Monitoring Advanced Technologies: European countries in the global competitive landscape

ATI Policy seminar

31st March 2021

#ATI

ati.ec.europa.eu

Housekeeping rules

All participants except speakers and moderators will be muted by default

If you are not a speaker, please turn off your video

Feel free to post your questions in the WebEx chat

If you would like to speak, please raise your hand and wait for the moderator to give you the floor

If you have any technical issue, please contact the WebEx host or co-hosts

European Commission

Agenda

Time	Session
15:00	**Welcome and introduction** *Evangelos Meles,* European Commission DG GROW
15:10	**Uptake of Advanced Technologies in Europe: insights from the ATI project** *Kincsö Izsak*, Principal Researcher at Technopolis Group, ATI Consortium *Giorgio Micheletti*, Consulting Director at IDC, ATI Consortium
15:30	**International Outlook (USA and China)** *Prof. Pierre Alexandre Balland,* Utrecht University & Artificial and Natural Intelligence Toulouse Institute - focus on USA *Dr. habil. Henning Kroll,* Fraunhofer ISI - focus on China
16:10	**Roundtable discussion** *Leena Sarvaranta,* Director European Affairs, VTT Finland *Prof. Pierre Alexandre Balland,* Utrecht University *Dr. habil. Henning Kroll,* Fraunhofer ISI
17:00	**Closing** *Evangelos Meles,* European Commission DG GROW

