Digital transformation in Europe: *Current challenges, future opportunities and the role of regulation and research*

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European Commission

JRC sites

Headquarters in **Brussels**
and research facilities located
in **5 EU Countries:**

Belgium (Geel)

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Italy (Ispra)

The Netherlands (Petten)

Spain (Seville)

Outline

- State of play
- Regulatory Framework
- Joint Research Centre’s research. Two examples
- Conclusions

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Competitiveness at the core of the EU policy agenda

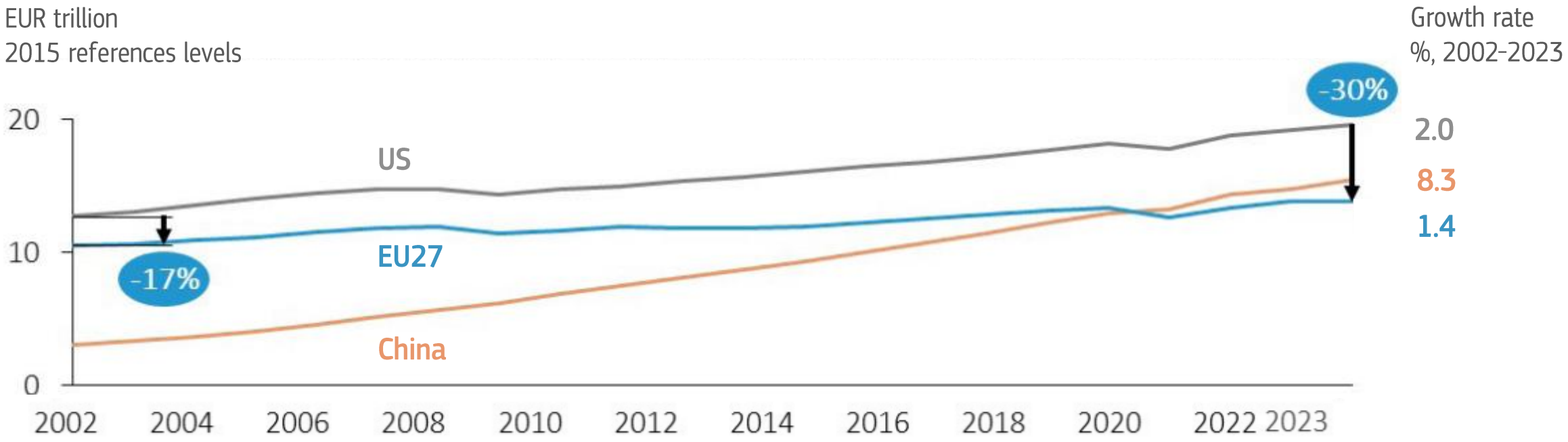
Political Guidelines in "Europe's Choice": a new Plan for Europe's sustainable prosperity and competitiveness

> Our freedom and sovereignty depend more than ever on our **economic strength**. Our security depends on our ability to **compete, innovate and produce**. And our social model depends on a **growing economy** while facing demographic change. Mario Draghi's [...] diagnosis was stark and his roadmap for action equally ambitious. [...] The first major initiative of the new Commission will be a **Competitiveness Compass** [...] built on the three pillars of the Draghi report. This will frame our work for the rest of the term.

Presentation of the von der Leyen II Commission
European Parliament, 27 November 2024

EU's divergent economic trajectory

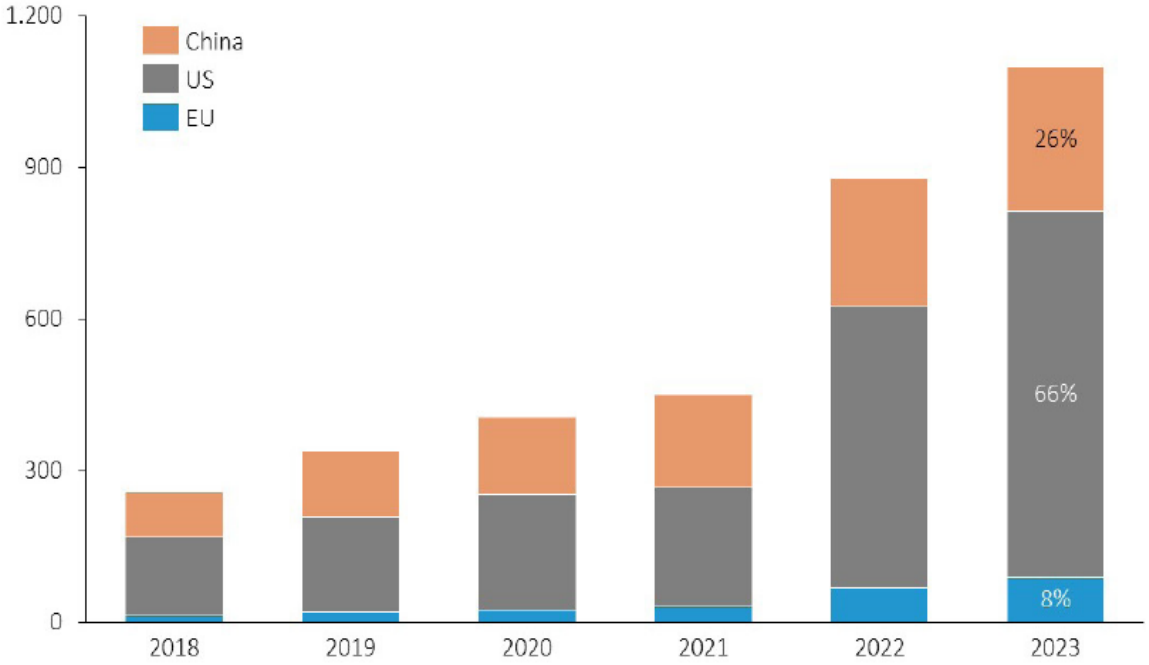
Real GDP evolution 2002-2023: EU US and China



