GLI USA PROIETTANO UNA CRESCITA DELLA PRODUTTIVITÀ DEL 33% IN 20 ANNI

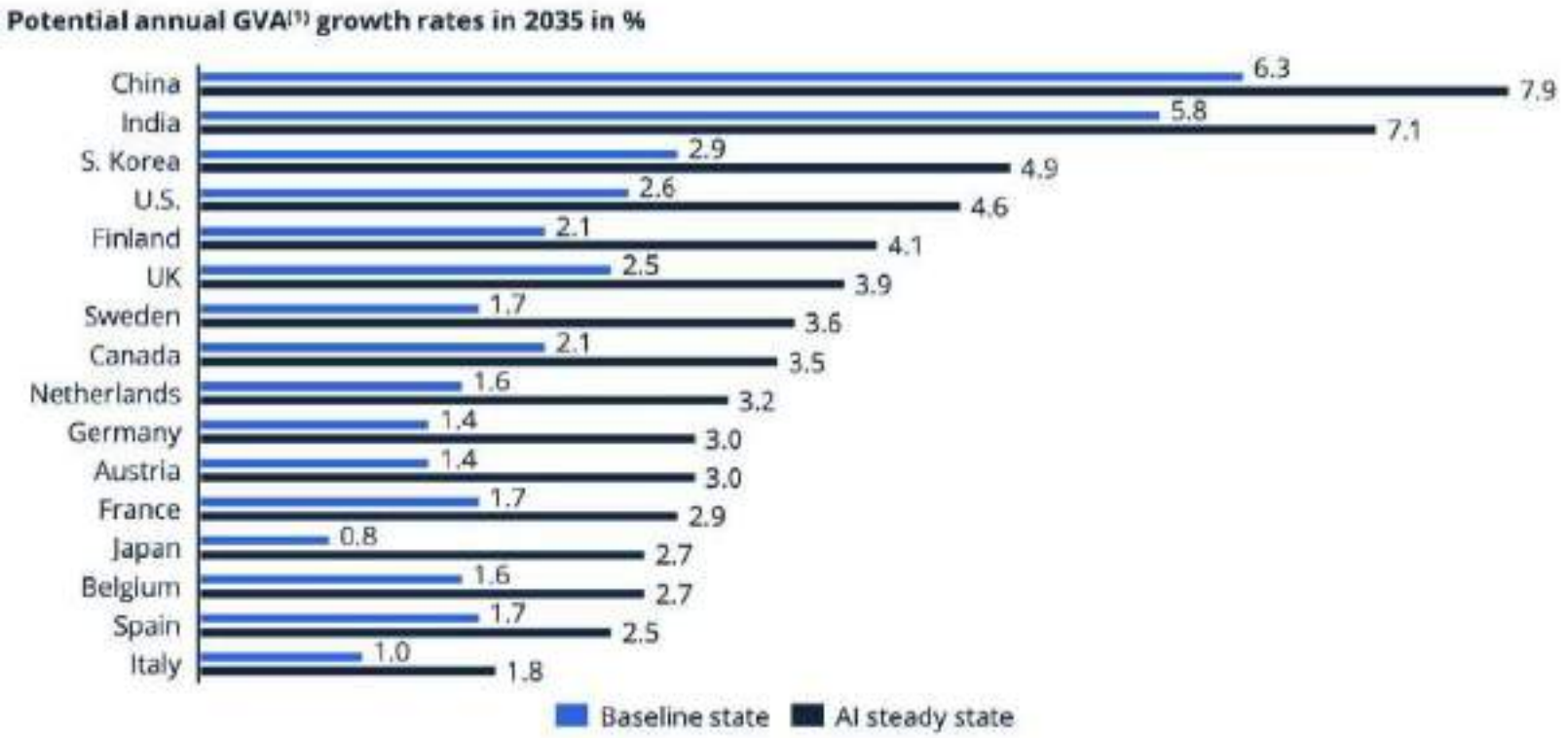
The baseline follows the [current projection of the Congressional Budget Office (CBO) of 1.5% productivity growth], giving rise to a total of 33% productivity growth over 20 years.



IMPATTI DELL'A.I. SUL VALORE AGGIUNTO: ITALIA ULTIMA AL 1,8%

AI is expected to have a big impact on GVA growth rates

Impact of AI (1/7)



A study by Accenture and Frontier Economics expects AI to have a big impact on a country's gross value added (GVA). It estimates the annual GVA growth rates in 2035 for a baseline state, based on current assumptions regarding economic growth, and for an AI steady state, assuming artificial intelligence is integrated into economic processes.

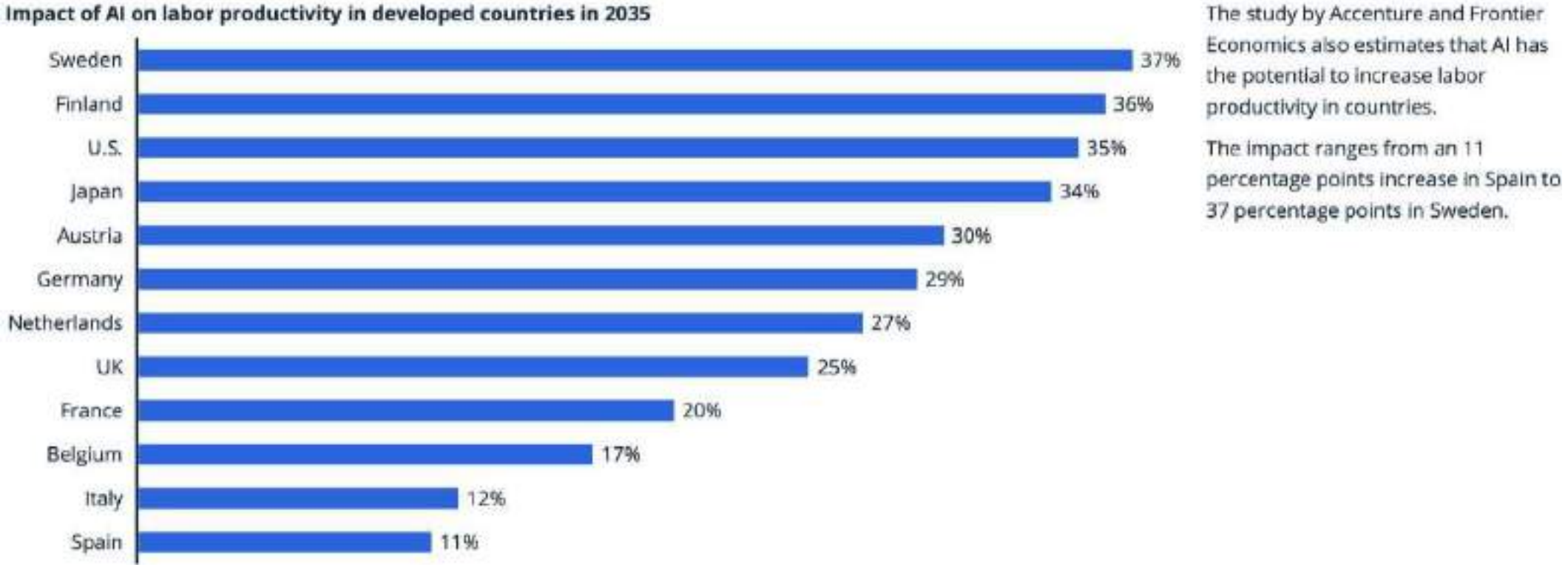
The extent of the impact depends on the country, ranging from a 0.8 percentage points increase in potential GVA growth rates in Italy or Spain to 2.0 percentage points in Finland or the U.S..

Source: Accenture & Frontier Economics, 2024

IMPATTI DELL'A.I. SULLA PRODUTTIVITA' DEL LAVORO: ITALIA ANCORA IN FONDO ALLA CLASSIFICA

AI has the potential to increase labor productivity

Impact of AI (2/7)



The study by Accenture and Frontier Economics also estimates that AI has the potential to increase labor productivity in countries.

The impact ranges from an 11 percentage points increase in Spain to 37 percentage points in Sweden.

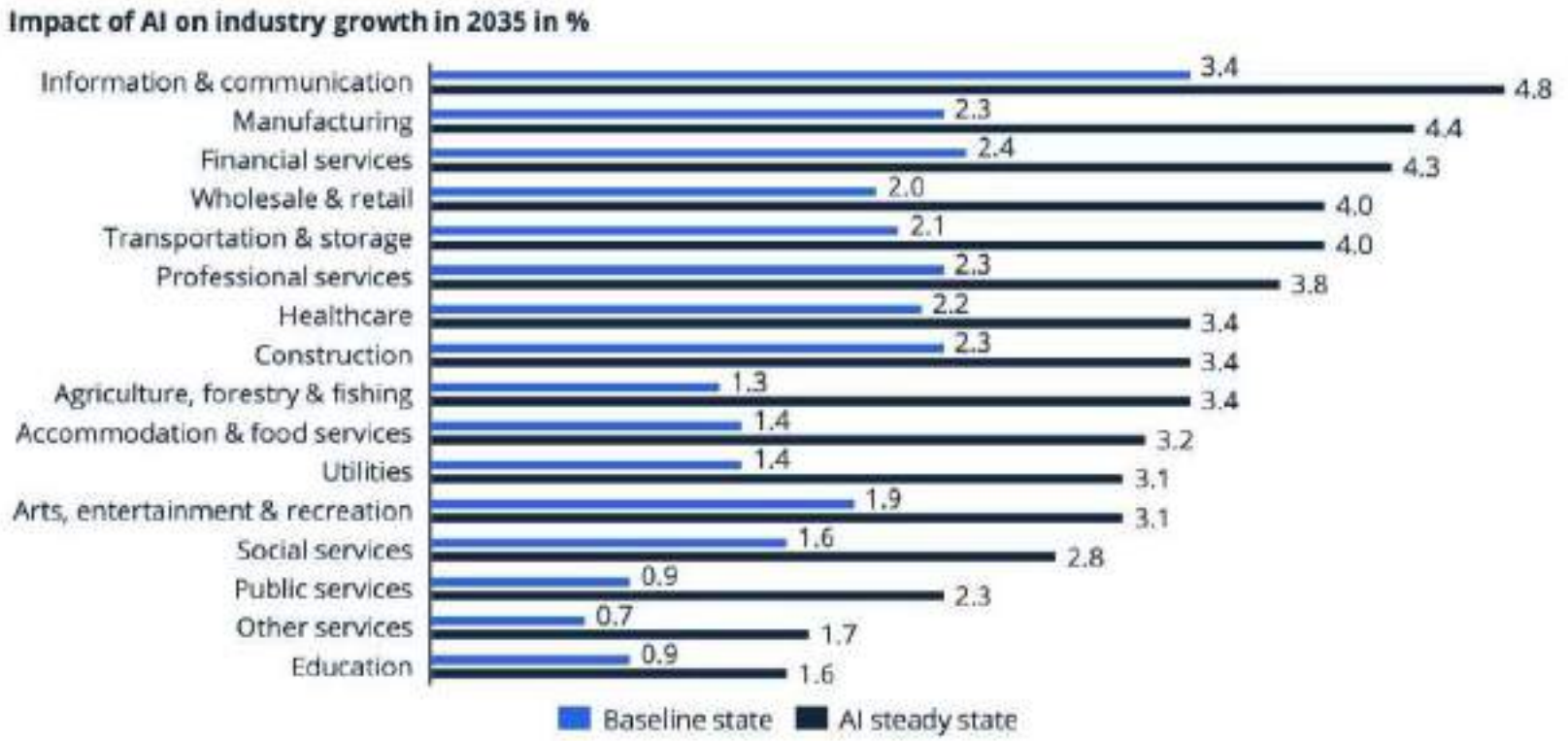
Source: Accenture & Frontier Economics, 2024