Welcome and introduction

Evangelos Meles, European Commission DG GROW

European Commission

EU industry is strong, but also faces major challenges…

sustainability

But also… COVID-19 pandemic

new business models

global shifts

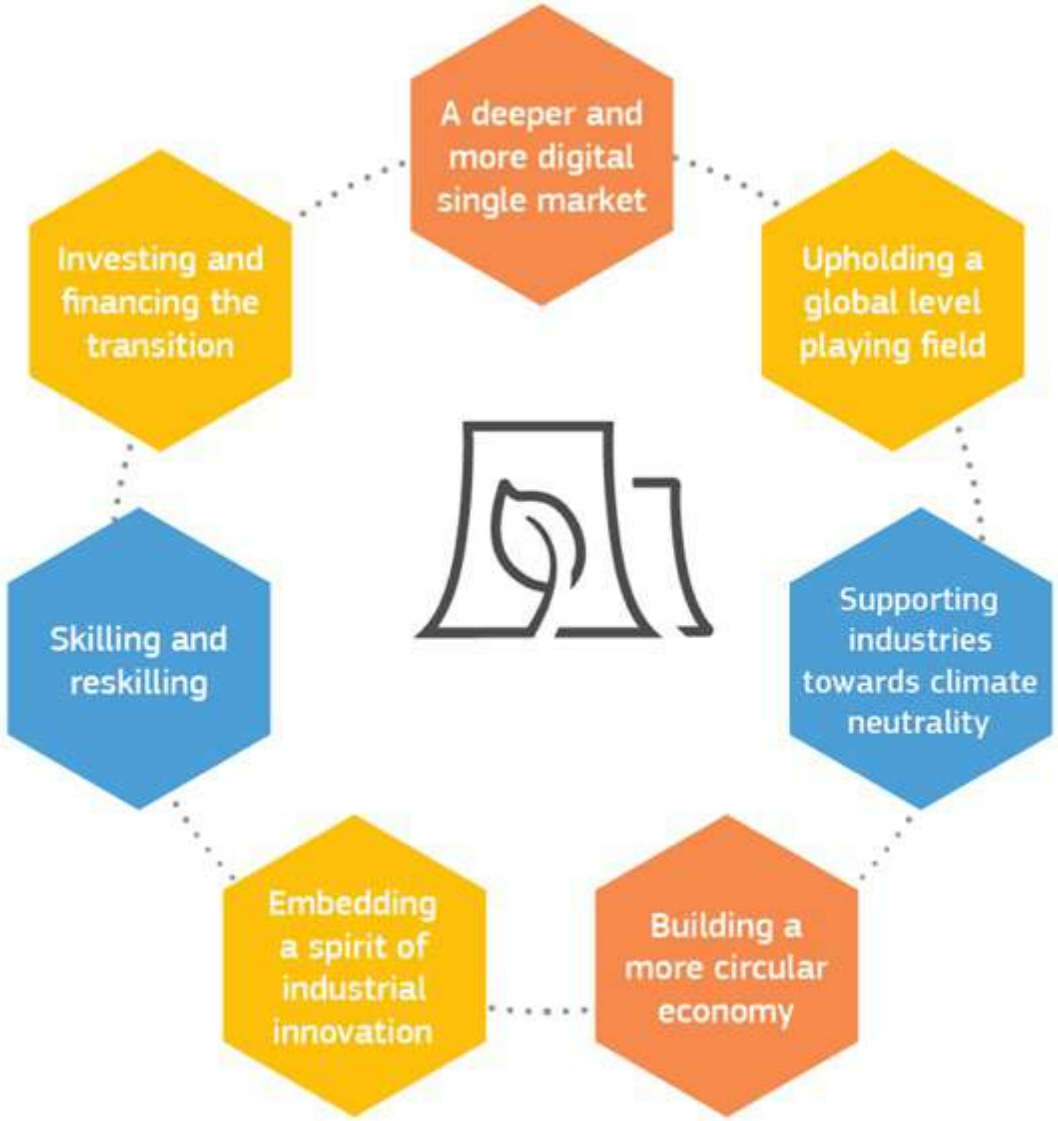
digitalisation

clean & affordable energy

Key drivers of industrial transformation

Achieving industrial transformation

Fundamental factors in making Europe's industrial twin transformation happen



Advanced Technologies for Industry monitor

The 4th industrial revolution is driven by digital and advanced technological developments that will radically transform industrial value chains, business models, production facilities and the entire society.

- The **Advanced Technologies for Industry** analyses and systematically monitors the state of uptake of advanced technologies by EU industry.

Advanced Technologies for Industry:

- Data dashboard
- Mapping of technology centres
- ATI Technology watch
- ATI Sectoral reports
- EU and international reports
- Policy briefs
- ATI Product watch

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16 advanced technologies

- Advanced Manufacturing Technology
- Advanced Materials
- Artificial Intelligence
- Augmented and Virtual Reality
- Big Data
- Blockchain
- Cloud computing
- Connectivity
- Industrial Biotechnology
- Internet of Things
- Micro- and Nanoelectronics
- Mobility
- Nanotechnology
- Photonics
- Robotics
- Security

Analytical reports

- Analytical reports such as on
  - **Technological trends**
  - **Sectoral insights**
  - **Products**
- Analyses of **policy measures and policy tools** related to the uptake of advanced technologies
- Analysis of technological trends in **competing economies** such as in the US and China

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Thank you

Slides 2-4: Adapted based on presentation from S.Szekacs; **slides 5-6:** ATI project

Slide 2 Photo1 by Daniele Levis Pelusi **on** Unsplash, **Photo 2 by** Rae Tian **on** Unsplash, **Photo3 by** Etienne Girardet **on** Unsplash, **Photo 4 by** Boudewijn Huysmans **on** Unsplash, **Photo 5 by** Andy Holmes **on** Unsplash, **Photo 6 by** Anton Darius | @theSollers **on** Unsplash

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Generation and Uptake of Advanced Technologies in Europe: insights from the ATI project

Kincsö Izsak, Principal Researcher at Technopolis Group, ATI Consortium

Giorgio Micheletti, Consulting Director at IDC, ATI Consortium

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Production of advanced technologies in Europe

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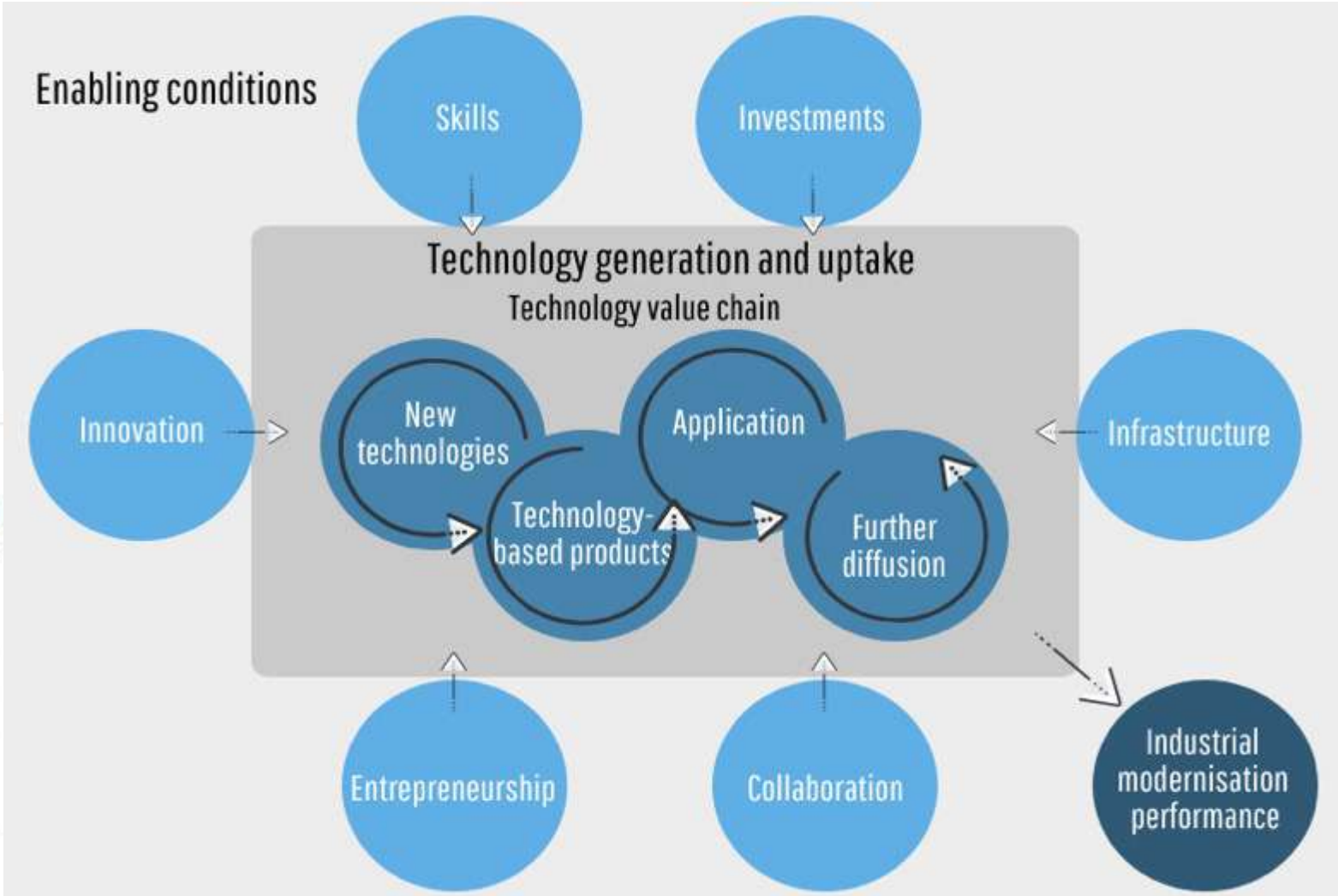
ATI Data Collection