Source: OECD 2024

Need to close the innovation gap

Europe lags on active unicorns



Source. Pitchbook, Accessed 2024

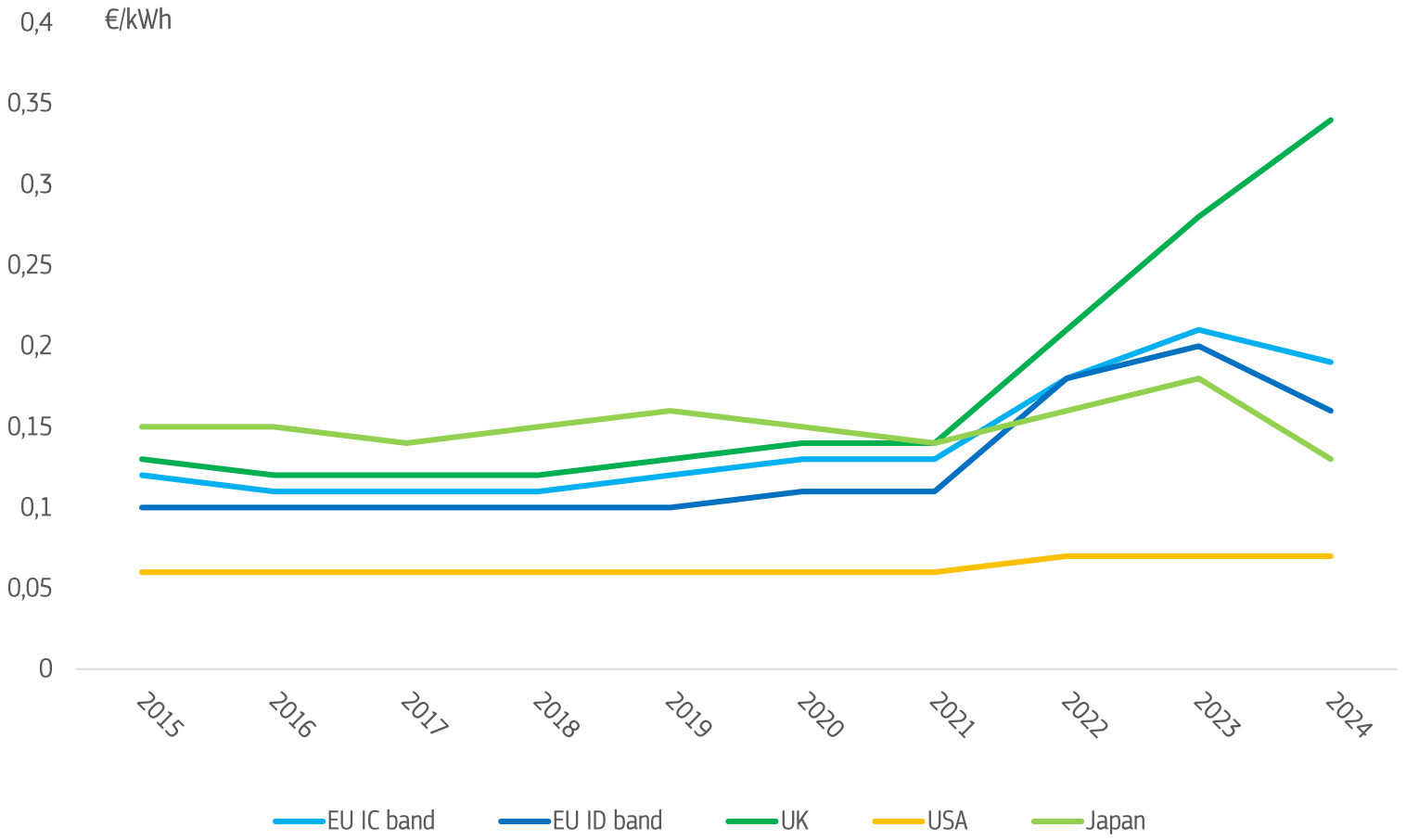
Top R&D spenders in Europe are the same over 20 years

	2003	2012	2022
US	Ford (auto) Pfizer (pharma) GM (auto)	Microsoft (software) Intel (hardware) Merck (pharma)	Google (software) Meta (software) Microsoft (software)
EU	Mercedes (auto) Siemens (electronic) VW (auto)	VW (auto) Mercedes (auto) Bosh (auto)	VW (auto) Mercedes (auto) Bosh (auto)

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

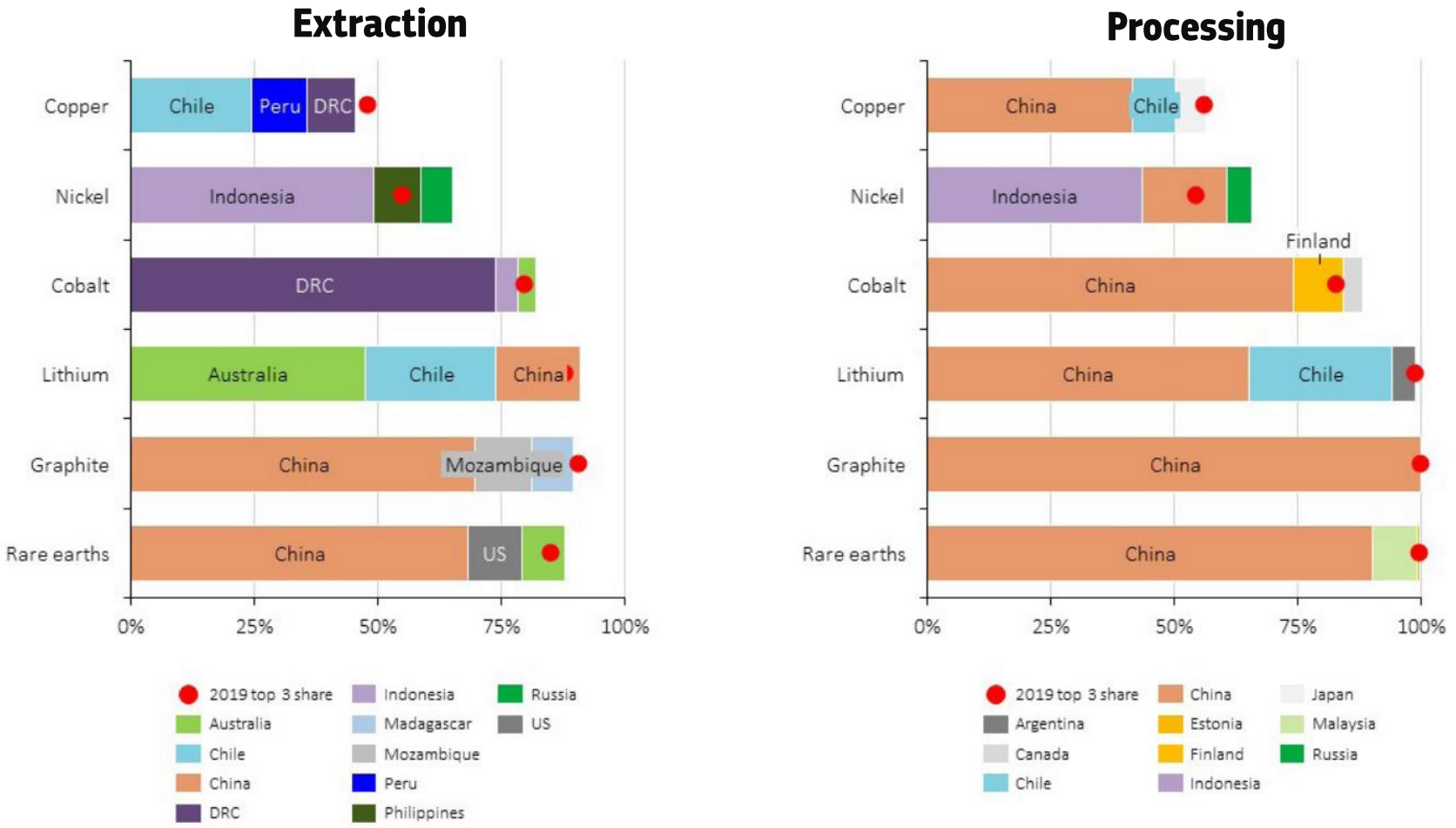
A joint plan for decarbonisation and competitiveness

Electricity prices in the EU and other advanced economies, Q1-Q2 2024



Excessive dependencies can become vulnerabilities

Concentration of extraction and processing of critical resources



Share of top-three producing countries in total production for selected resources and minerals, 2022

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Digital Services Act & Digital Markets Act

