Impact evaluation of technological and innovation policies as a critical step to new politics

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José Molero-Zayas, Antonio García-Sánchez, Ana Fernández-Zubieta (2025). New challenges for innovation policies in an uneven European innovation panorama: lessons from evaluation experiences. ***Proceedings of the European Academy of Sciences & Arts 2025****: vol 4-52*

1: THE AIM OF THE PRESENTATION

- The presentation addresses the recent changes in science and innovation policy studies from an European perspective.
- Based on the monitoring and evaluation exercises of four different innovation policies carried out in Spain over the last years, I reflect on the challenges of European innovation policy
- In addition, I signal the importance of broadening the understanding innovation to move towards a more transformative oriented policy paradigm.

2: THE "RATIONAL" OF INNOVATION POLICIES

It is about **Economic reasons for the State investing in Technology and Innovation**

Rationales and motives for public intervention

1. **Market pull** and market failures: **policy to compensate for market fails**
2. **Science push** and linear model. **Policy to upgrade science development and** to facilitate the **transfer** of knowledge
3. **System interactions:** policy to make the system work optimally
4. **Transforming the existing difficulties** for economic and social evolution. **Policies to transform reality** and to face social challenges

3: SOME FACTS OF INNOVATION IN EUROPE

- The starting point is the need **to take distance from the idea of the "European paradox"**
- **It reflects a limited conceptualization of innovation**. Which is linked to the policy R&I framework known as "the linear model".
- The scientific leadership of Europe is usually stated considering the number of scientific publications, but **it not so much when considering other indicators, such as the quality of these publications**