IMPATTI DELL'A.I. SUL POTENZIALE DI CRESCITA DEI SETTORI: IT, MANUFACTURING E SERVIZI FINANZIARI IN CIMA ALLA LISTA

AI has the potential to increase the growth rate of industries

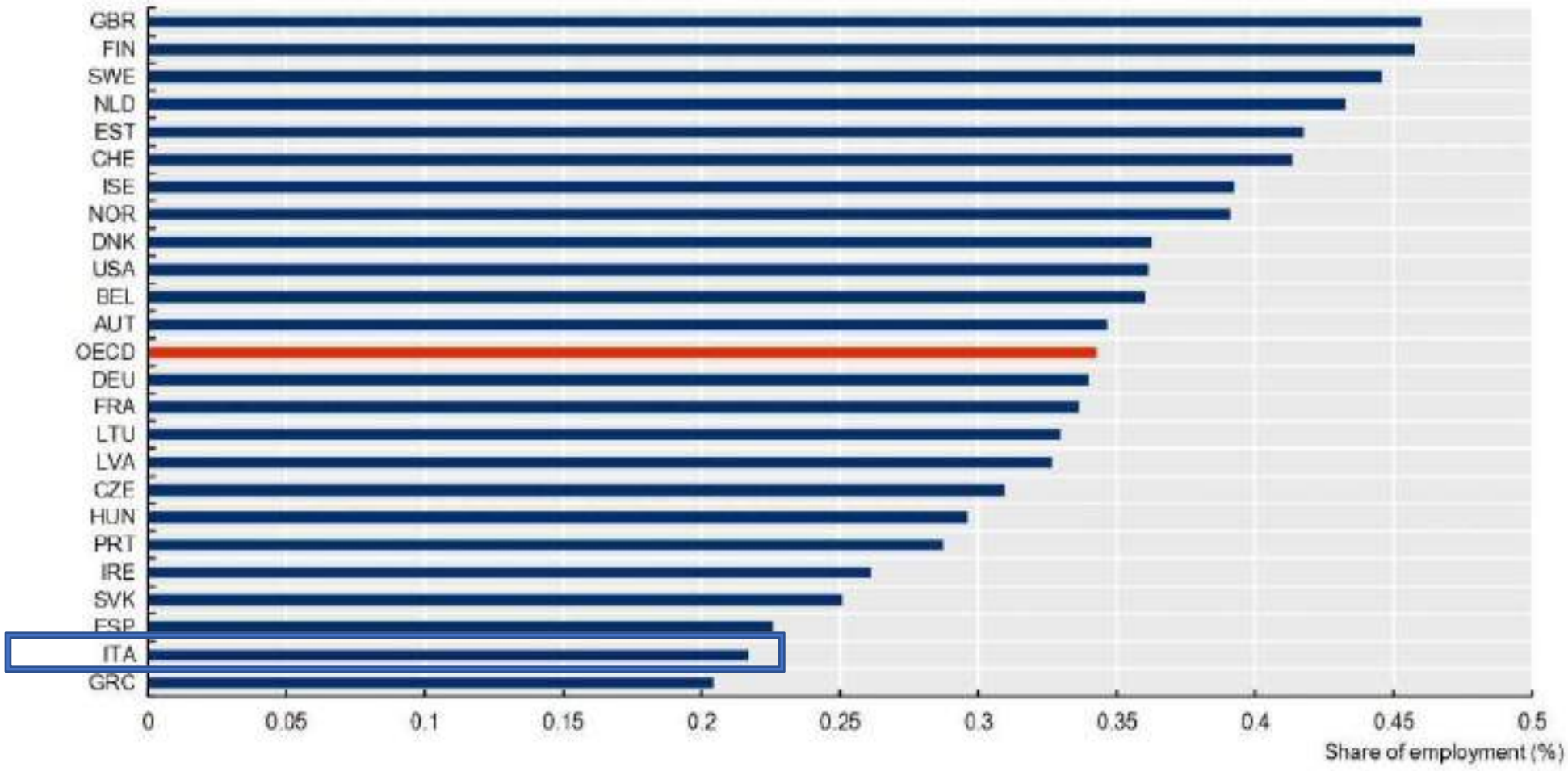
Impact of AI (4/7)

The study by Accenture and Frontier Economics also estimates that AI has the potential to increase economic growth rates by a weighted average of 1.7 percentage points by 2035 across 16 industries. Moreover, companies that successfully implement AI strategies face the prospect of increasing their profitability by an average of 38% by 2035. Information and communications, manufacturing and financial services are expected to be the top gainers in terms of annual GVA growth rates, with 4.8%, 4.4% and 4.3%, respectively.



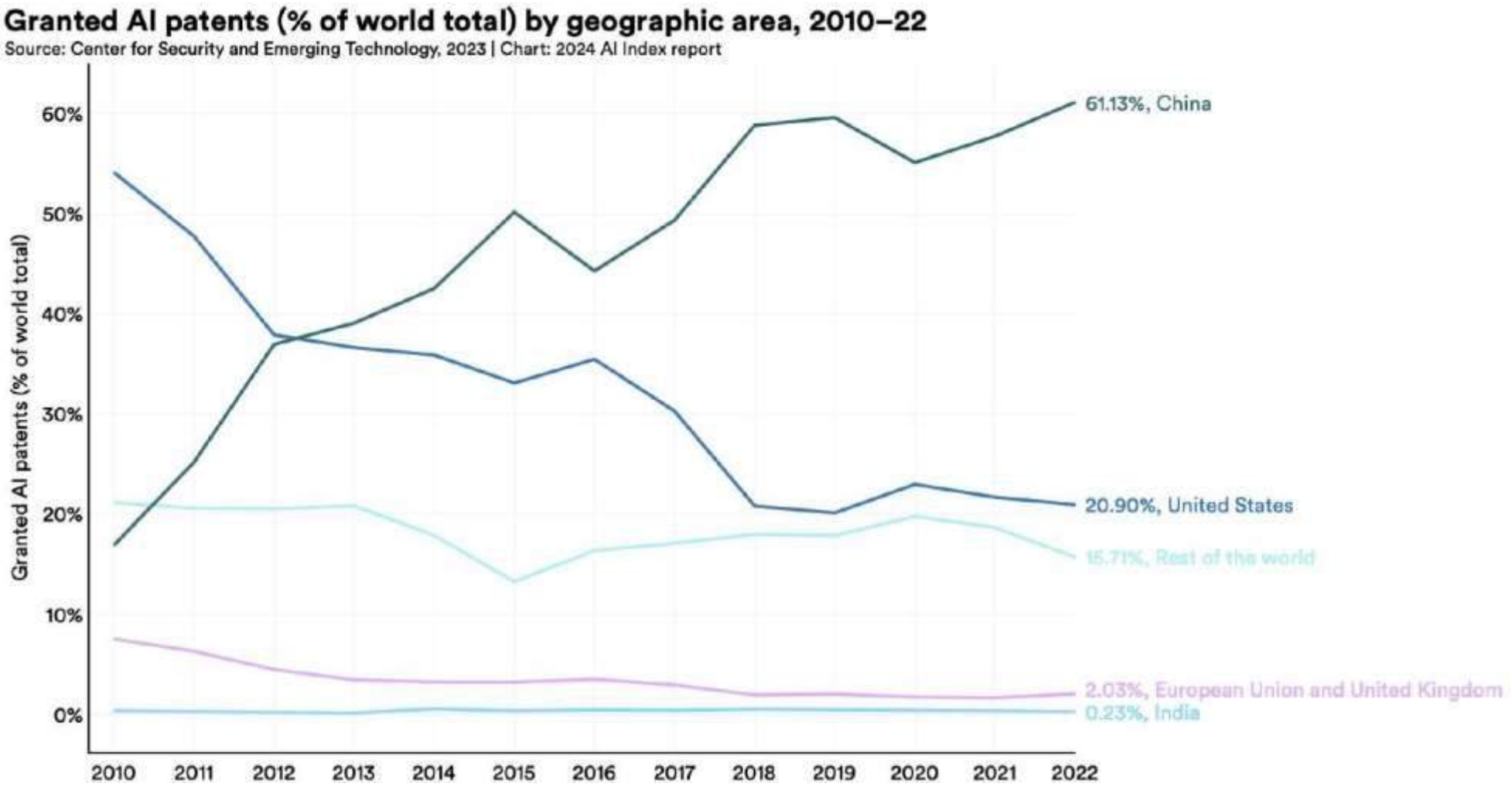
Source: Accenture & Frontier Economics, 2024

Quota di occupati con skill AI skills nei paesi OCSE

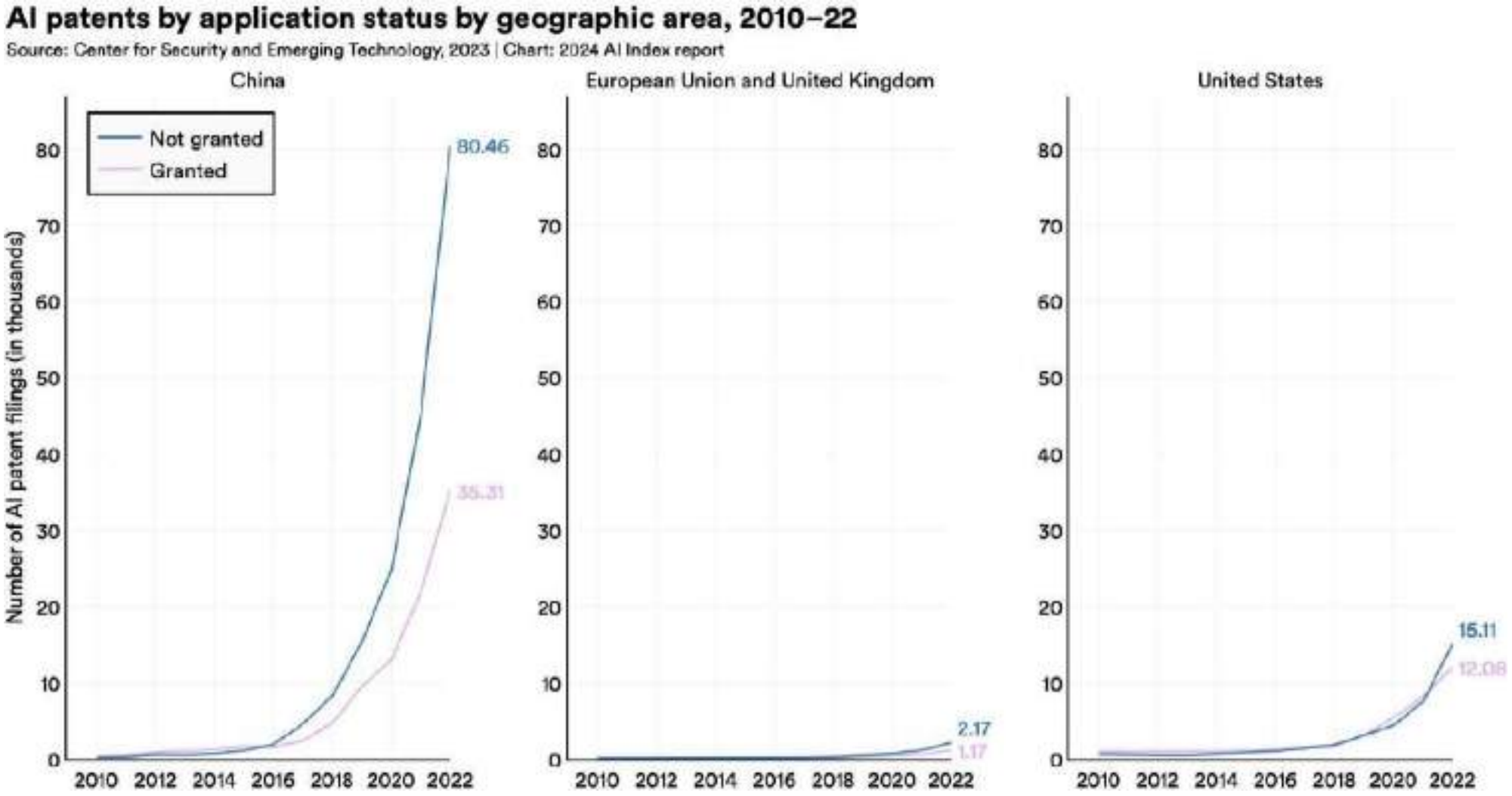


Note: Estimates obtained by summing the product of within-occupation shares of AI skill demand and employment shares by occupation. Within-occupation AI shares identified according to AI skill lists enumerated in Alekseeva et al. (2021[10]).
Source: OECD analysis of Lightcast, European Labour Force Survey (EU-LFS) and Current Population Survey (CPS) data.