A safer digital space

for all users

Fair online marketplaces

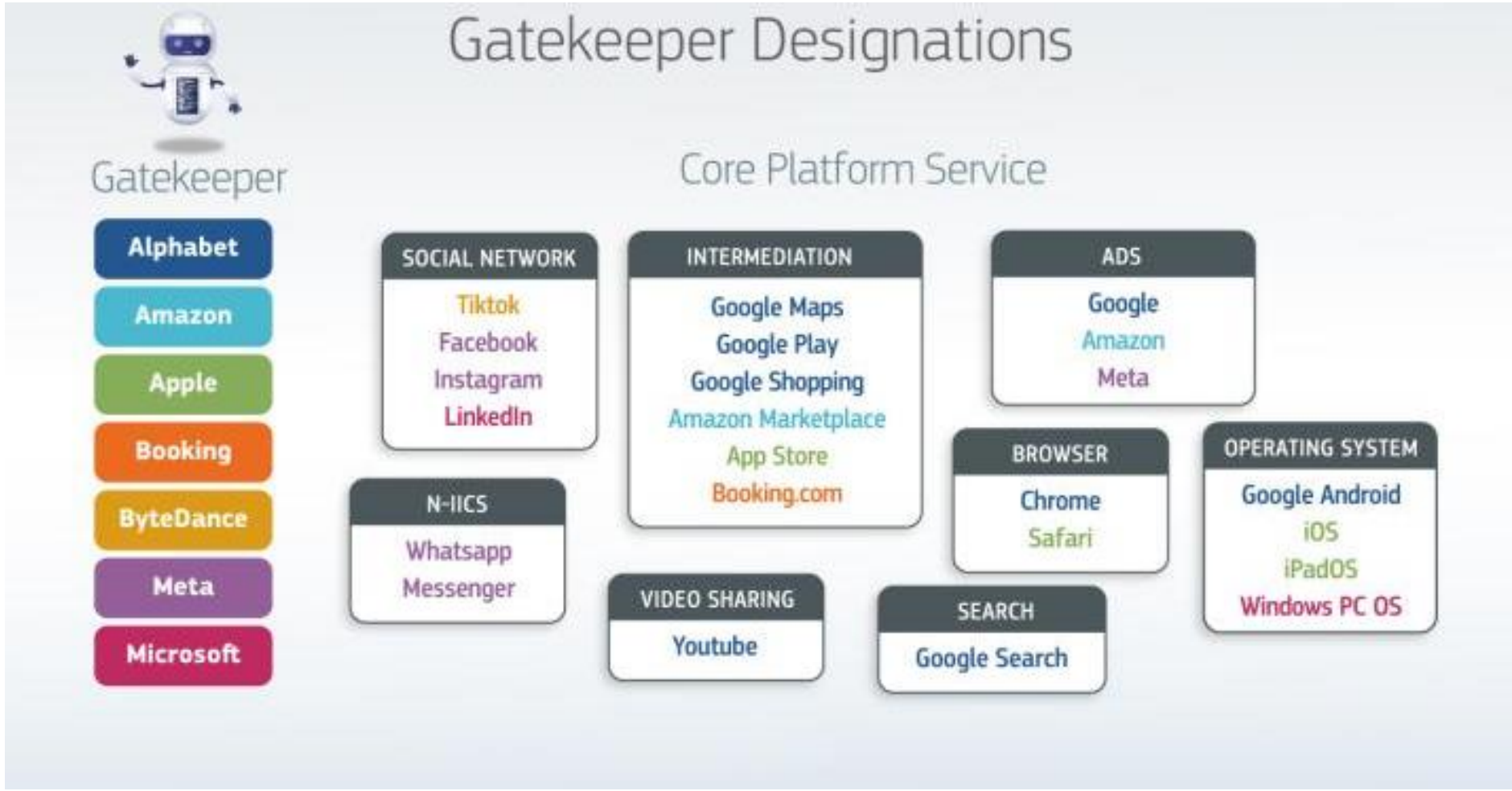
for small businesses & startups

European Commission

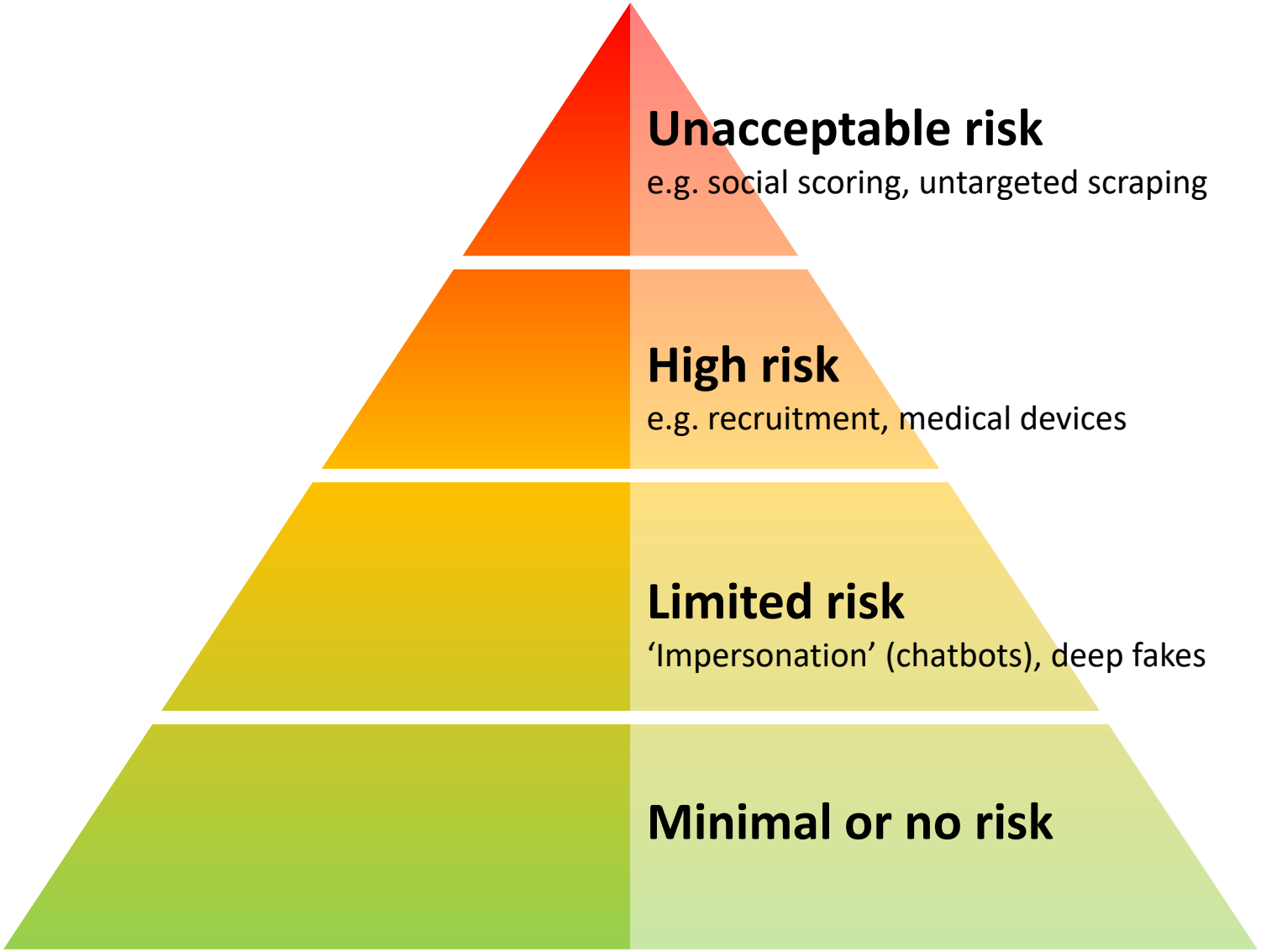
VLOPs & VLOSEs: Summary of designations

Very Large Online Platforms		Very Large Online Search Engines
• Alibaba AliExpress • Amazon Store • Apple AppStore • Booking.com • Facebook • Google Play • Google Maps • Google Shopping • Instagram • LinkedIn • Pinterest • Pornhub	• Shein • Snapchat • Stripchat • Temu • TikTok • Wikipedia • X • XNXX • XVideos • YouTube • Zalando	• Bing • Google Search

DMA: Gatekeepers



The AI Act follows a risk-based approach



Prohibited

Permitted subject to compliance with AI requirements and ex-ante conformity assessment

Permitted but subject to information/transparency obligations

Permitted with no restrictions, voluntary codes of conduct possible

Towards the creation of an AI Continent

2 sides of a coin

Supporting the **development of most advanced AI models**

+

Boosting **AI adoption in strategic sectors**

- **AI Factories**
- **AI Gigafactories**
- **Cloud and AI Development Act**
- **Data Union Strategy**

- **Apply AI Strategy**
- **Skills and talents**
- **Facilitate compliance AI Act**

EUROPEAN ARTIFICIAL INTELLIGENCE OFFICE

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Enhancing electricity price forecasting accuracy: A novel filtering strategy for improved out-of-sample predictions

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ARTICLE INFO

Keywords:
Electricity price forecasting

ABSTRACT

Reliable electricity price forecasts are key for energy sector strategy. The presence of market volatility and price spikes may negatively affect the accuracy of predictions if not properly addressed. In this study, we introduced

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Fast and robust clustering of general-shaped structures with tk-merge

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ARTICLE INFO

Keywords:
Robust statistics
Model-based clustering
Hierarchical clustering

ABSTRACT

In real-world applications, the group of provenance of data can be inherently uncertain, the data values can be imprecise and some of them can be wrong. We handle uncertain, imprecise and noisy data in clustering problems with general-shaped structures. We do it under very weak parametric assumptions with a two-step hybrid robust clustering algorithm based on trimmed k-means and hierarchical agglomeration. The algorithm has low computational complexity and effectively identifies the clusters also in presence of data contamination. We also present natural generalizations of the approach as well as an adaptive procedure to estimate the amount of contamination in a data-driven fashion. Our proposal outperforms state-of-the-art robust, model-based methods in our numerical simulations and real-world applications related to color quantization for image analysis, human mobility patterns based on GPS data, biomedical images of diabetic retinopathy, and weather data.

1. Introduction

Cluster analysis aims at aggregating "similar" objects under same groups according to some similarity measure, and it is widely used as an exploratory tool across different domains. The relevant literature has proposed algorithms characterized by various degrees of sophistication. The simplest ones rely on assumptions, sometimes unexpressed albeit strong, which restrict considerably their applicability to complex data. On the other hand, also the more flexible algorithms are often not practicable in applications, because of their computational and technical complexities. We aim at reaching flexibility without sacrificing algorithmic simplicity,

The Future of Governance Beyond Bureaucracy through Proactive Public Services: No Proactivity No Party?

Abstract. Data and artificial intelligence are transforming governments, with proactive public services (PPS), leveraging this synergy, becoming a new standard for digital governments. This form of public services aims to address social or economic needs within society by "anticipating" citizens' needs and provide timely interventions requiring minimal or no direct citizen engagement. PPS are seen to increase convenience, better citizen outcomes, and greater service efficiency. However, the shift to PPS (often) comes with challenges. While this shift is observed widely among European Union member states and beyond, in practice, respective approaches often remain ad-hoc, which is the result of rather scarce knowledge and documentation of respective practices and experiences. This is also observed in scientific literature with only a limited number of studies available, often addressing a selected area of PPS. This study aims to synthesize existing knowledge on PPS through a systematic literature review, identifying