https://ati.ec.europa.eu/data-dashboard/country

Statistical data on the **production and use of advanced technologies** including enabling conditions such as skills, investment or entrepreneurship



ATI: general findings and other reports

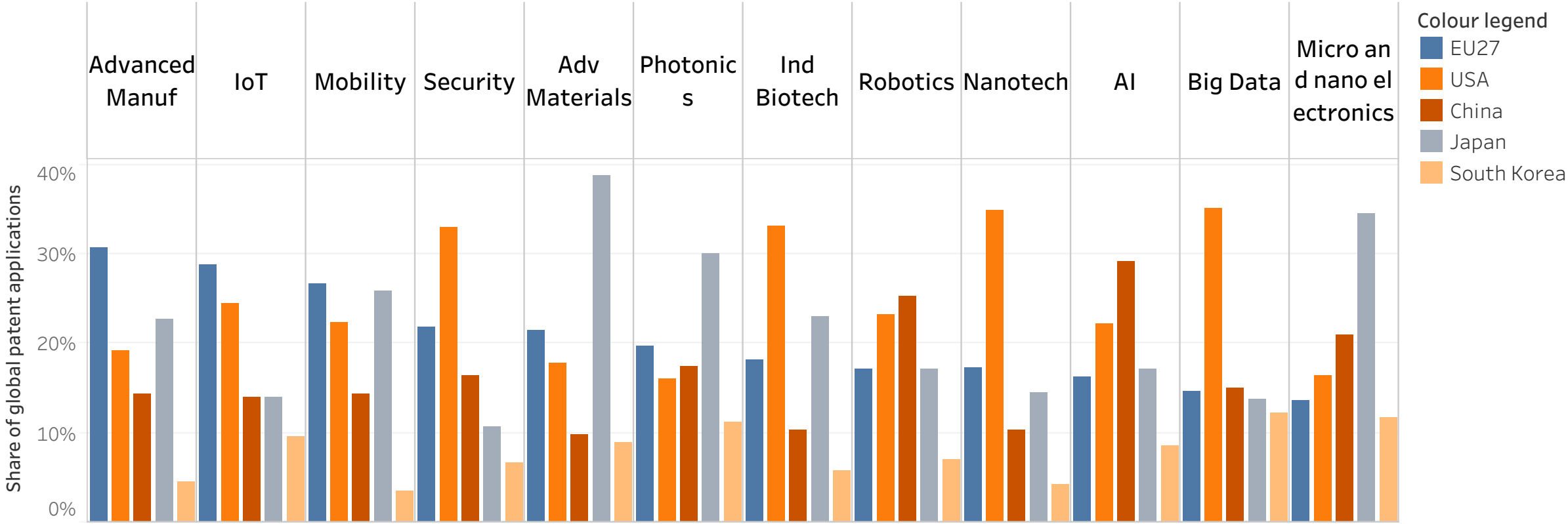
Objective: assess trends in the generation and uptake of advanced technologies, the related entrepreneurial activities and venture capital investment, the supply of and demand for skills and also assessed the digital opportunities for Europe in a global context.