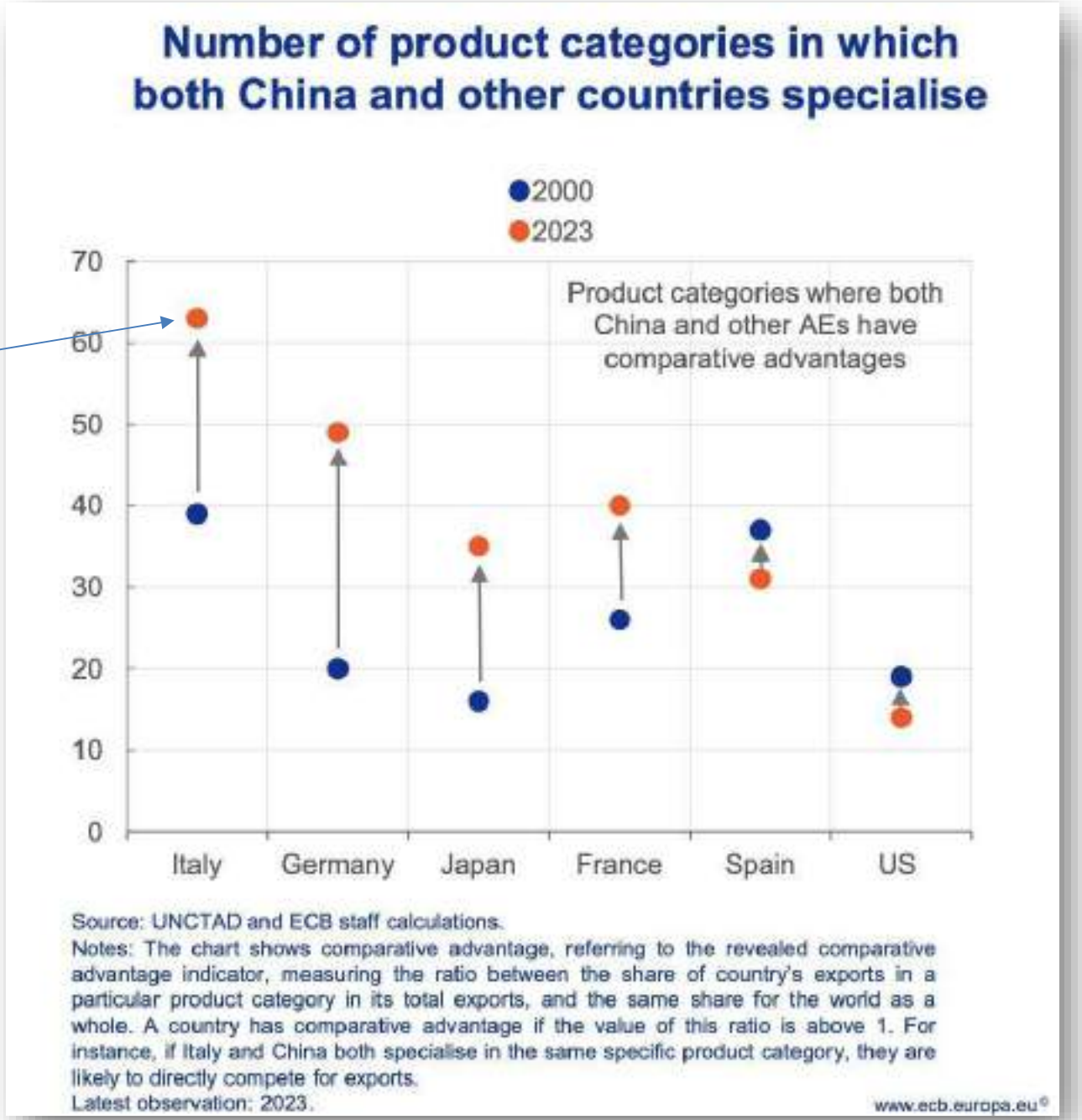
LA CINA HA OLTRE IL 61% DEI BREVETTI IN AMBITO AI. GLI USA SONO AL 21%. TUTTA L'EUROPA NON SUPERA IL 2%



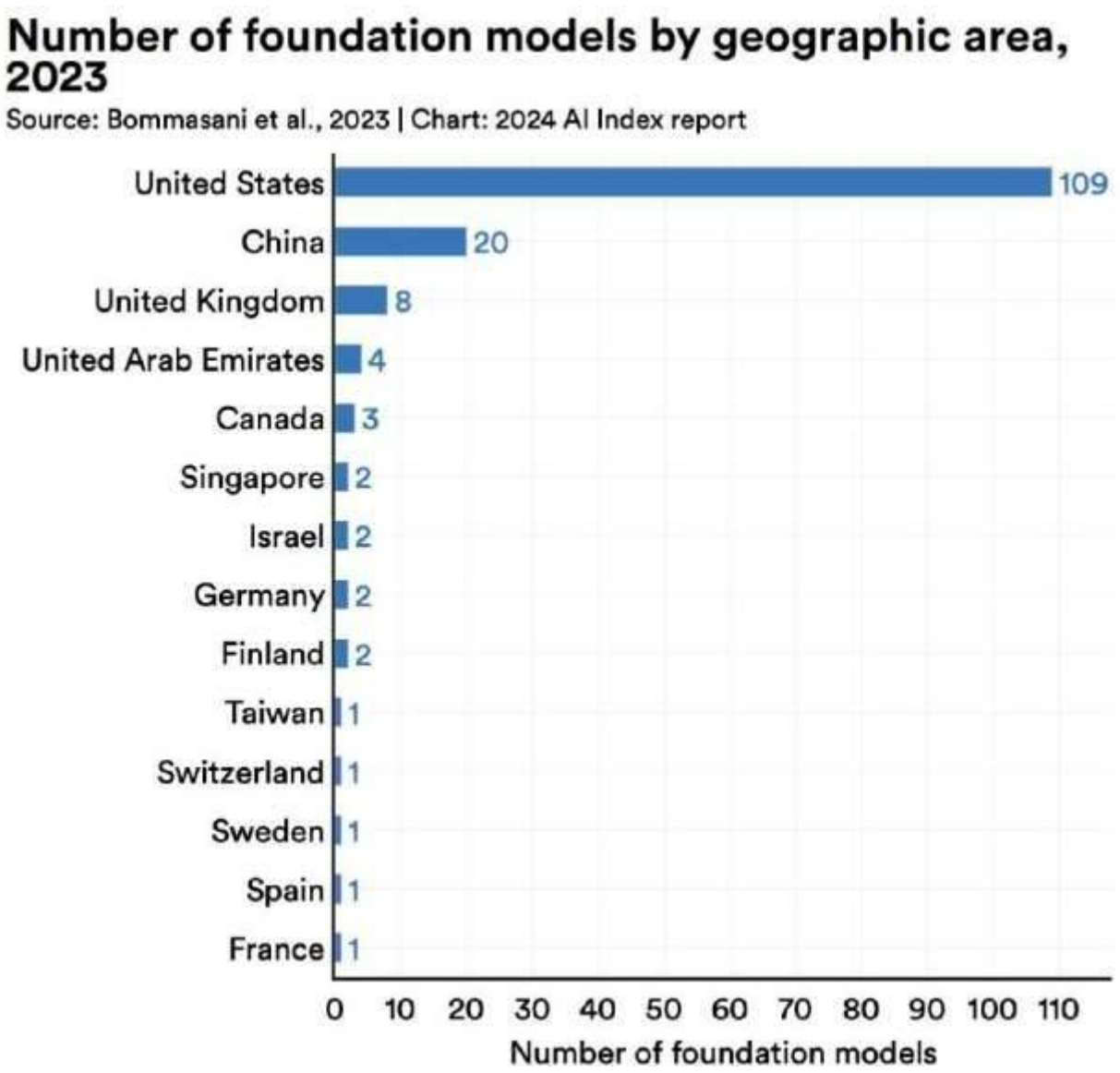
LA CINA STA GENERANDO RICHIESTE DI BREVETTI SU A.I. 40 VOLTE PIU' DI TUTTA L'EUROPA E 5 VOLTE DEGLI USA

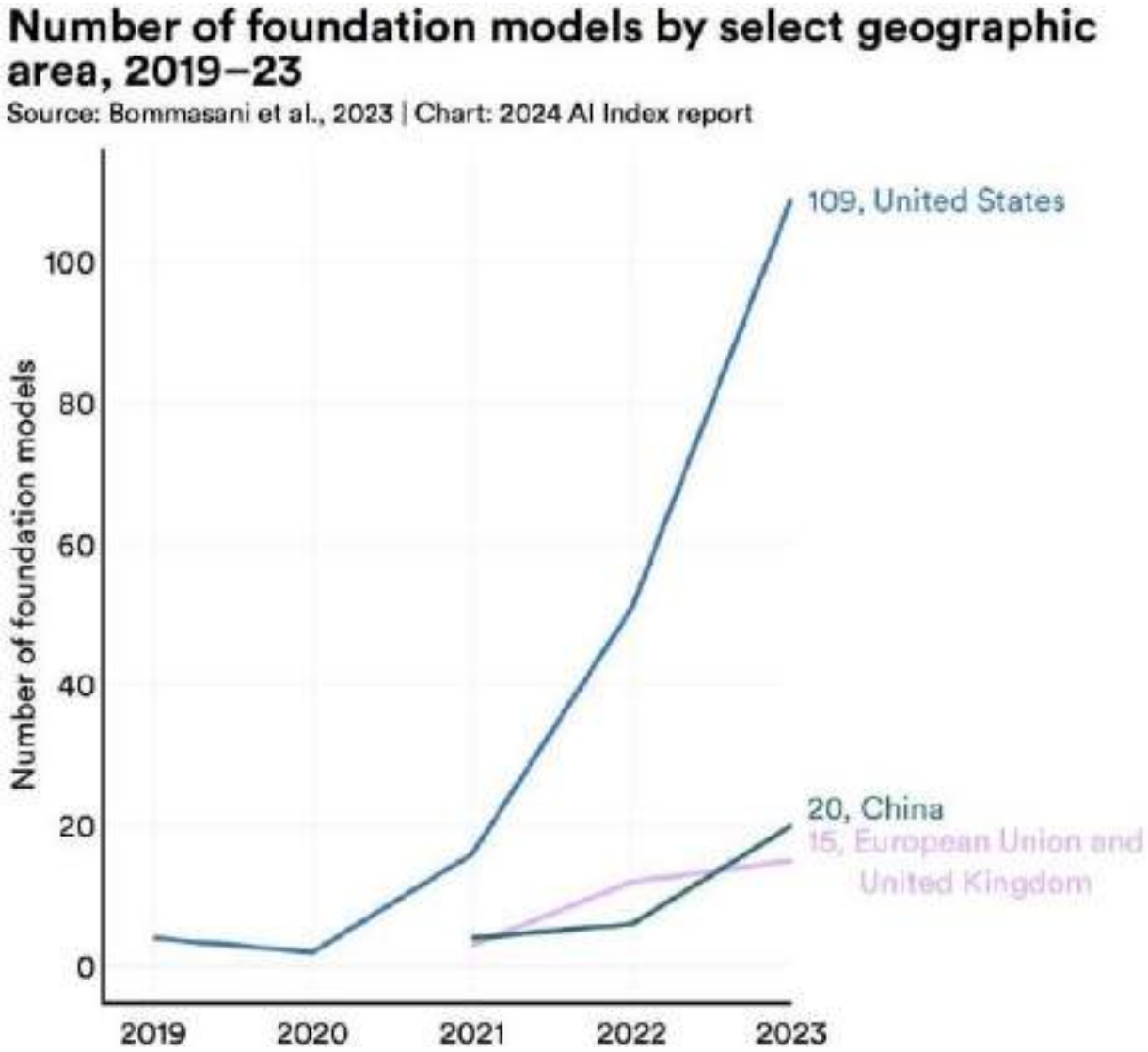


La Cina in 20 anni ha «invaso» oltre 60 categorie di prodotto tipiche del Made in Italy