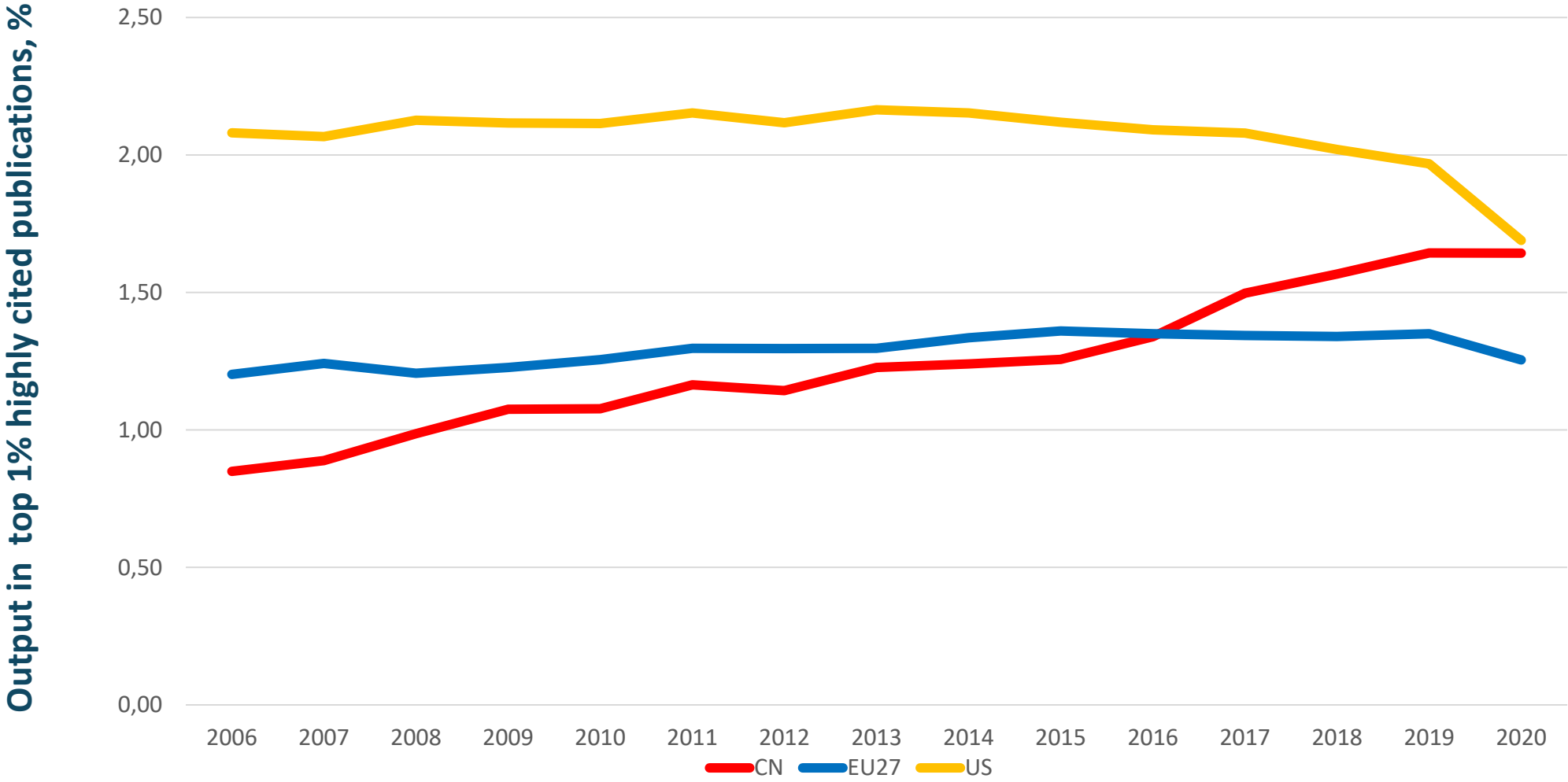
INNOVATION AND INDUSTRIAL DEVELOPMENT

- It is important to consider **the relationship of innovation with industrial development**
- There is **a general decline of Europe in productivity during the twenty-first century**. The trend of recent years has generally been a process of deindustrialization of Europe in a context where especially Asian countries, with China heading, have been increasing their weight in international industry
- The **“Draghi report” builds upon the need of the EU to increase funding to gain competitiveness**. Its consequences in competitiveness, wealth creation, quality of jobs and security are increasing in a changing geopolitical context.