Key content:

- **Technology generation trends**
- **Technology adoption**
- **Venture capital investment into advanced technologies**
- **Demand for and supply of skills for technological transformation based on LinkedIn**
- **Industrial Digital Maturity Index**

Production of advanced technologies

Share of global patent applications, 2018 (latest available data)



Source: Fraunhofer ISI calculations

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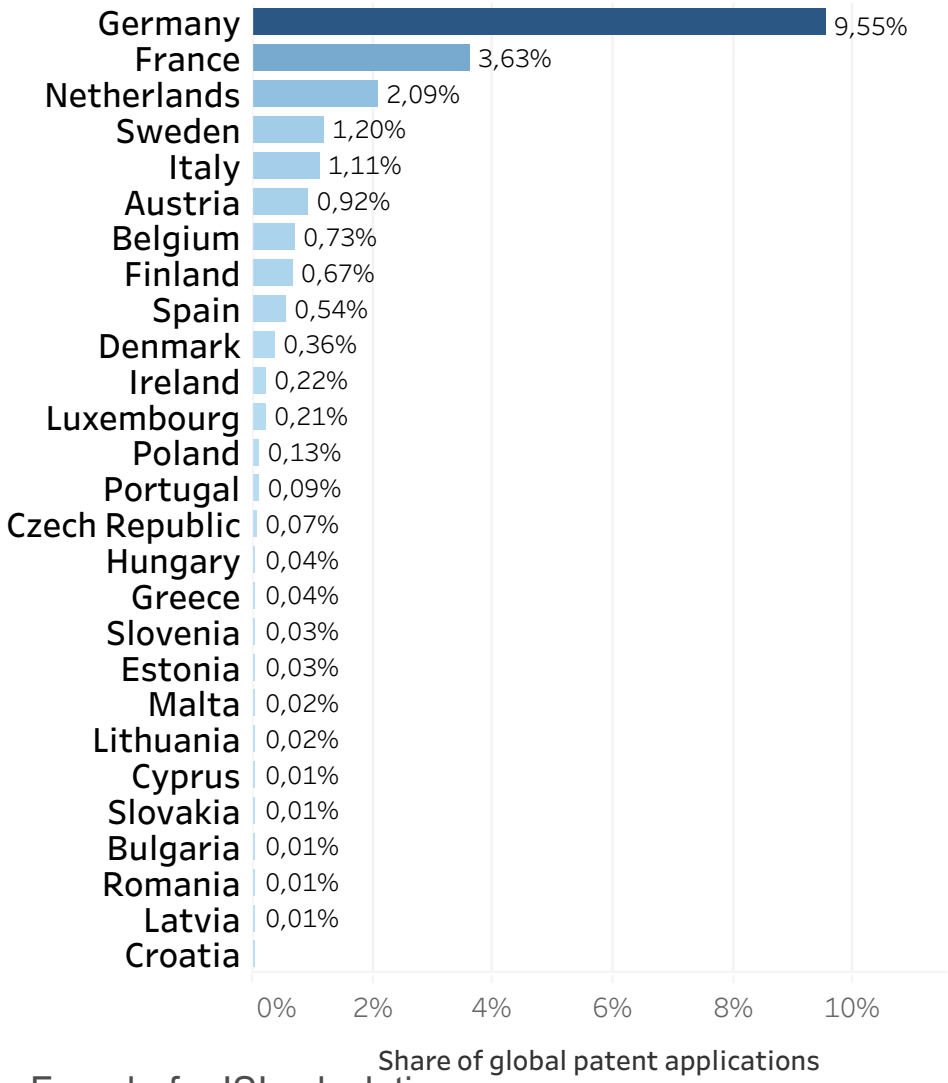
Share of global patent applications across the EU in all advanced technologies



Source: Fraunhofer ISI calculations

Germany dominates the picture in all AT but most specifically in Nanotechnology where it reaches a mere 13%.

France follows second with shares between 10% in Robotics and 28% Nanotechnology.

The Netherlands is specialised in Photonics, Artificial Intelligence, Big Data, and Internet of Things.

Denmark focuses on Industrial Biotechnology (5%) and Robotics (4%).

Ireland contributes 4% in the field of Big Data.