GLI USA GUIDANO IL MONDO NELLO SVILUPPO DEI FOUNDATION MODEL PER A.I. GENERATIVA E BATTONO LA UE 109 A 7





I COSTI DI CALCOLO E TRAINING PER I FOUNDATION MODEL DI GEN-A.I. SONO NELL'ORDINE DI CENTINAIA DI MILIONI DI US$

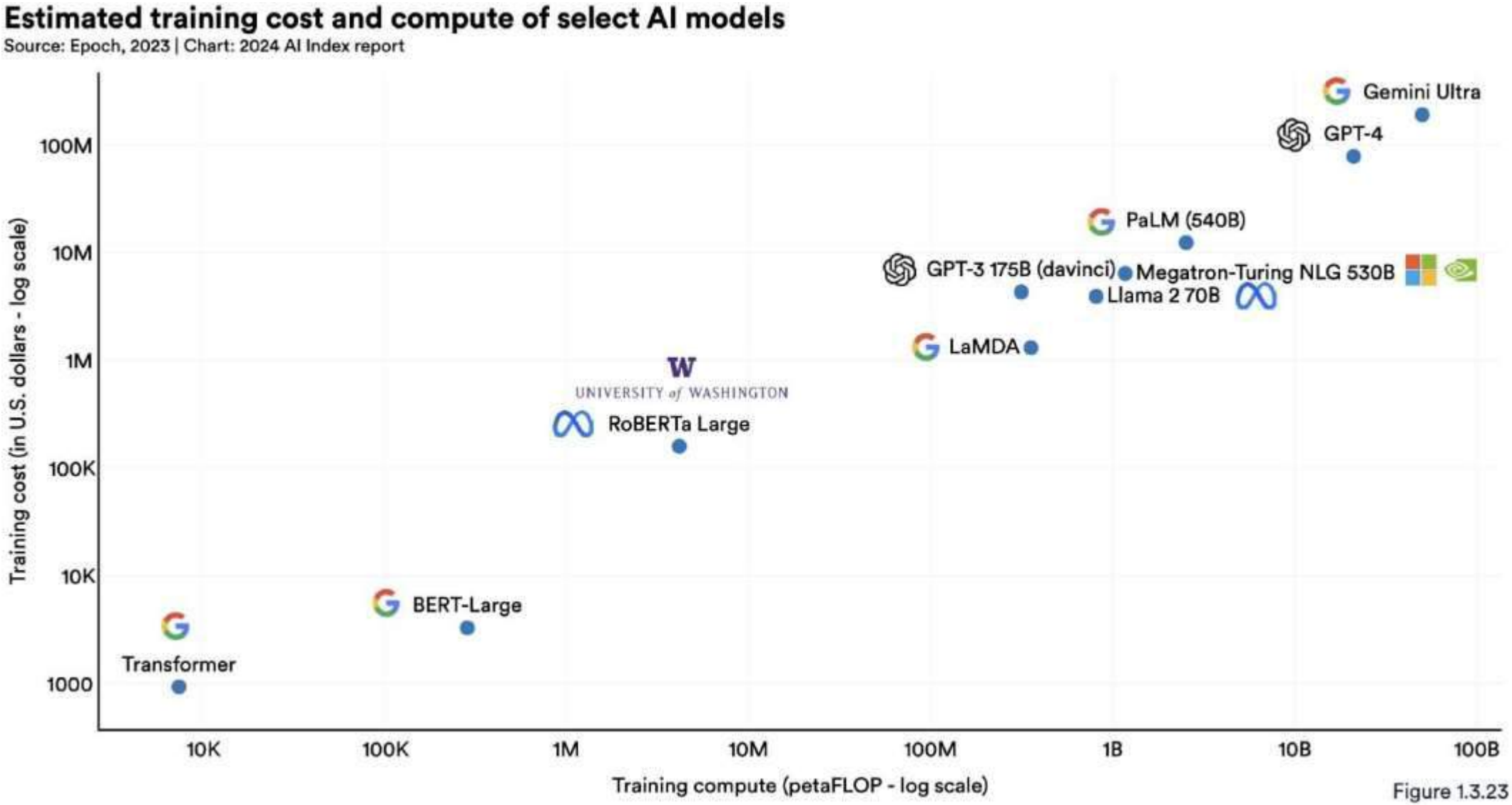
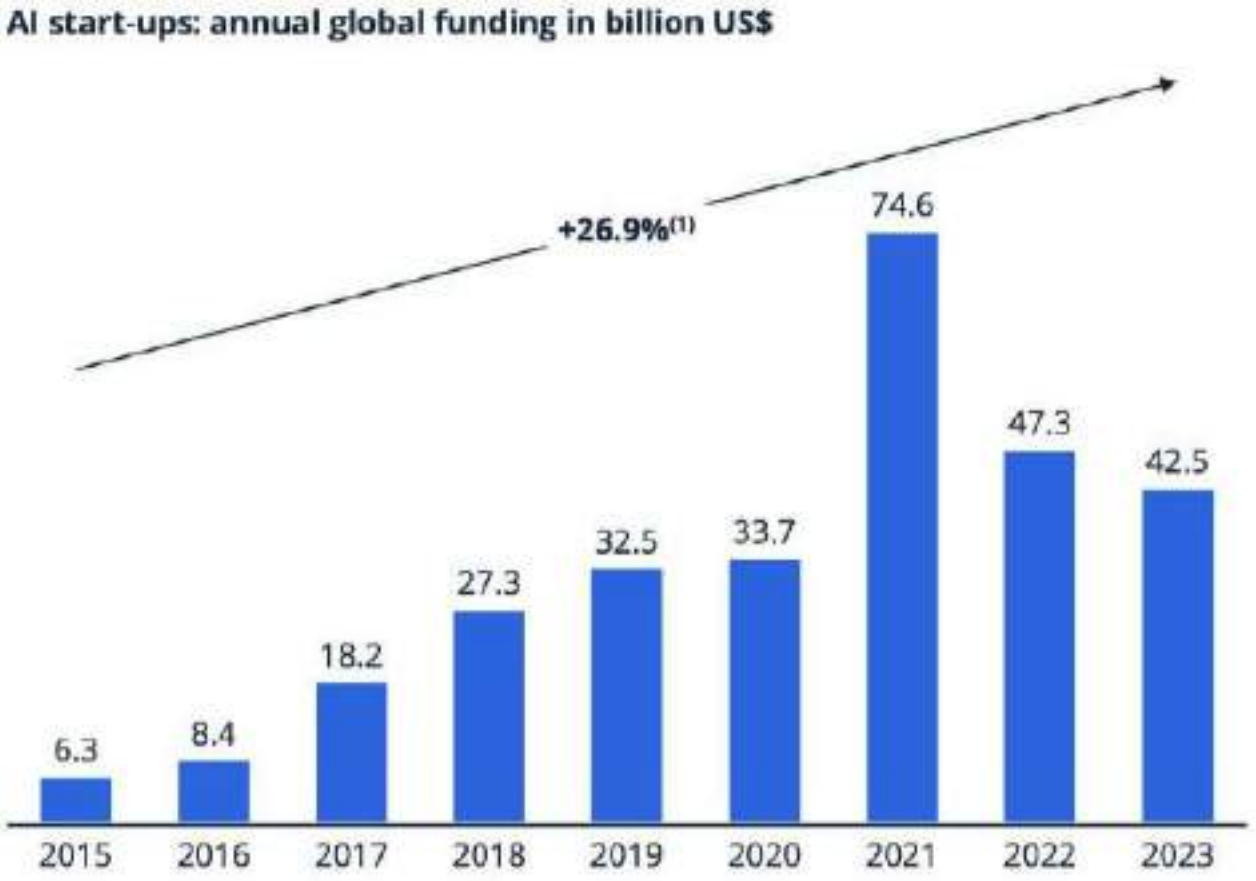
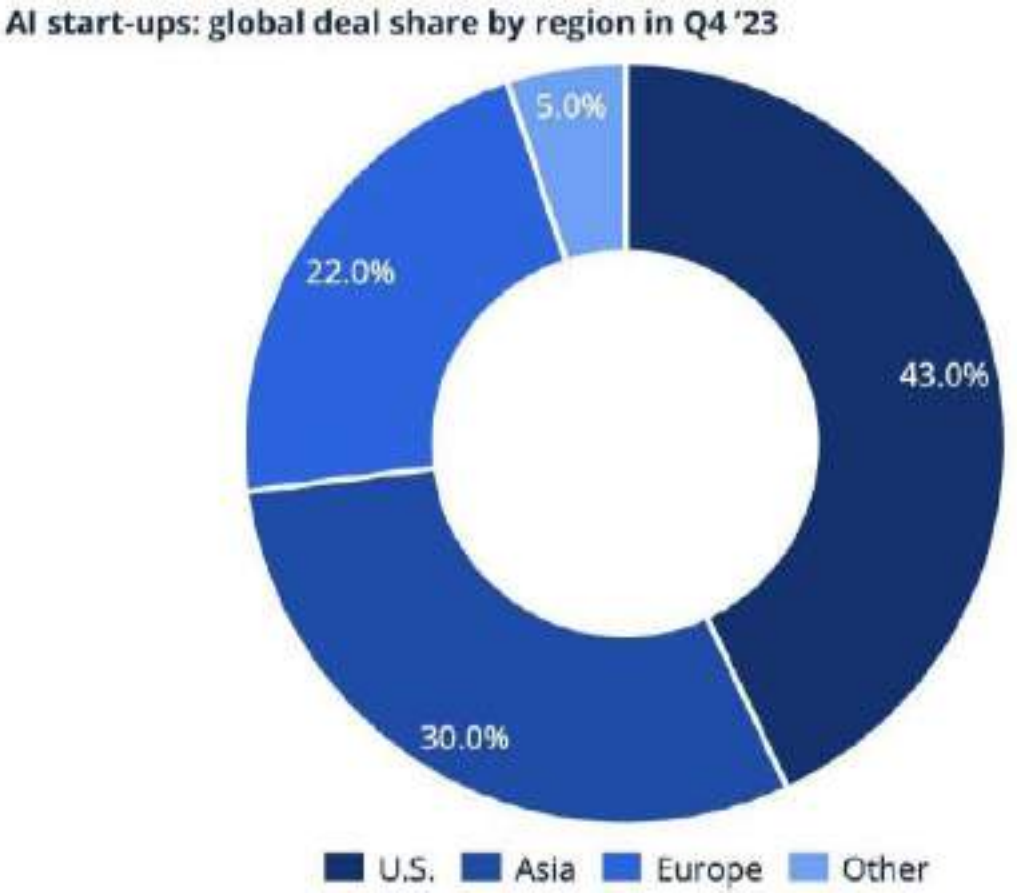