THE COMPARATIVE PERFORMANCE OF EUROPE IN SCIENCE AND TECHNOLOGY

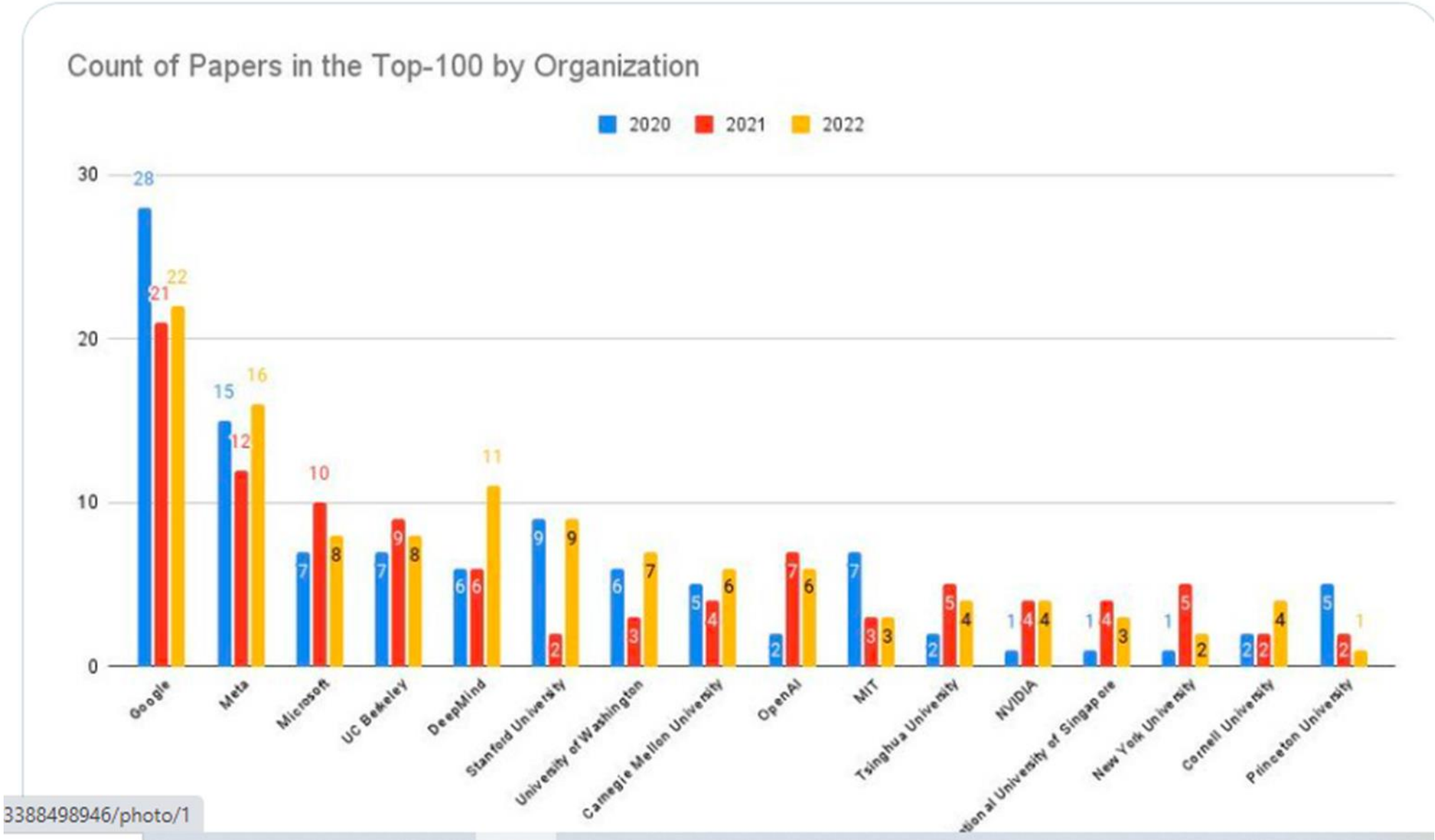
- Europe holds **a relevant position**, but it also **presents important weaknesses**
- **Europe is one of the main contributors of highly cited** scientific publications, **but its position has been stagnant over the last decades** with China overtaking the EU several years ago (fig 1)
- The knowledge production landscape is changing **with new actors (i.e., China and India) challenging the relevant position of Europe in several research fields**
- The EU shows strengths in green technologies but **important weaknesses in digital technologies (fig 2 and others)**

China has overtaken the EU in the top 1% highly cited publications and is closing the gap with the US



Source: JRC elaboration based on INCITES (Web of Science) data

Top 100 most cited papers in AI - none from Europe ... 👇👇👇



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Defence, space, robotics and transportation

Technology	Top 5 countries					Technology monopoly risk
Advanced aircraft engines (incl. hypersonics)	48.49%	11.69%	6.96%	3.93%	3.60%	7/10 4.15 **medium**
Drones, swarming and collaborative robots	36.07%	10.30%	6.13%	5.15%	4.53%	5/10 3.50 **medium**
Small satellites	24.49%	17.32%	7.82%	4.36%	4.11%	5/10 1.41 **low**
Autonomous systems operation technology	26.20%	21.01%	5.28%	5.11%	3.55%	3/10 1.25 **low**
Advanced robotics	27.89%	24.64%	5.49%	4.81%	3.79%	4/10 1.13 **low**
Space launch systems	19.67%	18.24%	9.81%	8.18%	6.53%	1/10 1.08 **low**

Australian Strategic Policy Institute (ASPI)