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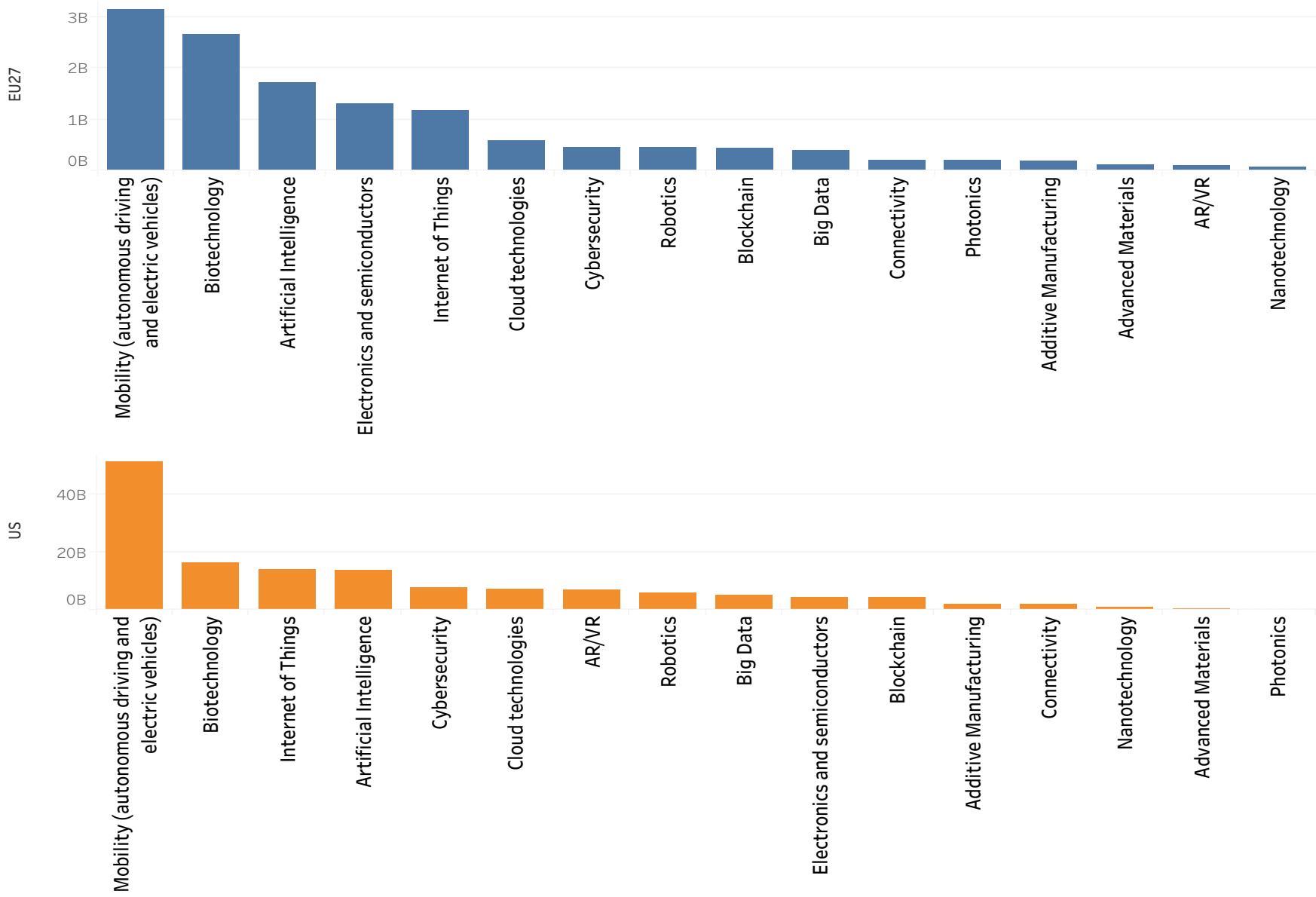
Venture capital and private equity investment in firms with advanced technologies in 2020



Source: Technopolis Group calculations, based on Crunchbase and Dealroom, 2021

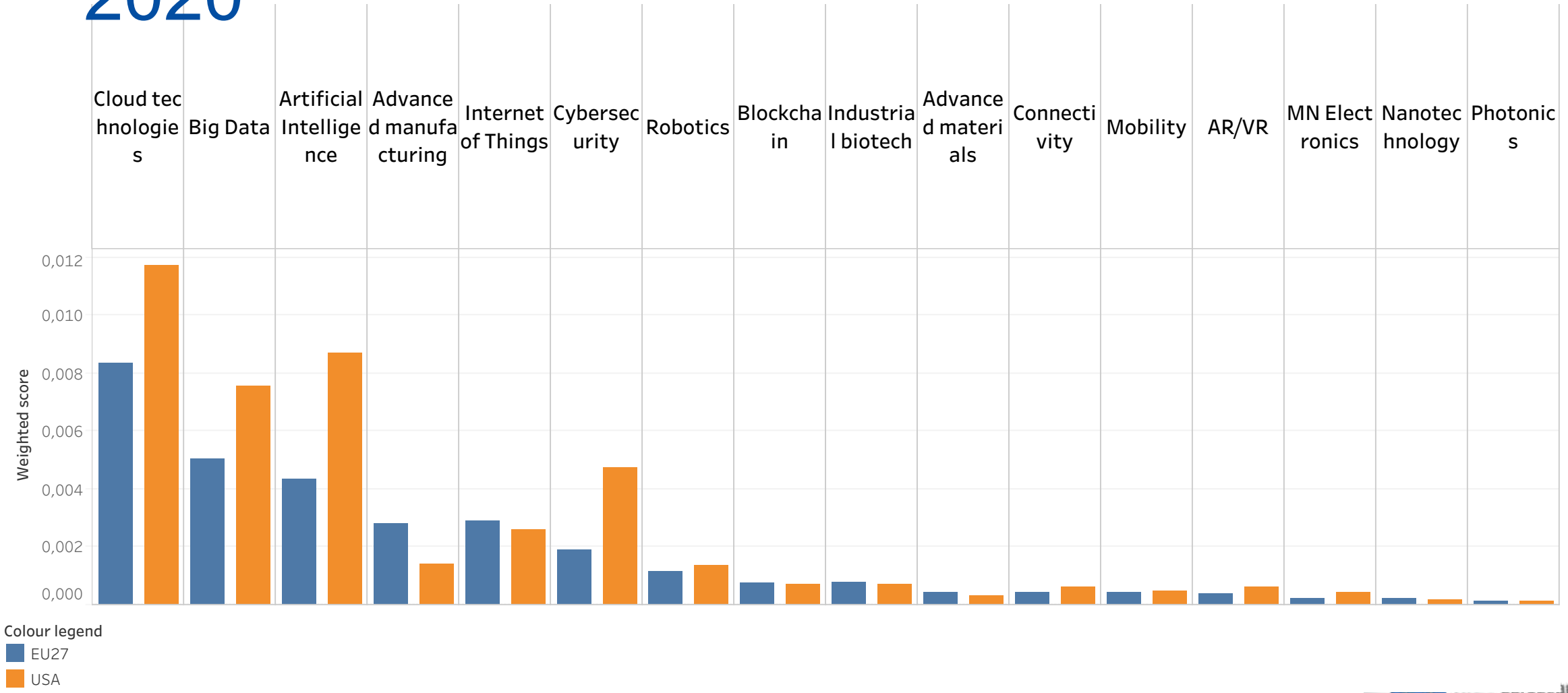
Private equity and VC investment across the EU in 2020