Figure 1.3.23

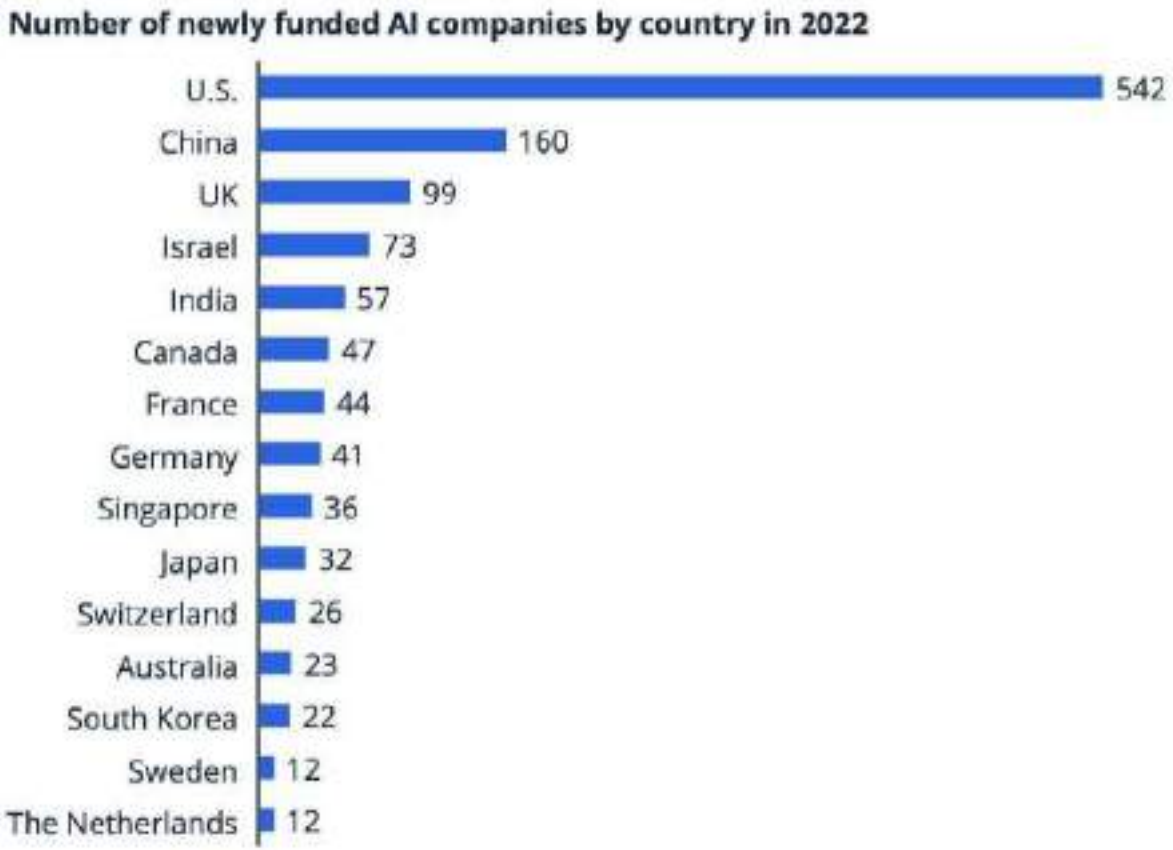
L'EUROPA LESINA I FONDI PER LE STARTUP DI A.I.: SOLO IL 22% DEI DEALS, CONTRO IL 43 DEGLI USA E IL 30% DELLA CINA

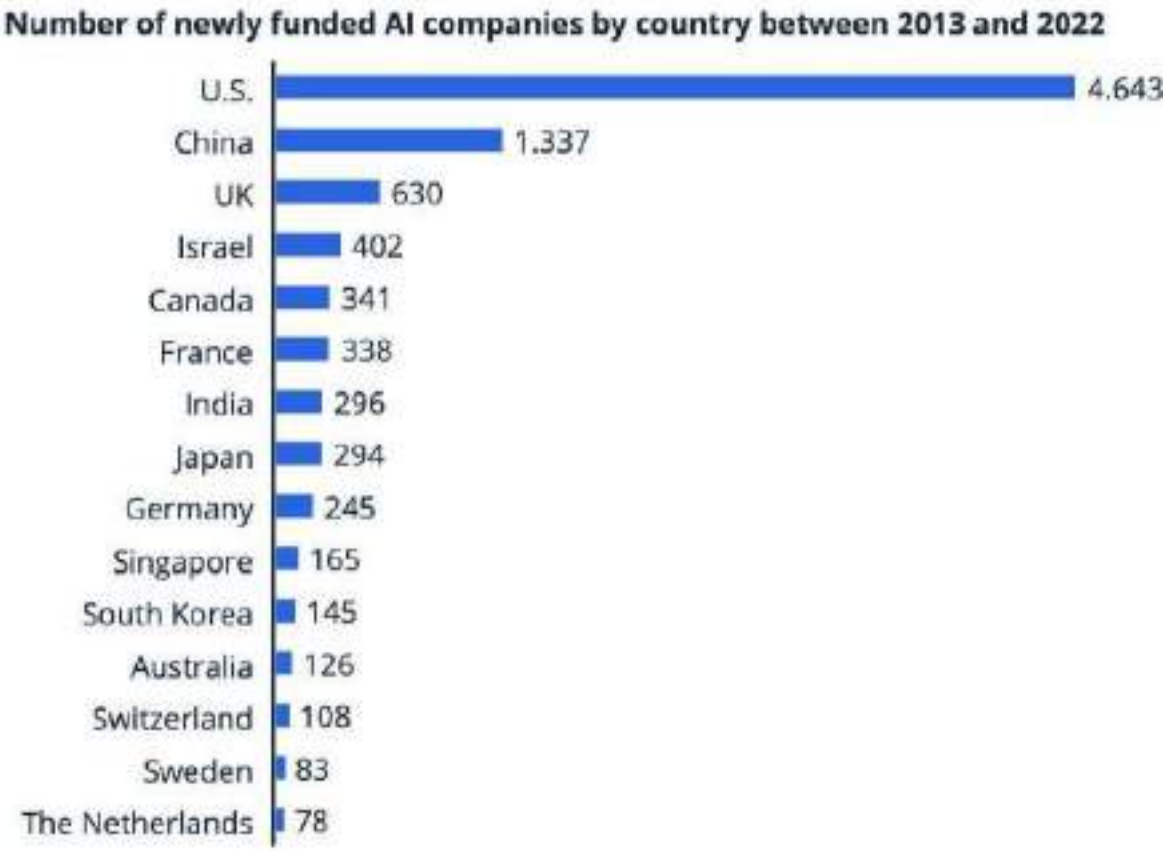




Source: NetBase Quid

GLI USA HANNO FONDATO QUASI 5.000 STARTUP DI A.I. IN TUTTA LA UE NON SI ARRIVA A 1.000





Source: NetBase Quid

EU vs USA? Mid-tech vs High-tech

Top-three R&D spenders and their industries in the EU and the US

Top 3 R&D spenders and their industries in the EU and the US			
	2003	2012	2022
US	Ford (auto)	Microsoft (software)	Alphabet (software)
	Pfizer (pharma)	Intel (hardware)	Meta (software)
	GM (auto)	Merck (pharma)	Microsoft (software)
EU	Mercedes-Benz (auto)	VW (auto)	VW (auto)
	Siemens (electronics)	Mercedes-Benz (auto)	Mercedes-Benz (auto)
	VW (auto)	Bosch (auto)	Bosch (auto)

Source: Fuest et al. (2024). Based on the EU Industrial R&D Investment Scoreboard.

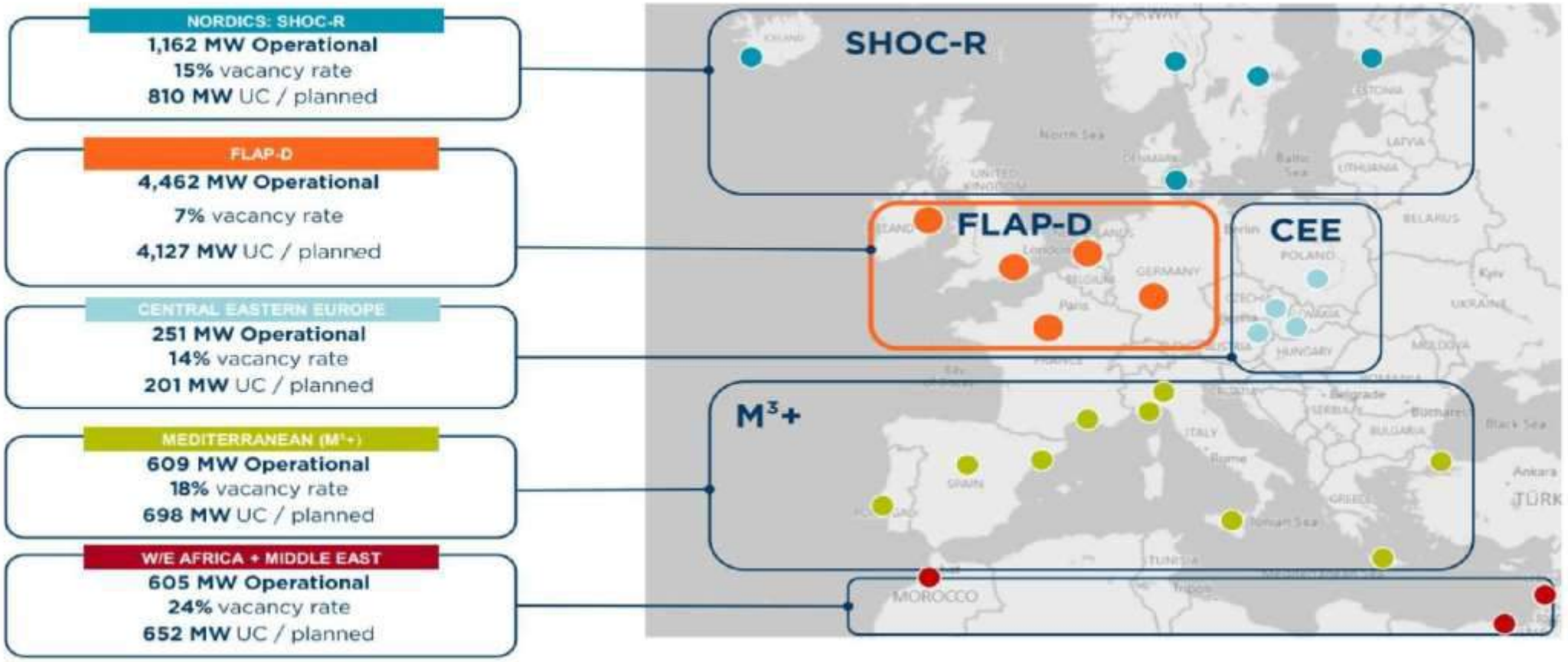
Vogliamo fare le nozze della Gen AI con i fichi secchi dell'AS/400?