Artificial intelligence, computing and communications

Technology	Top 5 countries					Technology monopoly risk
Advanced radiofrequency communications (incl. 5G and 6G)	29.65%	9.50%	5.18%	4.89%	4.83%	8/10 3.12 **high**
Advanced optical communications	37.69%	12.76%	5.64%	3.88%	3.48%	8/10 2.95 **medium**
Artificial intelligence (AI) algorithms and hardware accelerators	36.62%	13.26%	4.20%	4.15%	3.48%	7/10 2.76 **medium**
Distributed ledgers	28.38%	11.32%	8.94%	5.54%	4.81%	6/10 2.51 **medium**
Advanced data analytics	31.23%	15.45%	6.02%	4.19%	3.92%	8/10 2.02 **medium**
Machine learning (incl. neural networks and deep learning)	33.20%	17.93%	4.87%	3.87%	3.32%	7/10 1.85 **low**
Protective cybersecurity technologies	23.33%	16.80%	7.67%	5.71%	5.20%	5/10 1.33 **low**
High performance computing	29.31%	25.57%	6.34%	4.68%	3.98%	3/10 1.15 **low**

INTERNAL ASYMMETRIES AND INEQUALITIES

- Europe is facing **new challenges that innovation policies need to address** considering the **differences across Europe**
- Using the **European Innovation Scoreboard**, the European Commission builds a Synthetic Index. **It allows to group the countries in four group,** as you can see in the figure
- These profound differences **introduce a big element of difficulties** on designing policies (framework programs)