Private equity and VC investment has been concentrated in EU countries such as **Germany and France** but has been also high in the ranking in

- Sweden
- Netherlands
- Ireland
- Italy
- Finland
- Spain
- Belgium
- Denmark

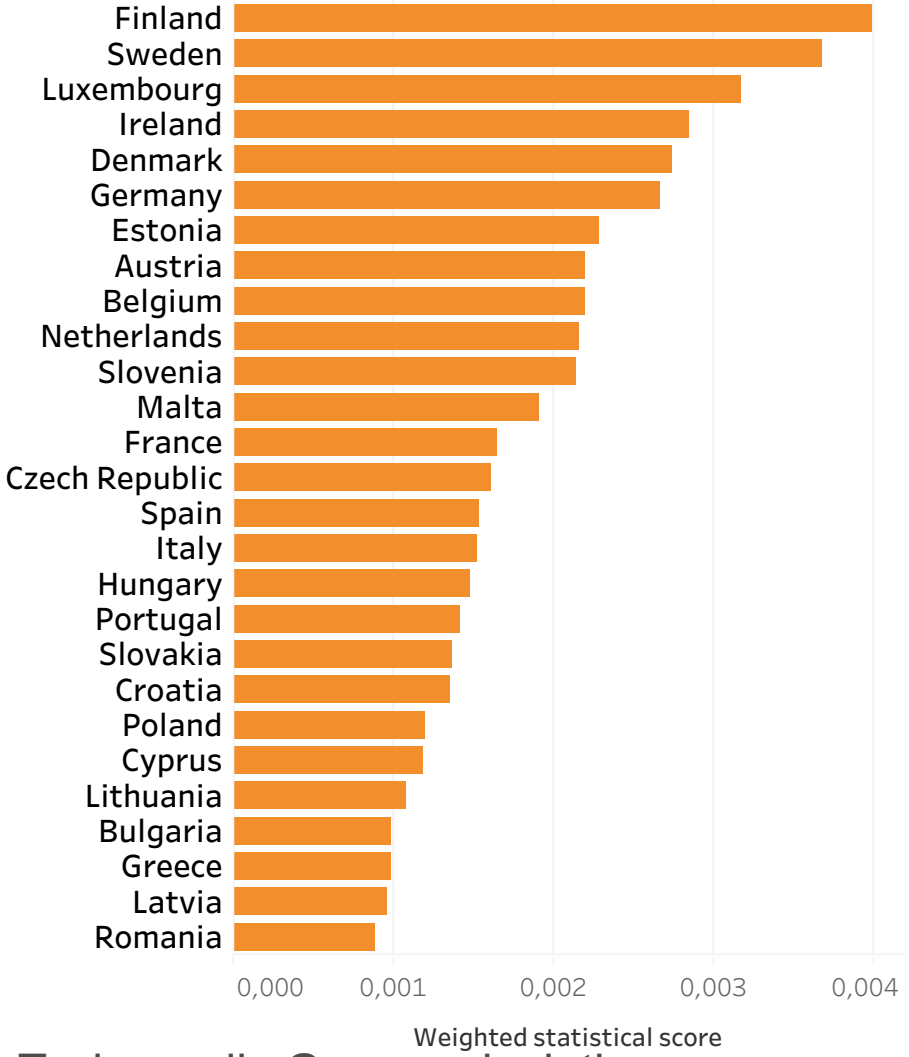
Source: Technopolis Group calculations, based on Crunchbase and Dealroom

Availability of advanced technology skilled professionals for industry (based on LinkedIn), 2020



Source: Technopolis Group calculations, based on LinkedIn, 2020

Availability of advanced technology skilled professionals (based on LinkedIn), 2020



- EU Member States that had the highest number of advanced technology skilled professionals employed in industry weighted against a list of representativeness criteriaand size of the economy include: **Finland, Sweden, Luxembourg, Ireland and Denmark**