La distribuzione globale dei data center: gli USA ne hanno il quadruplo dei Paesi EU5

Description: As of March 2024, there were a reported 5,381 data centers in the United States, the most of any country worldwide. A further 521 were located in Germany, while 514 were located in the United Kingdom. Read more
Note(s): Worldwide; March 2024
Source(s): Cloudscene

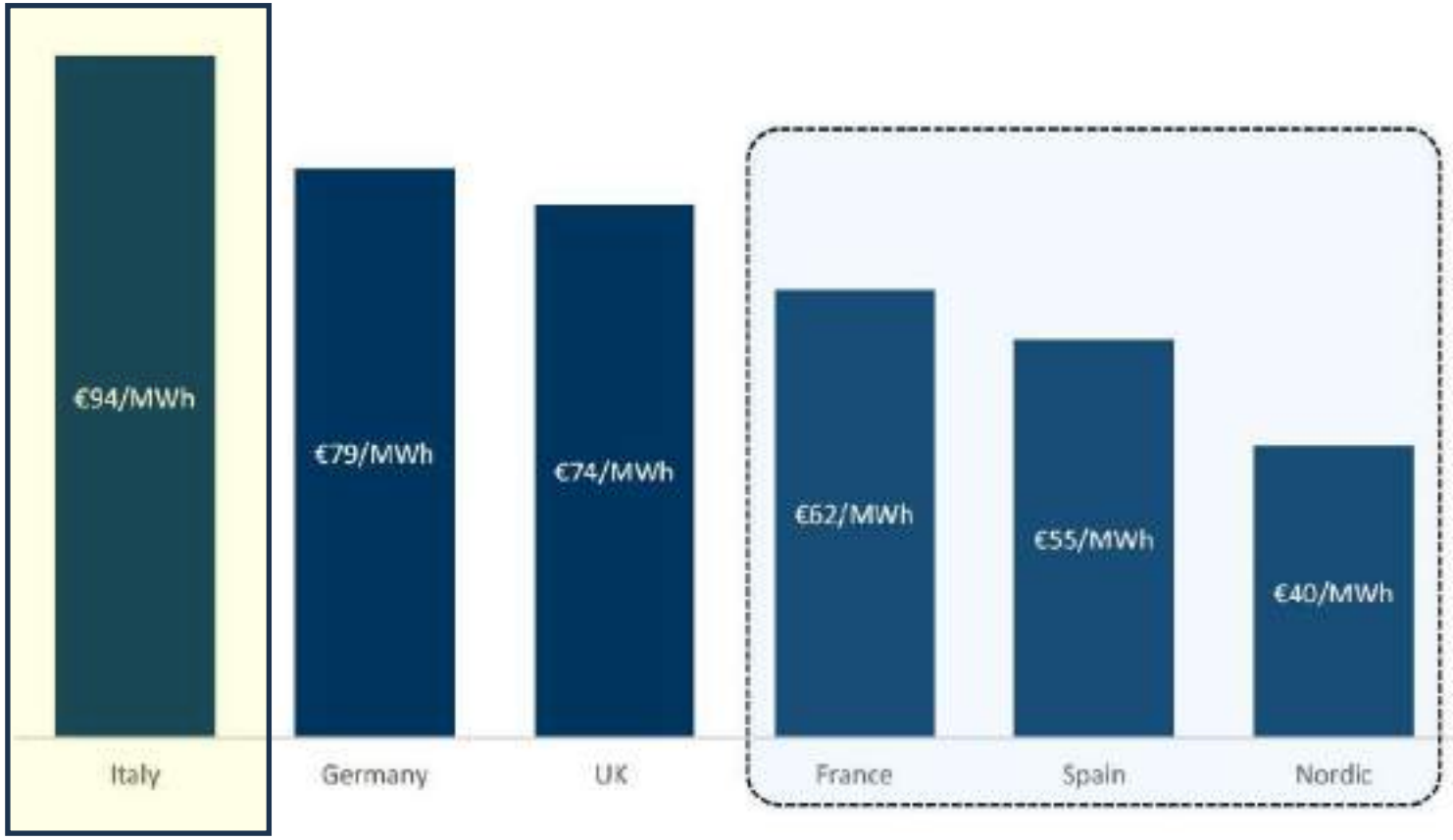
In Europa, la capacità dei data center è concentrata nei principali nodi internet. Nel Mediterraneo c'è meno del 10% del totale europeo e circa 1,6% del totale globale.

Exhibit 30: European data center capacity is relatively concentrated
EMEA data center capacity (MW)



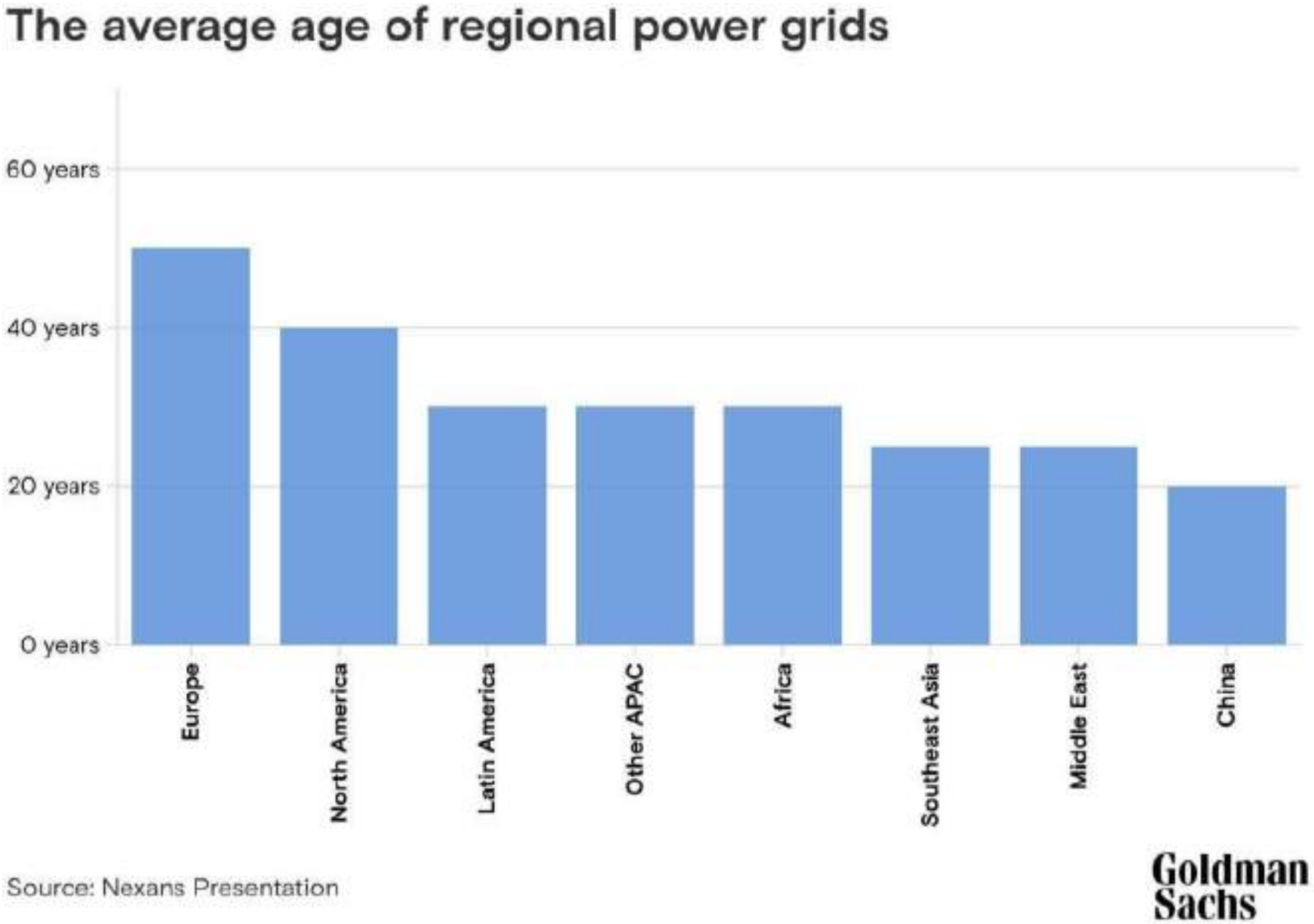
Source: Cushman & Wakefield

Exhibit 40: Nordic, Spain and France have the lowest power prices in Europe currently
Forward power prices by region, 2026 (€/MWh)



Source: OMIP, EEX, Bloomberg

I paesi con il costo dell’energia più alto saranno penalizzati nella crescita delle infrastrutture di calcolo



Le reti elettriche in Europa sono le più vetuste del mondo

Exhibit 47: The distribution network will need a significant upgrade to cope with rising complexity in the power system brought about by the energy transition

Indicative illustration of distribution network before and after energy transition

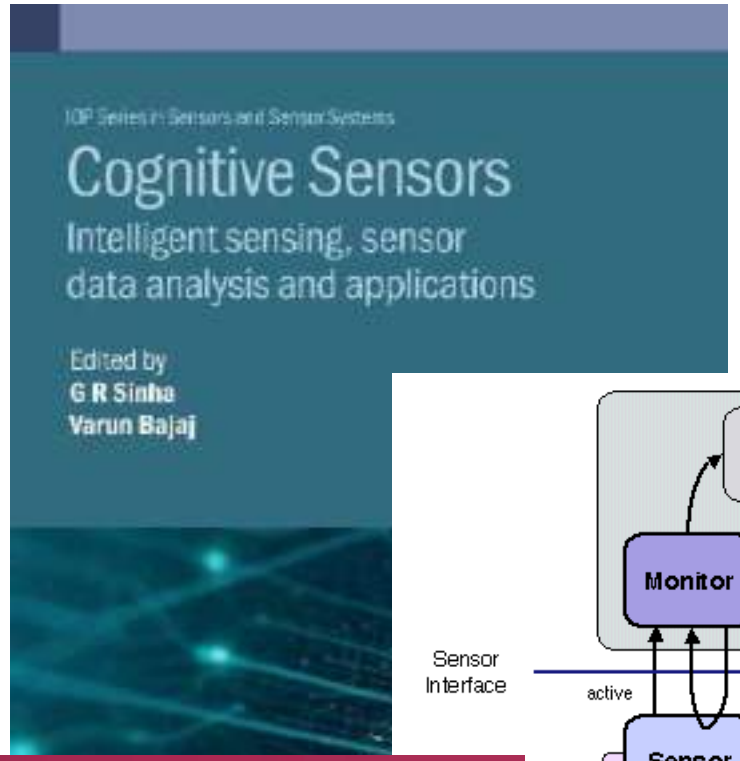
Source: Goldman Sachs Global Investment Research