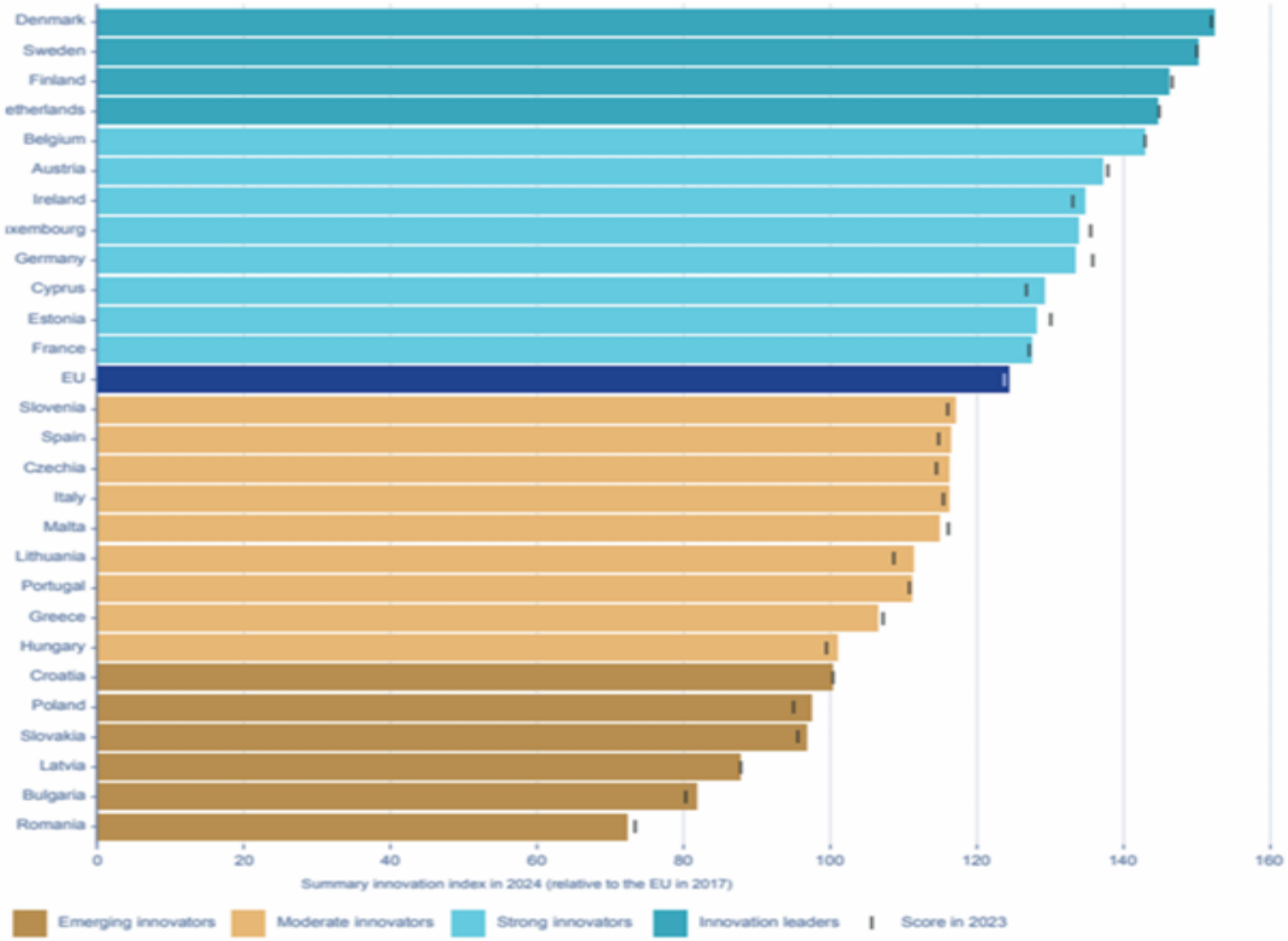


Figure 3. Innovation performance of the EU Member States, relative to the EU. Source: European Commission (2024b), performance scores are relative to that of the EU in 2017. Colored bars show the country's performance in 2024. Vertical lines show performance in 2023.