Source: Technopolis Group calculations

Uptake of advanced technologies in Europe

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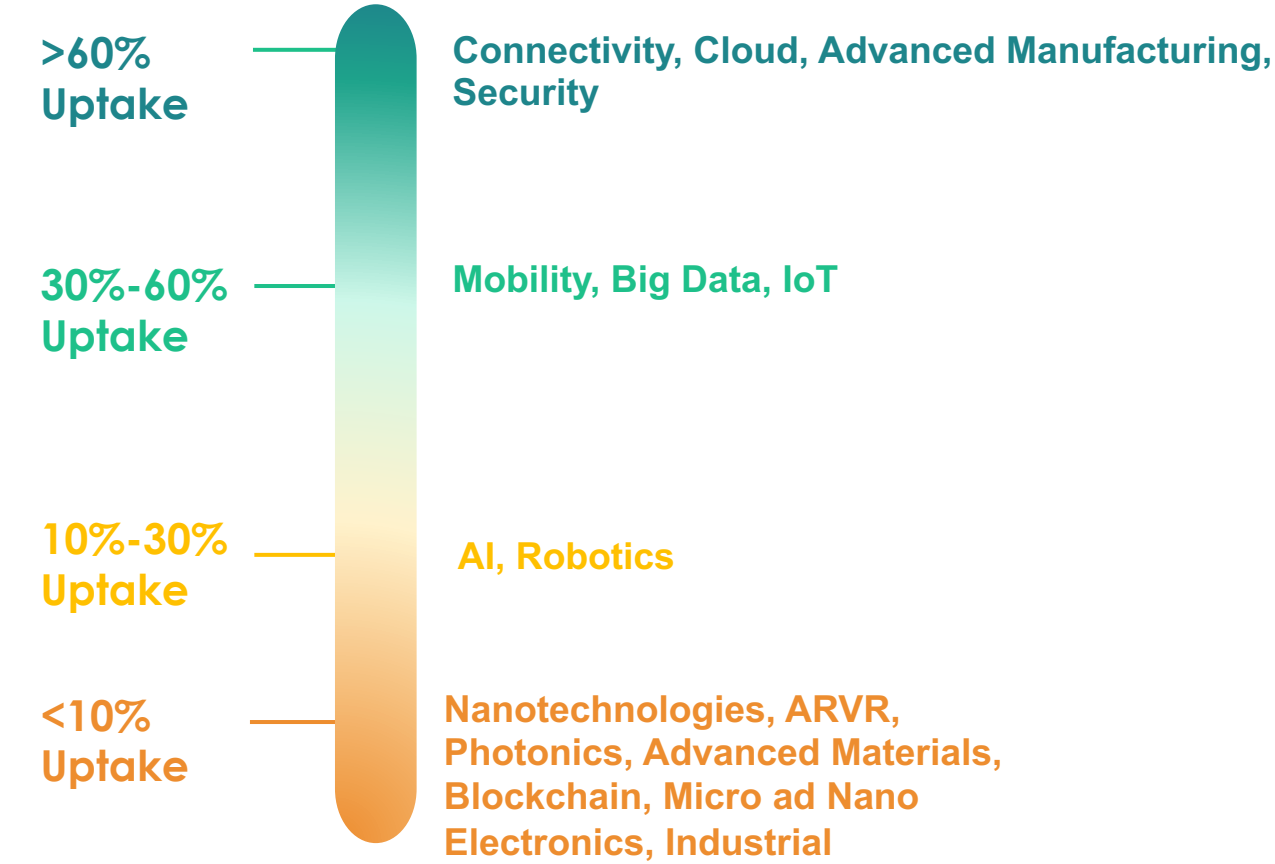
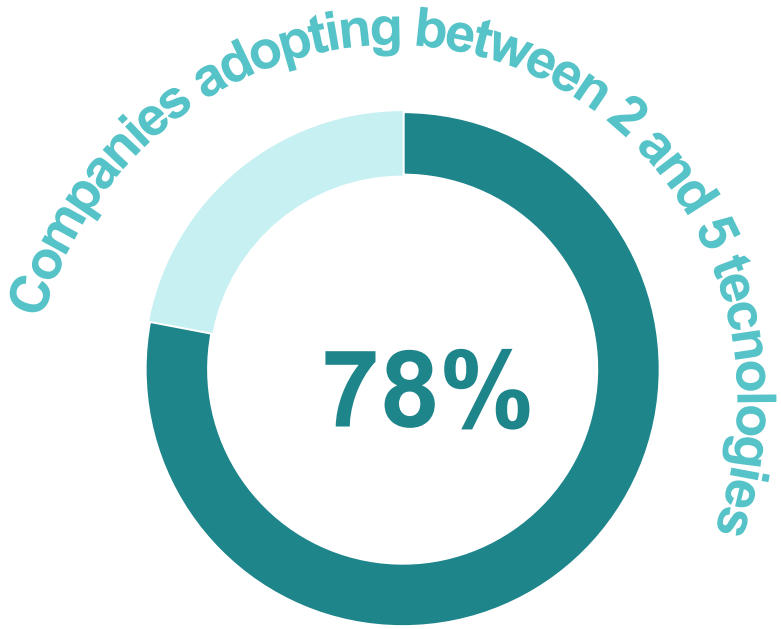
Advanced Technologies Uptake - An Overview