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An overview of the expected public values arising from blockchain adoption in the European public sector

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Engineering International Belgium S.A., Brussels, Belgium, and
Luca Tangi
European Commission, Joint Research Centre, Ispra, Italy

Abstract

Purpose – This study aims to systematically explore the anticipated realisation of public values through blockchain technology (BCT) within the European public sector. Its purpose is to offer a comprehensive analysis of BCT implementations, focusing on the various expected public values and understanding how these expectations shape the adoption of BCT in public administration across Europe.
Design/methodology/approach – This research involves a qualitative analysis of 165 BCT use cases across European governments at the national, regional and local levels. The study employs a public values lens, categorising the expected public values into three clusters: internal, external and relational.
Findings – The results indicate that most cases focus on external transformation, aiming to improve public service provision and enhance citizen satisfaction and engagement by increasing public trust, efficiency, accountability and transparency. For the internal dimension, the results emphasise security, efficiency and cooperativeness as expected public values in adopting BCT. Finally, fewer cases highlight expectations related to relational public values, such as citizen involvement and democratic participation.
Originality/value – This research offers new insights into BCT in the public sector through a public values lens within the European context. It examines the expected public values arising from BCT adoption, providing insights for policymakers and practitioners considering BCT integration in daily operations. This study emphasises the need for further empirical research to explore BCT's potential in realising these expected public values and to evaluate the trade-offs and disruptive impacts on public administrations.

Keywords Blockchain, Public values, Public sector, Europe, Digital government
Paper type Research paper

1. Introduction

Blockchain technology (BCT) has emerged as a transformative force in recent years owing to its potential to revolutionise various sectors. Its impact is expected to be widespread, encompassing multiple disciplines, including computer science and business, an expectation that is reflected in global research patterns (Dubey, 2022). The impact of BCT is anticipated to be particularly notable in the public sector: governments are increasingly interested in

VETNET European Research Network Vocational Education and Training

Universitat de les Illes Balears

Herrero Rámila, C., Castaño Muñoz, J., Romero Rodriguez, S., & Moreno Morilla, C. (2025). Key drivers of inclusive digital transformation of European vocational education and training systems. In E. Quintana-Murci, F. Salvà-Mut, B. E. Stalder, & C. Nägele (Eds.), *Towards inclusive and egalitarian vocational education and training: Key challenges and strategies from a holistic and multi-contextual approach. Proceedings of the 6th Crossing Boundaries Conference in Vocational Education and Training, Palma, Mallorca, Spain, 21 to 23 May 2025* (pp. 263–271). VETNET. https://doi.org/10.5281/zenodo.15373835

Key Drivers of Inclusive Digital Transformation of European Vocational Education and Training Systems

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Have I Seen you Before? Measuring the Value of Tracking for Digital Advertising*

Grazia Cecere† Sarah Lemaire ‡

December 10, 2023

Abstract

Privacy regulation aiming to reduce the ability of ad platforms to aggregate user data can decrease the quality of ad display and thus challenge data-driven business models. We investigate the effect of privacy protection rules on the market for ads. We leverage a change in Apple's privacy policy, the *App Tracking Transparency*, to compare ad campaigns targeting iOS users versus Android users. To assess the effect of the policy, we use an original database of estimated ad outcomes on a social network in the US market. The results suggest a relative reduction in targeting efficiency and ad prices.