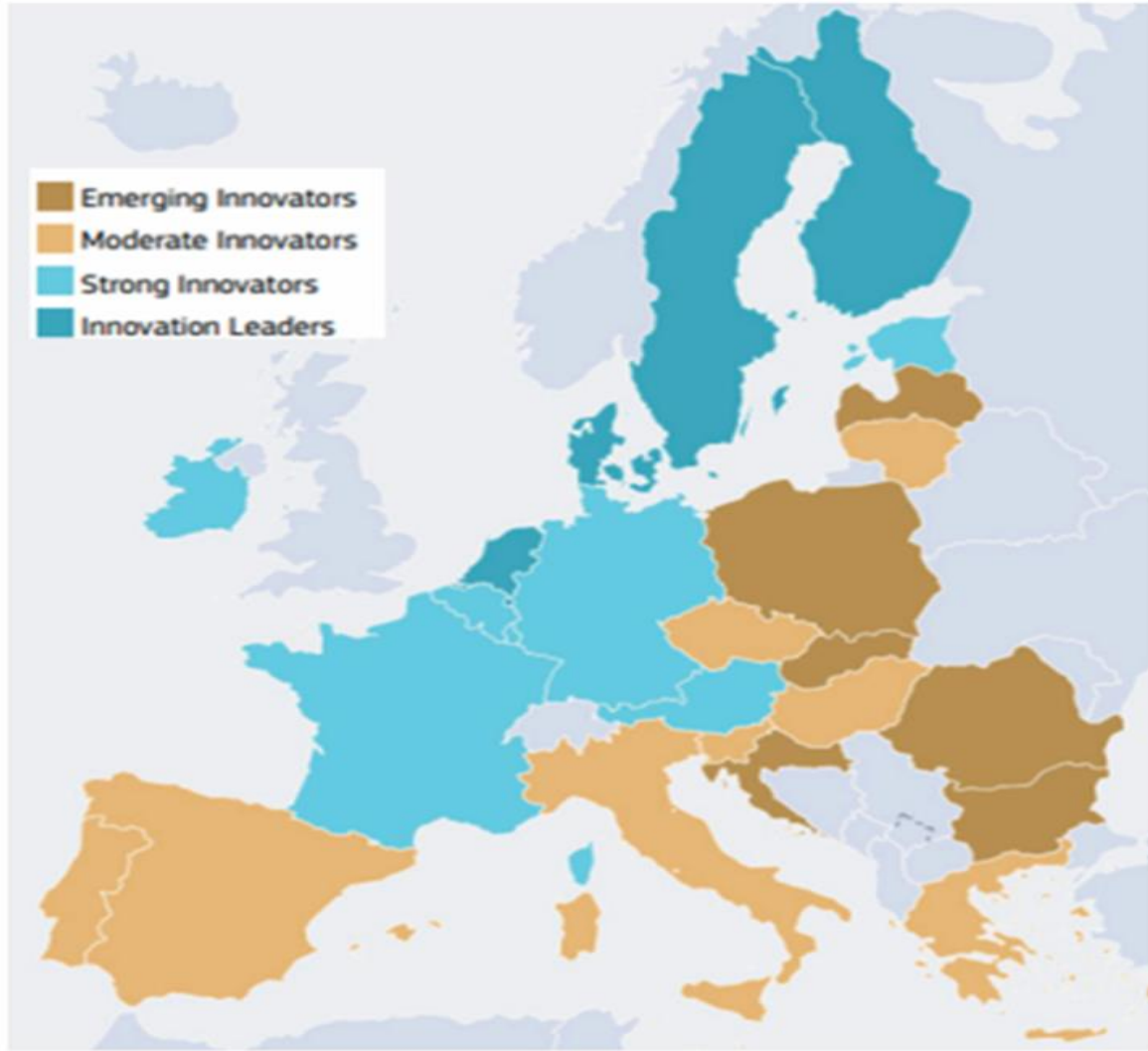
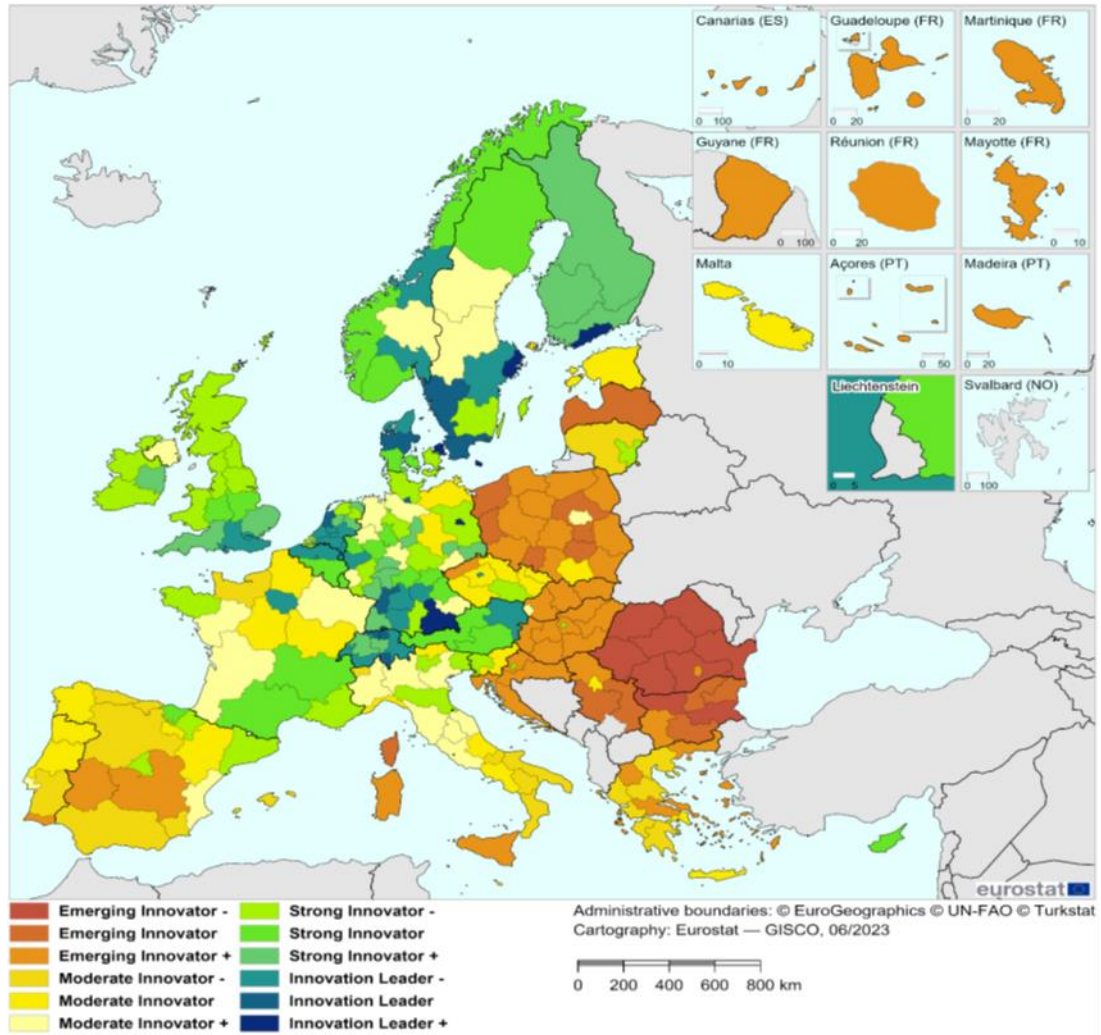