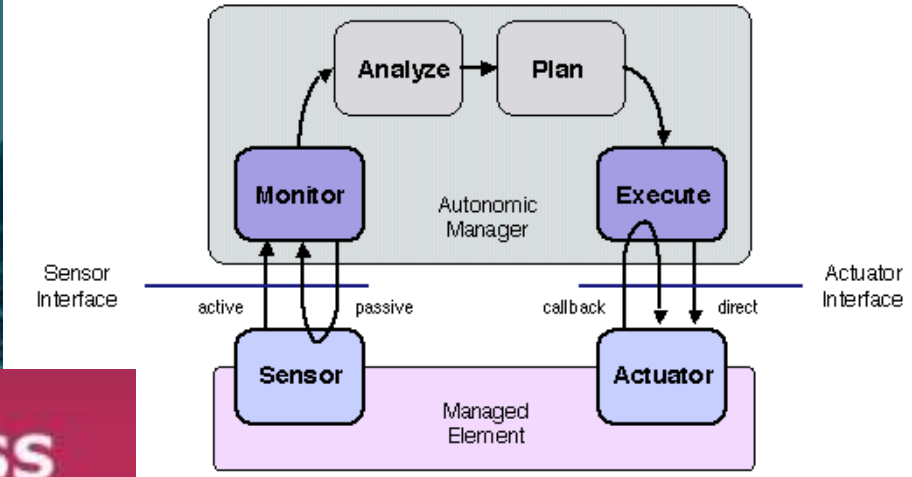
Andranno riprogettate e ristrutturate le reti distributive e le infrastrutture critiche per sostenere i nuovi driver di consumo di elettricità

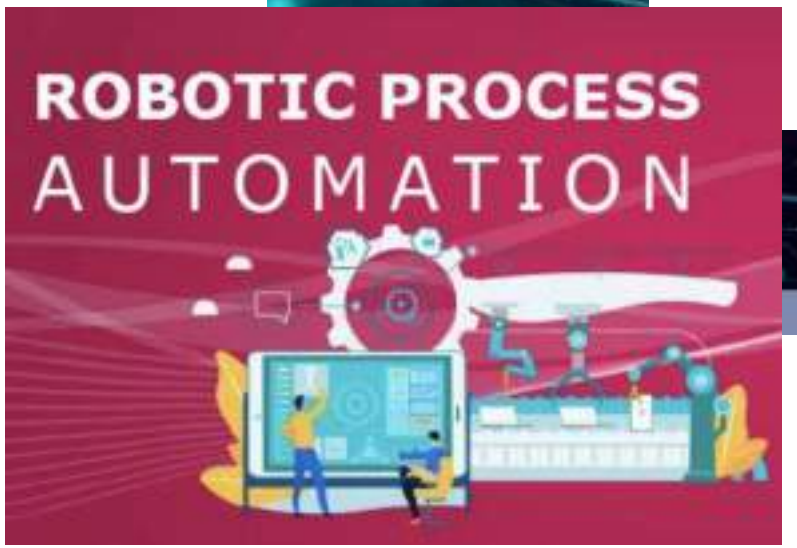
CONCLUSIONI

CON LE TECNOLOGIE NLP E COMPUTER VISION ABBIAMO COSTRUITO I «**SENSORI COGNITIVI**» DEI PROCESSI AZIENDALI.

GLI LLM E I TRANSFORMERS STANNO DIVENTANDO «**ATTUATORI ORGANIZZATIVI**»





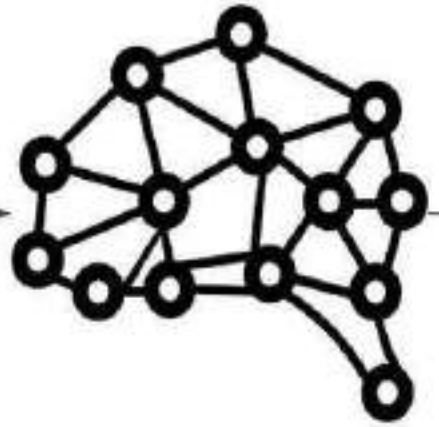


AI AGENTS - FROM SOFTWARE TO AUTONOMOUS SOFTWARE

Where We Were

Existing Software

Where We Are

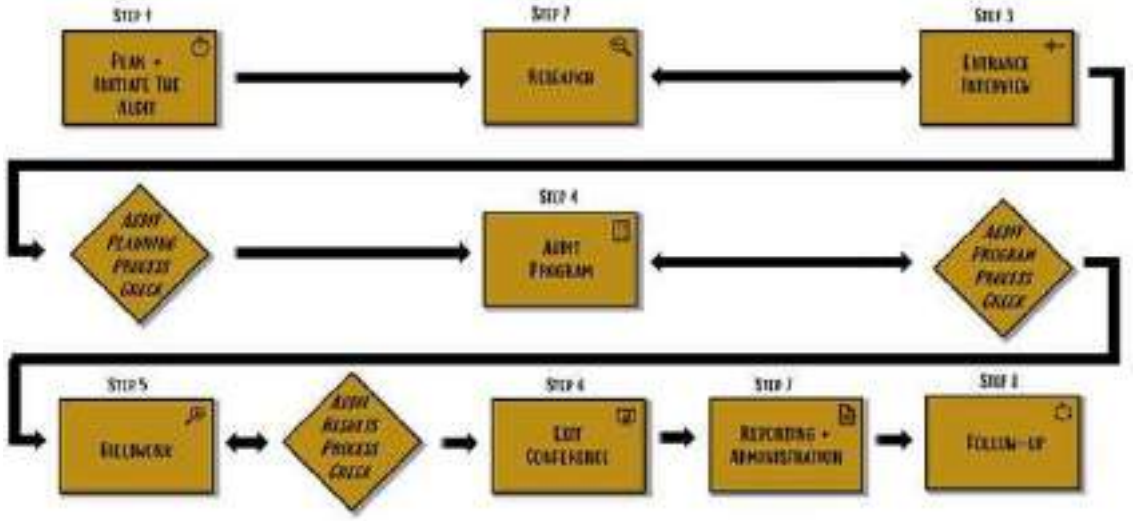


LLMs

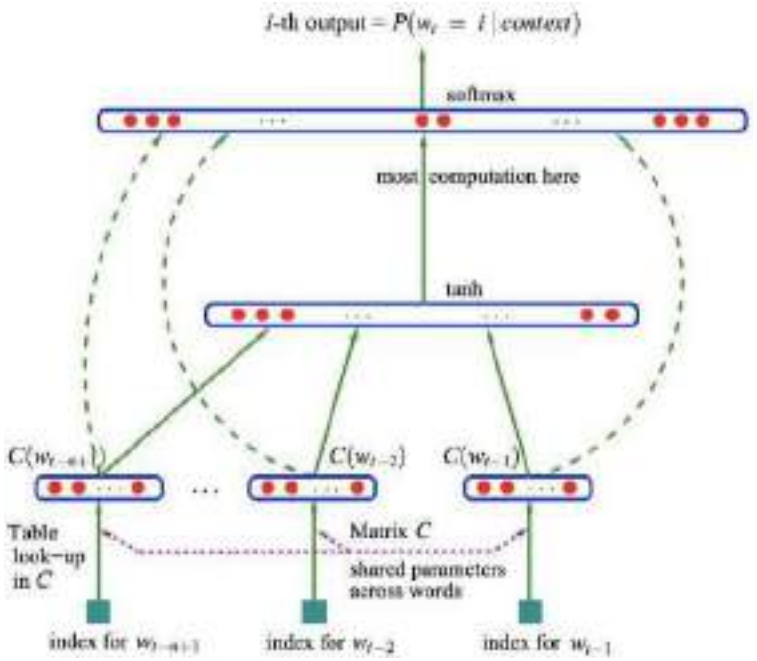
Where We're Going

AI Agents

Con Generative AI, il workflow dei processi organizzativi collassa in un «language model» che va pre-istruito e contestualizzato

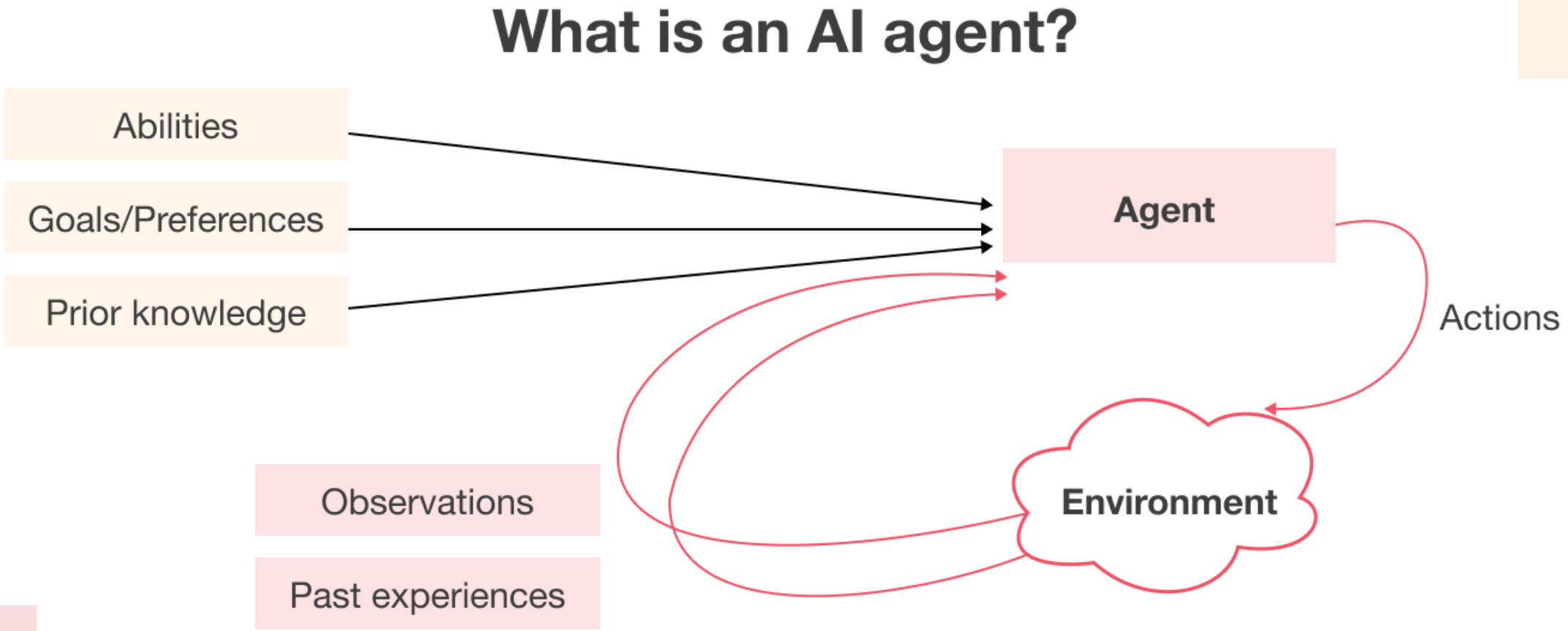


Language Model of Computational Linguistic

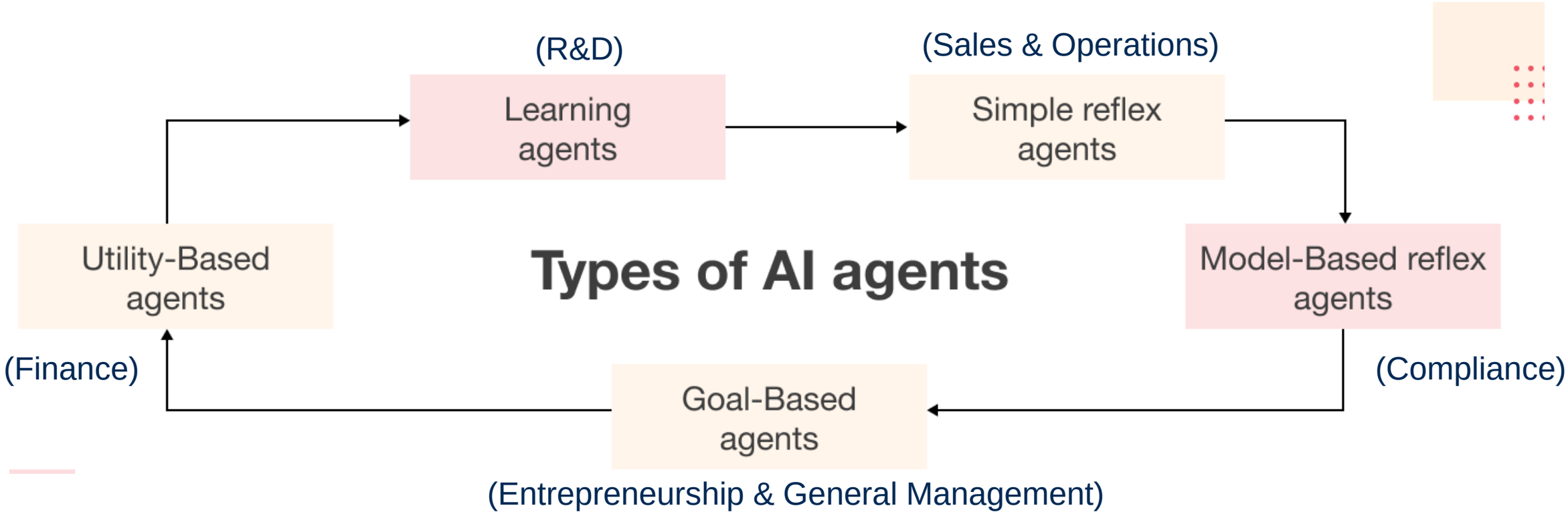


Da un modello «procedurale» a un modello «conversazionale»
E dal formalismo all'inclusività

ARRIVANO GLI «INTELLIGENT AGENTS»…



QUALI SARANNO I DIVERSI TIPI DI «AI AGENTS»?