*We thank Marc Bourreau, Alexandre de Cornière, Pierre Dubois, Isis Durrmeyer, Daniel Ershov, Renato Gomes, Ulrich Hege, Christian Hellwig, Doh-Shin Jeon, Ilja Kantorovitch, Laura Lasio, Nour Meddahi, Charles Pebereau, Guillem Roig, Wilfried Sand-Zantman, and Catherine Tucker for their helpful comments. We thank the participants of the EARIE Conference 2021, the IIOC Conference 2022, the Doctoral Workshop on The Economics of Digitization 2022, the EEA-ESEM Congress 2022, the Digital Economy Workshop 2023. The financial support of the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation program (grant agreement No 670494 & grant agreement No. 759733 - PLATFORM) and the financial support of TSN Carnot are also gratefully acknowledged. Disclaimer: Any opinions and conclusions expressed on this articles are those of the authors and do not necessarily represent the views of their institutions.

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Measuring the digital ecosystem

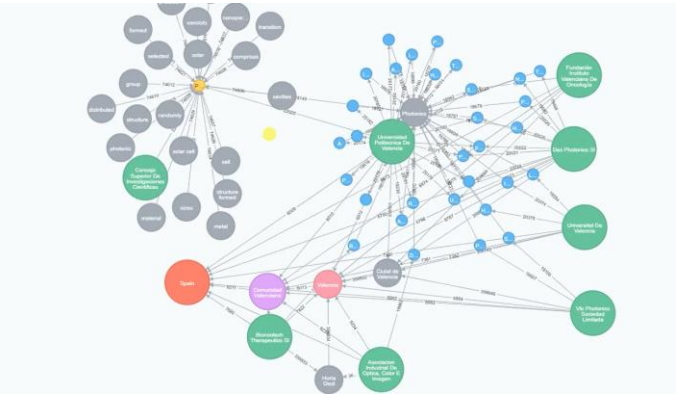
DGTES: Why & How

Policy need (and scientific challenge)

- **New tools** to map **industrial ecosystems**
- Accounting for their dynamics & **complex interlinkages**

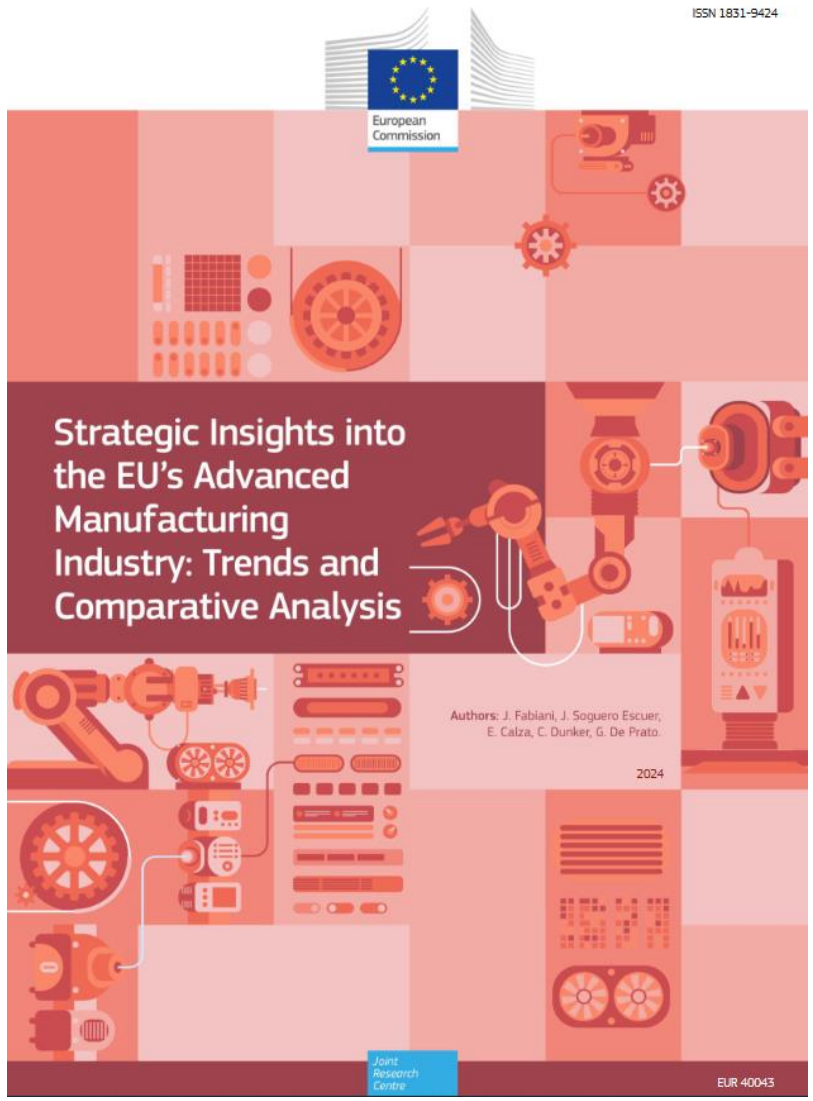
The Techno-Economic Ecosystem Analytical Approach

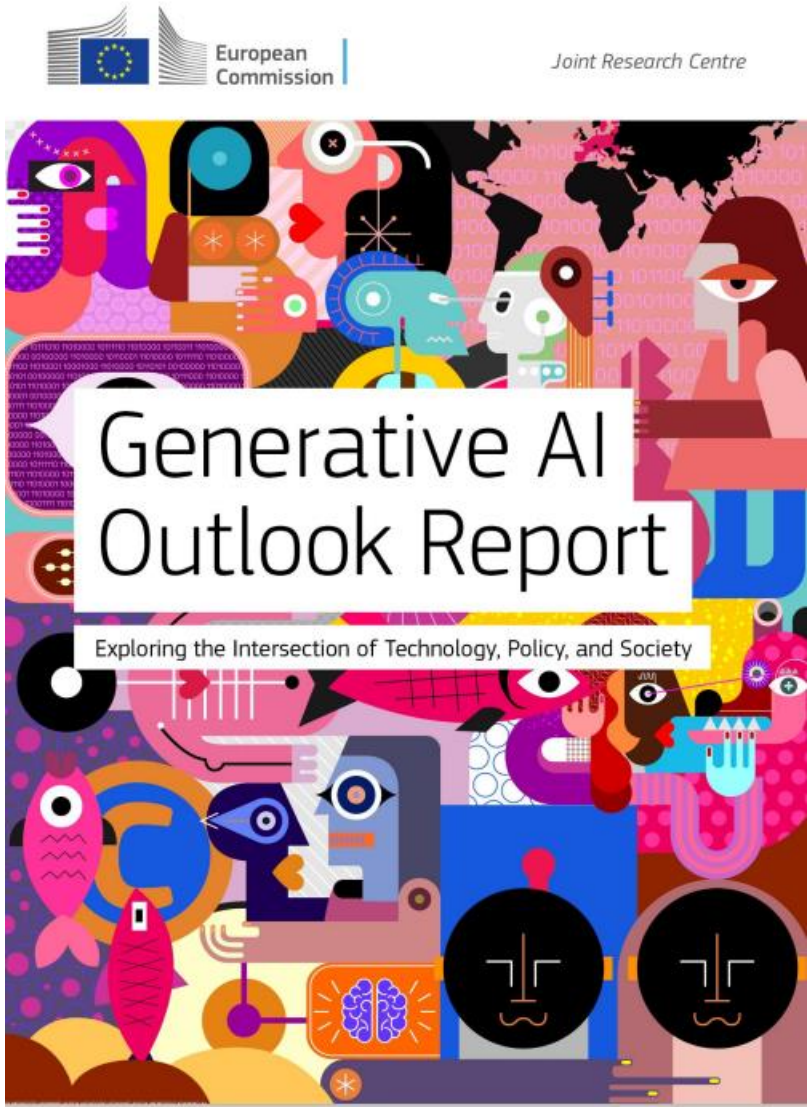
- Building a network of players, activities, technologies, locations, interactions
- Based on multiple micro-data sources (innovation, research, business)
- Applicable to virtually any ecosystem