Figure 4. Innovation performance of the EU Member States. Source: European Commission (2024b).

Regional Performance Groups



Note: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the European Union.

Source: European Commission – Regional Innovation Scoreboard 2023

INNOVATION CASE STUDIES AND LESSONS

- Now the aim is at **integrating the challenges and lessons of different R&I policies frameworks in Spain**
- It includes a set of **monitoring and evaluation exercises of different innovation policies and their impact** in areas, such as, firm performance, workers' and managers' perspectives and links with regional policies.
- This benchmarking exercise **helps us to highlight the strengths and weaknesses identified in the different analysis**
- we confirm **the importance of the coordination of innovation policies with other emerging policy areas**, such as, new industrial policies and environmental ones

FOUR EVALUATION INCLUDED

1. A more traditionally oriented **impact evaluation exercise focused on the impact of the main programme aid granted by the Spanish innovation agency** (Centre for the Development of Industrial Technology - CDTI);
2. **Survey-based research on innovation from the workers perspective** carried out for the main trade union in Spain (Workers' Commissions- CC.OO. project);
3. **Survey-based research on innovation from the strategic management perspective** (Association for the Progress of Management -APD);
4. A set of **monitoring exercises on a placed-based innovation policy** (S3).

SOME RELEVANT RESULTS (I)

- The impact evaluation exercises show the **effectiveness of public R&D aid programs in terms of additionality**
- Nevertheless, positive results are **much more evident in terms of inputs (dedicated R&D resources) than in the outputs** (technological results obtained).
- Considering the R&D output, public support **does not always favour significantly better performance of beneficiary firms** compared to non-beneficiary ones.
- Very **few results as far as behavioural additionality** is concerned.

SOME RELEVANT RESULTS (II)

- **Other factors influence the innovation performance of firms but are not usually considered in an impact evaluation approach**. For example, the **institutional and cultural factors (how innovation is perceived and how innovation practices take place**)
- Survey based exercises on the workers and managers views on innovation ratify **the need of broadened the scope of R&I policies to align R&I programs with, for example, the quantity and quality of employment created**
- These studies show the need **to foster linkages between innovation performance and innovation culture and work development** and the importance of pursuing innovation towards sustainability and structural transformations
- They also show **the importance of education and the promotion of innovative culture**
- All that is related with what today we call **transformative policies**

CONCLUDING REMARKS

- The increasing international competition and inequality of R&I European systems require **more ambitious and transformative R&I policies**
- It is important **to align traditional innovation purposes with other social needs as employment level and quality, sustainability and the promotion of innovative culture, transparency, tolerance and eliminate hampering elements** (uncertainty, resistance to change or excessive risk aversion, for instance)

TWO BASIC CONDITIONS MUST BE MET

- On the one hand a **new design of the concrete actions, much more transversal and oriented to the resolution of critical problems**
- On the other hand, it requires **a practice of evaluation of these policies that include both the traditional concrete impact measurements and other forms of ex ante evaluation and open monitoring exercises** that allow us to see the pros and cons of the proposed actions and the capacities of the administration to carry them out

Thank you very much

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