Cinque tipi principali di agenti AI:

1. **Simple reflex agents** sono programmati per rispondere a specifici stimoli ambientali sulla base di regole predefinite.
2. **Model-based reflex agents** sono agenti reattivi che mantengono un modello interno dell'ambiente e lo utilizzano per prendere decisioni.
3. **Goal-based agents** eseguono un programma per raggiungere obiettivi specifici e intraprendere azioni basate sulla valutazione dello stato attuale dell'ambiente.
4. **Utility-based agents** considerano i potenziali risultati delle loro azioni e scelgono quello che massimizza l'utilità attesa.
5. **Learning agents** eseguono tecniche di machine learning per migliorare il loro processo decisionale nel tempo.

BASTA «ALLUCINAZIONI»: ARRIVA LA «OBJECTIVE-DRIVEN AI»

Lytle Lecture 2023-2024

NEW YORK UNIVERSITY Meta AI

Objective-Driven AI

Towards AI systems that can learn,
remember, reason, plan,
have common sense,
yet are steerable and safe

Yann LeCun
New York University
Meta – Fundamental AI Research

University of Washington
Lytle Lecture
2024-01-24

Smettere di scrivere ordini di servizio e cominciare a fare training su un modello di linguaggio

ORDINE DI SERVIZIO N. 37

Milano:

A tutto il personale

Oggetto: procedura di apertura studio (da effettuare tutte le mattine all'entrata)

1. Bloccare antifurto.
2. Apertura tapparelle e verifica finestre
3. Accendere distribuzione acqua in sala attesa.
4. Accendere tutti i computer (compreso quello dello studio privato) e le stampanti.
5. Accendere tutte le poltrone, la centralina rx e i monitor telecamera porte.
6. Accendere Ortopantomografo e compressore.
7. Apertura e verifica dell'aria condizionata e/o ventilazione ricircolo aria.
8. Apertura acqua centralizzata.
9. Verificare segreteria telefonica e ascoltare eventuali messaggi.
10. Verifica agenda e predisporre sale per i primi pazienti.

Per eseguire la procedura di apertura studio è tassativamente necessario essere in studio non meno di quindici minuti prima dell'inizio del primo appuntamento.

Dott. Germano Usoni-Dott.ssa Enrica Rebaglati

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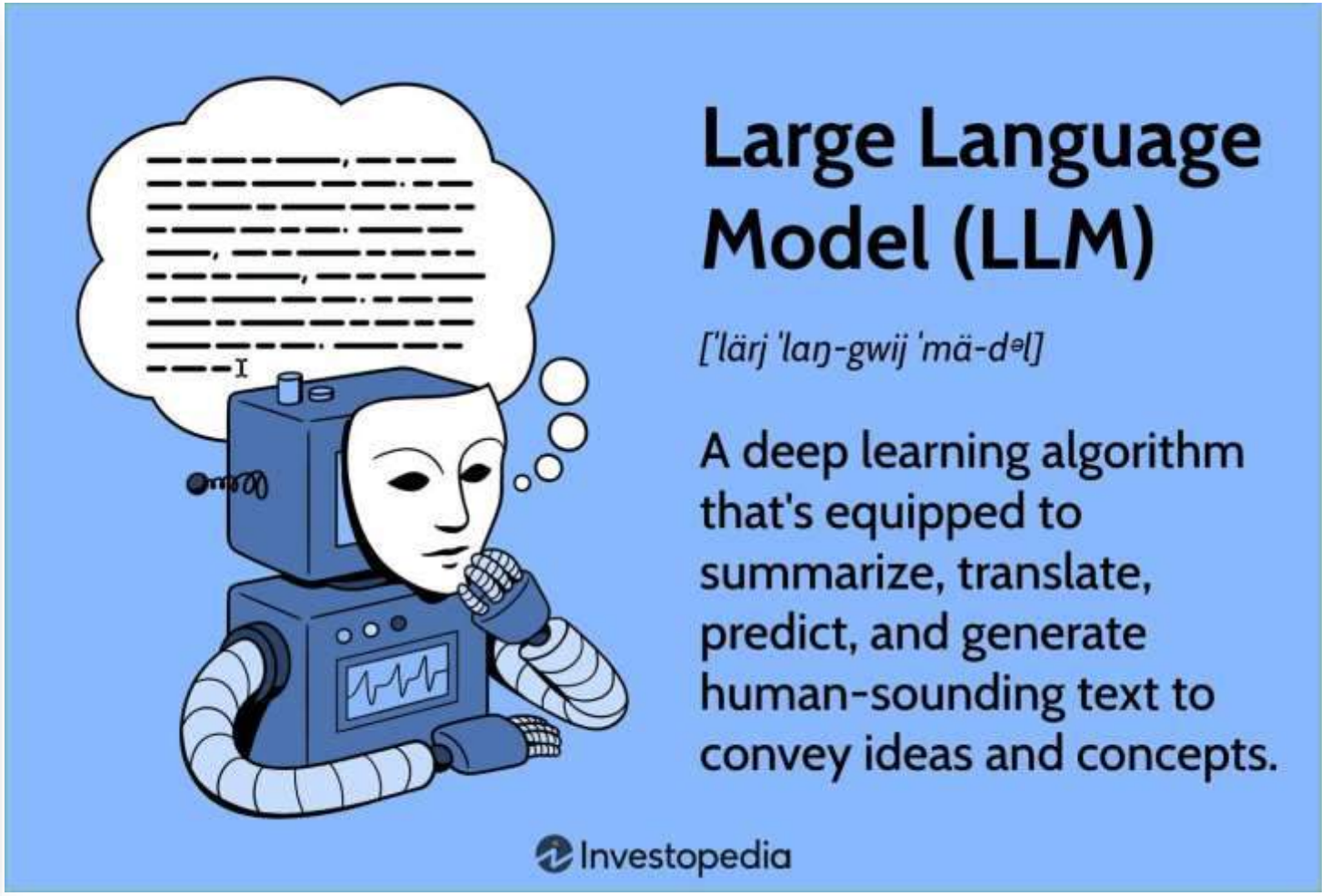

TRUMP VANCE TRANSITION

- November 12, 2024 -

STATEMENT FROM PRESIDENT DONALD J. TRUMP

I am pleased to announce that the Great Elon Musk, working in conjunction with American Patriot Vivek Ramaswamy, will lead the Department of Government Efficiency ("DOGE"). Together, these two wonderful Americans will pave the way for my Administration to dismantle Government Bureaucracy, slash excess regulations, cut wasteful expenditures, and restructure Federal Agencies - Essential to the "Save America" Movement. "This will send shockwaves through the system, and anyone involved in Government waste, which is a lot of people!" stated Mr. Musk.

It will become, potentially, "The Manhattan Project" of our time. Republican politicians have dreamed about the objectives of "DOGE" for a very long time. To drive this kind of drastic change, the Department of Government Efficiency will provide advice and guidance from outside of Government, and will partner with the White House and Office of Management & Budget to drive large scale structural reform, and create an entrepreneurial approach to Government never seen before.

I look forward to Elon and Vivek making changes to the Federal Bureaucracy with an eye on efficiency and, at the same time, making life better for all Americans. Importantly, we will drive out the massive waste and fraud which exists throughout our annual $6.5 Trillion Dollars of Government Spending. They will work together to liberate our Economy, and make the U.S. Government accountable to "WE THE PEOPLE." Their work will conclude no later than July 4, 2026 - A smaller Government, with more efficiency and less bureaucracy, will be the perfect gift to America on the 250th Anniversary of The Declaration of Independence. I am confident they will succeed!

«We'll send shockwaves through the system»

PROVATE A SVILUPPARE UN'APPLICAZIONE DI A.I. IN EUROPA, DOPO L'AI ACT. ECCO CIO' CHE DOVRETE FARE. PRIMA.

Immagina di avere una start-up e di aver costruito un'applicazione di AI per l'educazione – un caso d'uso ovvio e valido.
Prima di poterlo rilasciare nell'UE, devi fare quanto segue:

1. Creare un «**sistema di gestione del rischio**» rigoroso e completo (Article 9, p. 56).
2. Garantire che il sistema sia addestrato su dati che abbiano le "**proprietà statistiche appropriate**" (Article 10, p. 57).
3. Redigere una «**documentazione tecnica dettagliata**» prima di qualsiasi rilascio (Article 11, p. 58).
4. Creare una "**registrazione automatica degli eventi durante l'intera vita del sistema**" (Article 12, p. 59).
5. Costruire un sistema affinché l'operatore e l'autorità di controllo possano "**interpretare l'output del sistema**" (Article 13, p. 59)
6. Incorporare funzioni per la "**supervisione umana**" e un "**pulsante di arresto**" (Article 14, p. 60)
7. Creare un «**completo sistema di cybersecurity**» (Article 15, p. 61).
8. Creare un "**sistema di gestione della qualità**" che includa "**l'installazione, implementazione e manutenzione di un sistema di monitoraggio post-mercato**". (Article 17, p. 62).
9. Mantenere tutto ciò per i **prossimi 10 anni (**Article 18, p. 63**)**.
10. Nominare un "**rappresentante autorizzato che sia stabilito nell'Unione**" (Article 22, p. 65)
11. Sottoporsi a una "**valutazione di conformità**" verificando di aver fatto quanto sopra con **un'autorità designata** e **ricevere un certificato ufficiale (**Article 43, p. 78**)**.
12. Sottoporsi a una «**valutazione d'impatto sui diritti fondamentali**» e inviarla all'Autorità di Vigilanza del Mercato (Article 27, p. 69).
13. Redigere una «**Dichiarazione di Conformità UE**» (Article 47, p. 80).
14. Registrarsi in un «**database ufficiale dell'UE**» che deve contenere tutte le applicazioni di AI (Article 49, p. 81).

In caso di errore, si rischia **una multa fino a un massimo di 15 milioni di euro o del 3% del fatturato totale** (Article 99, p. 115).

DESIGNED FOR YOUR WORLD

SDA Bocconi
SCHOOL OF MANAGEMENT

THANKS!

ARRIVEDERCI...

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Twitter: @carloalberto