Ecosystem by design

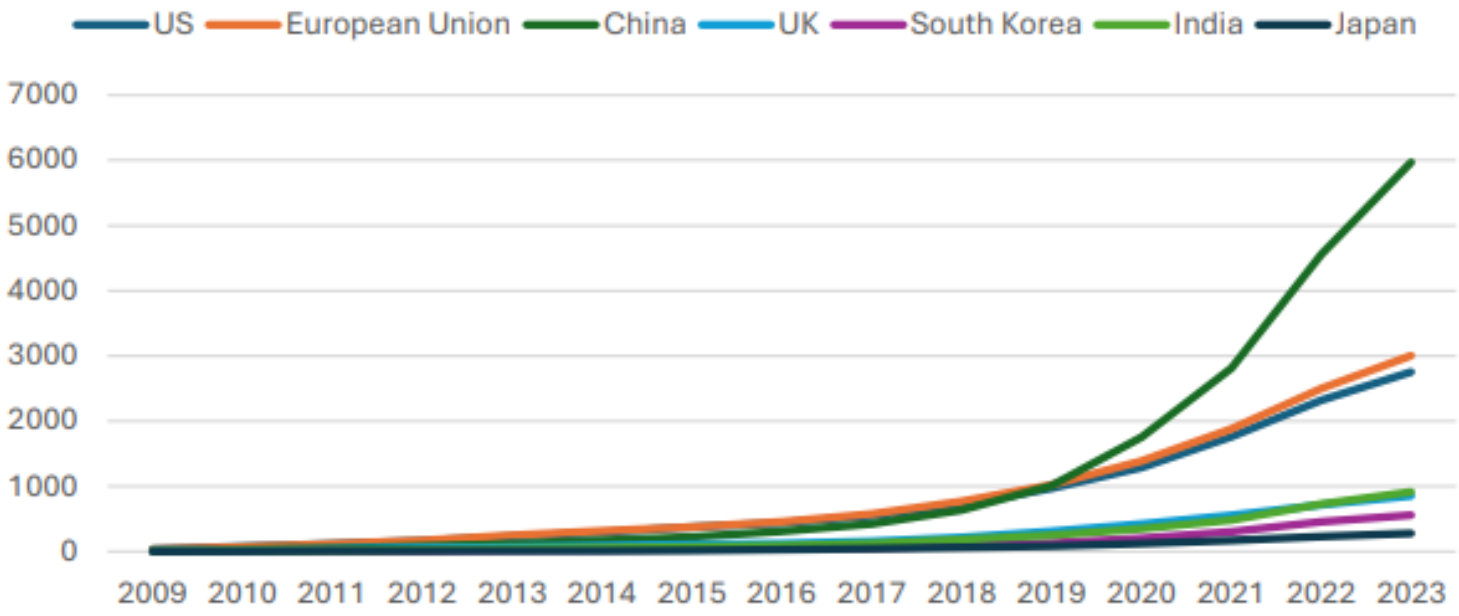
DGTES data is regularly used for reports





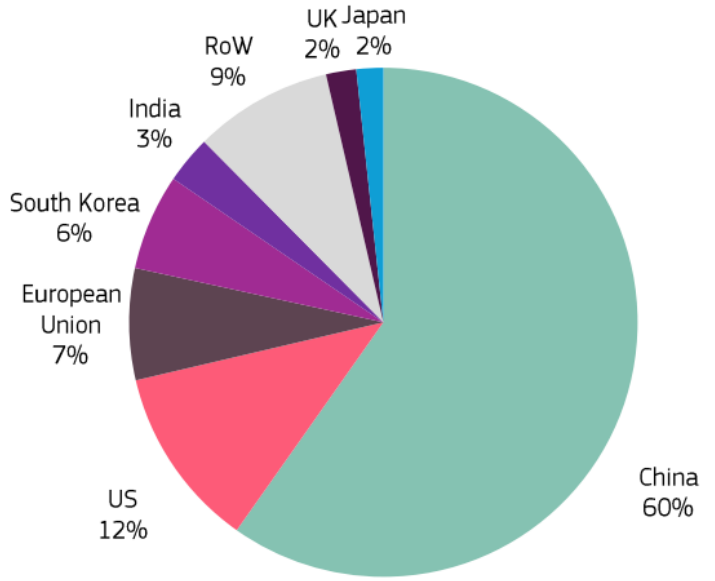
The EU is strong in GenAI R&I

Figure 2. Research publications on GenAI in selected geographies 2009-2023.



Source: JRC DGTES Dataset.

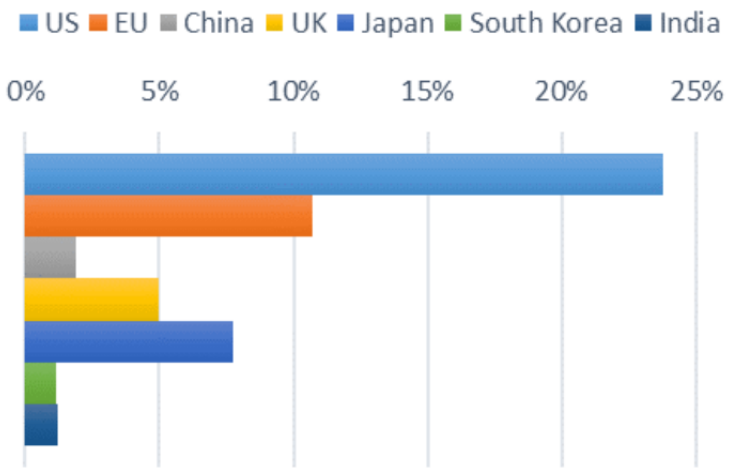
Figure 1. Global distribution of GenAI players 2009-2024



Source: JRC DGTES Dataset.

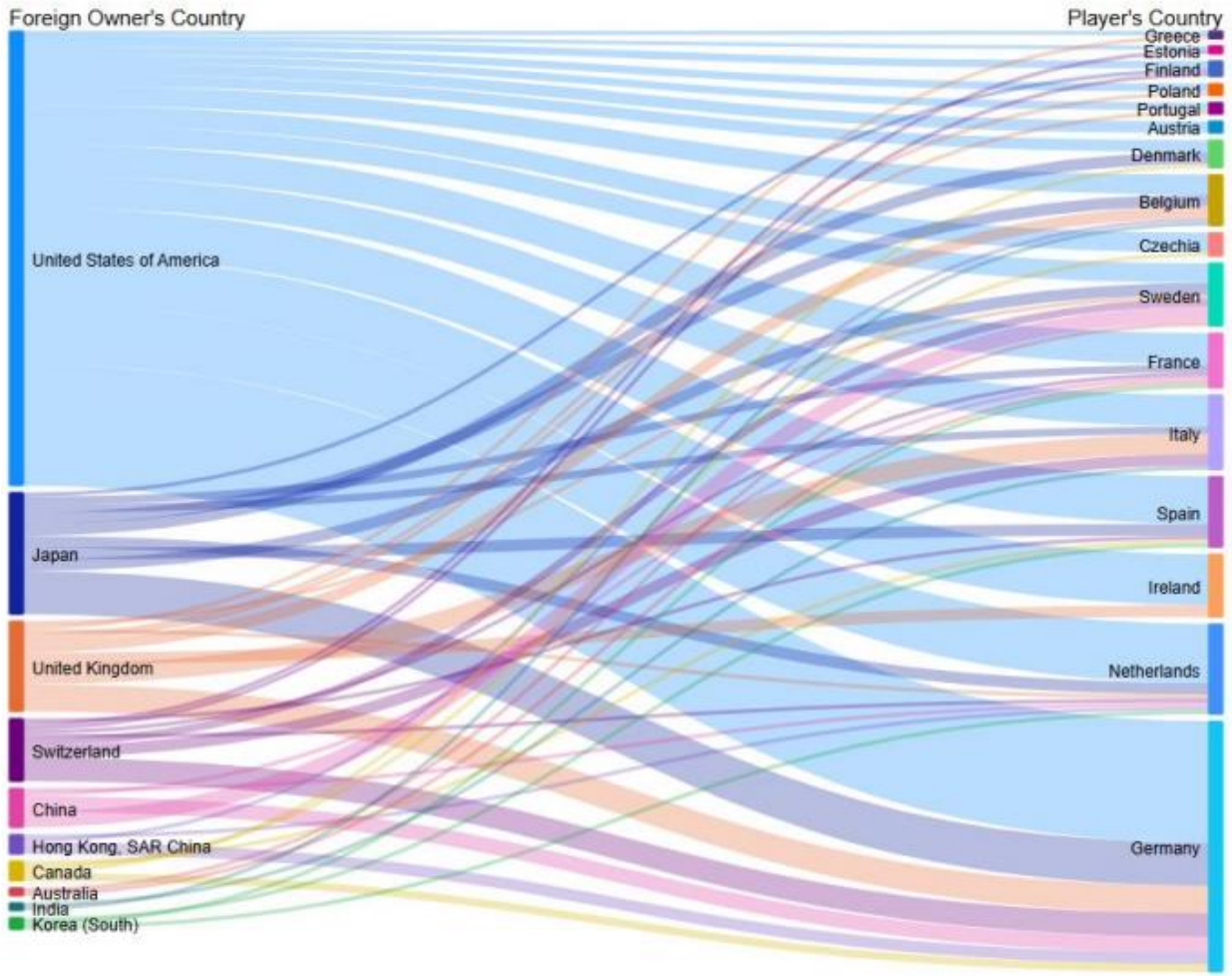
Foreign owned companies

Figure 5. Control of foreign GenAI players.



Source: JRC DGTES Dataset

Figure 6 Foreign ownership of EU players.



Source: JRC DGTES Dataset

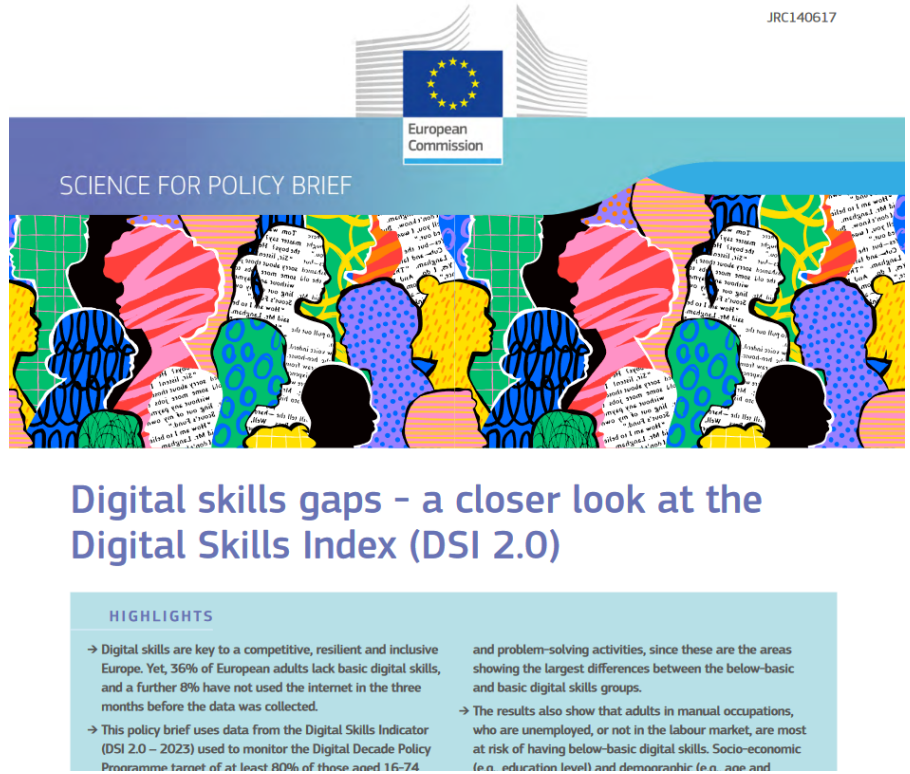
Digital Skills

Research question:

- What are the **target groups** for digital skills development?

Methodology

- Eurostat Digital Skills Index (DSI) data is used to identify the **target groups** for digital skills development
- Model showing the probabilities of socio-demographic groups of being in the below-basic digital skills group



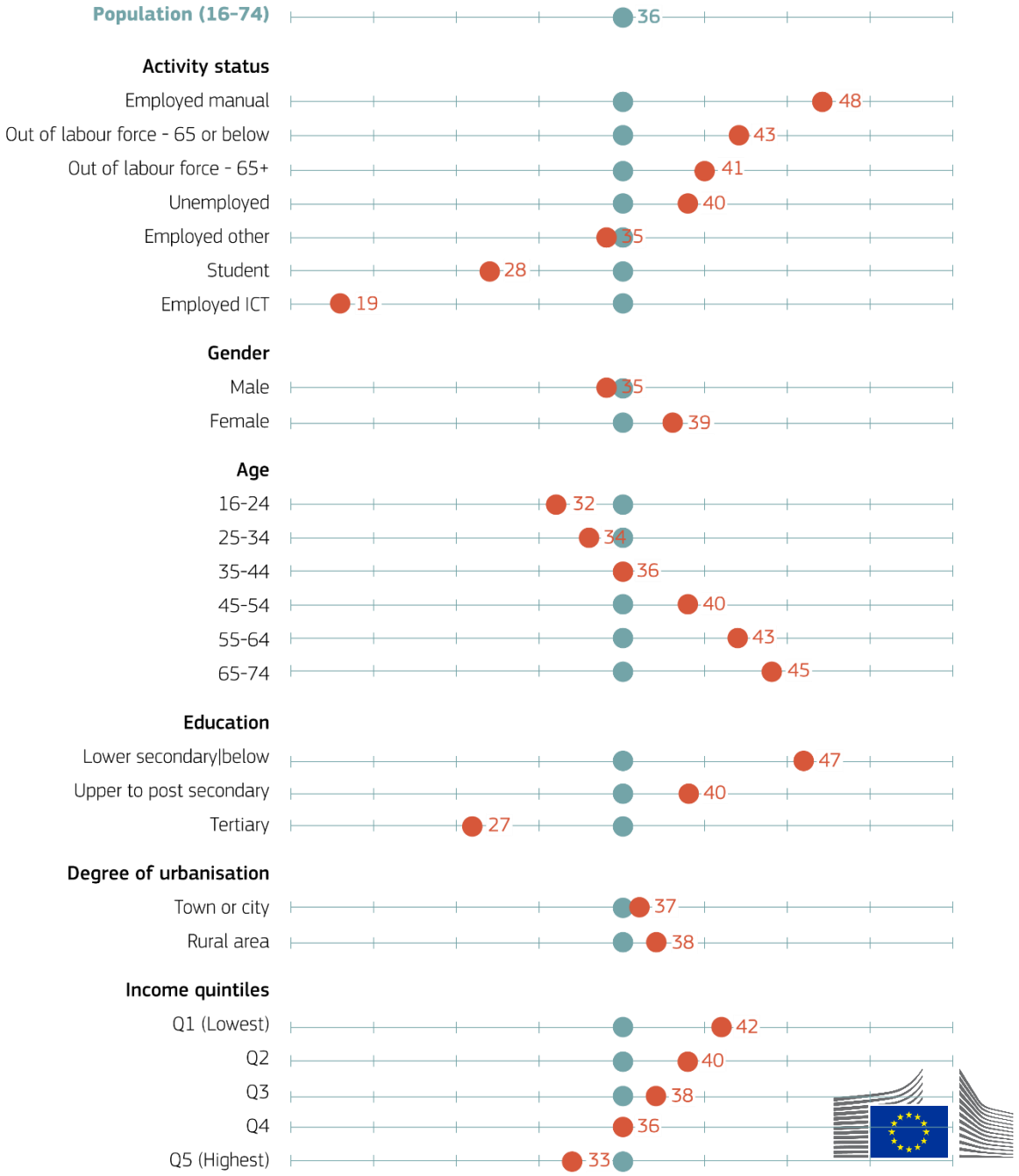
BERTONI, E., COSGROVE, J. and CACHIA, R., Digital skills gaps - a closer look at the Digital Skills Index (DSI 2.0), European Commission, Ispra, 2024, JRC140617

Target groups for digital skills development

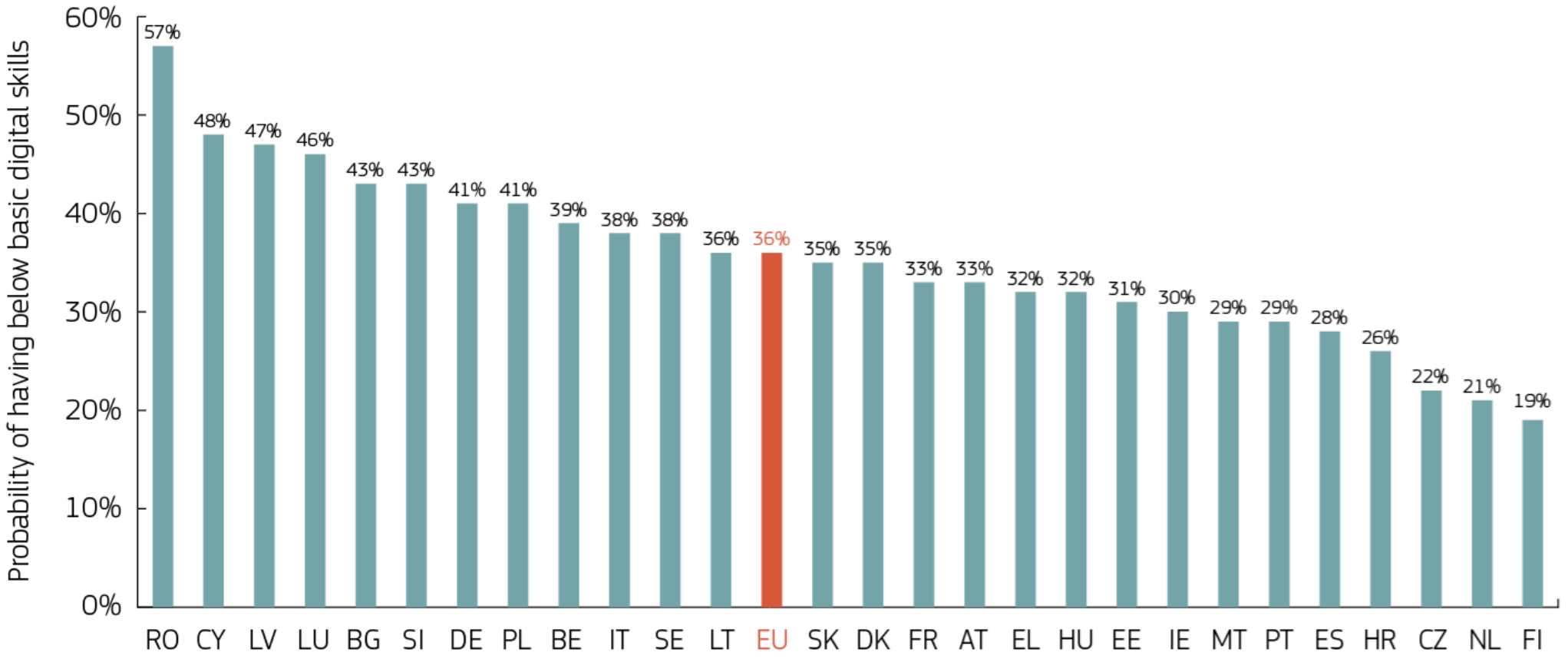
Results

Characteristics of individuals with highest probability of having below-basic digital skills:

- Individuals employed in manual occupations
- Unemployed individuals
- Individuals who are out of the labour market
- Female
- Older individuals
- Individuals with a low level of formal education
- Individuals living in rural areas
- Individuals in the lowest income quintile



High variation in the probability of having below-basic digital skills across EU countries



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Conclusions – work in progress

- Digital tech play a major role in boosting EU competitiveness
- The EU rules guarantees a trustworthy and safe digital economy
- Multidisciplinary science is at the centre of sound and effective policies

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