Advanced Technologies Current Uptake





The technologies that are more likely to be implemented together are **Cloud** and **Security** solutions representing the technology backbone often in synergy with **IoT, AI** and **Big Data**

Source: Advanced Technologies for Industry Survey, November 2020 (N=1500)

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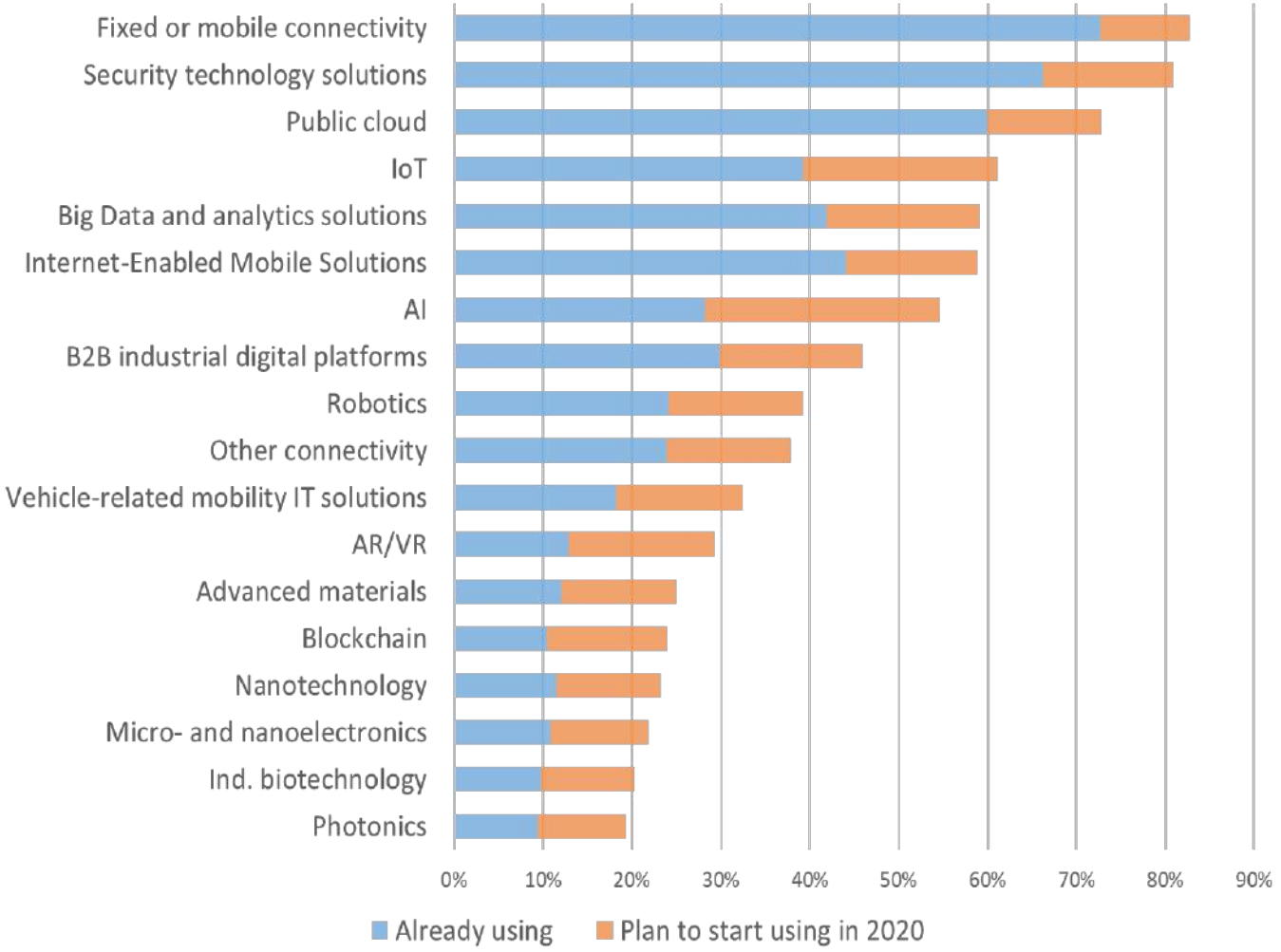
Advanced Technologies Current Uptake in the EU



Source: Advanced Technologies for Industry Survey, *November 2020, % of respondents*

- **Fixed/mobile connectivity** and **public cloud**
  -> foundation of technological innovation.

- The high level of adoption of **Security** solutions -> crucial role played in daily activities

- **Artificial Intelligence** and **IoT** -> increased investments and taking off the ground

- Other technologies, such as **Robotics, B2B industrial platforms, and AR/VR,** are quickly taking ground, thanks to the increasing number of use cases and business scenarios where they can be applied.

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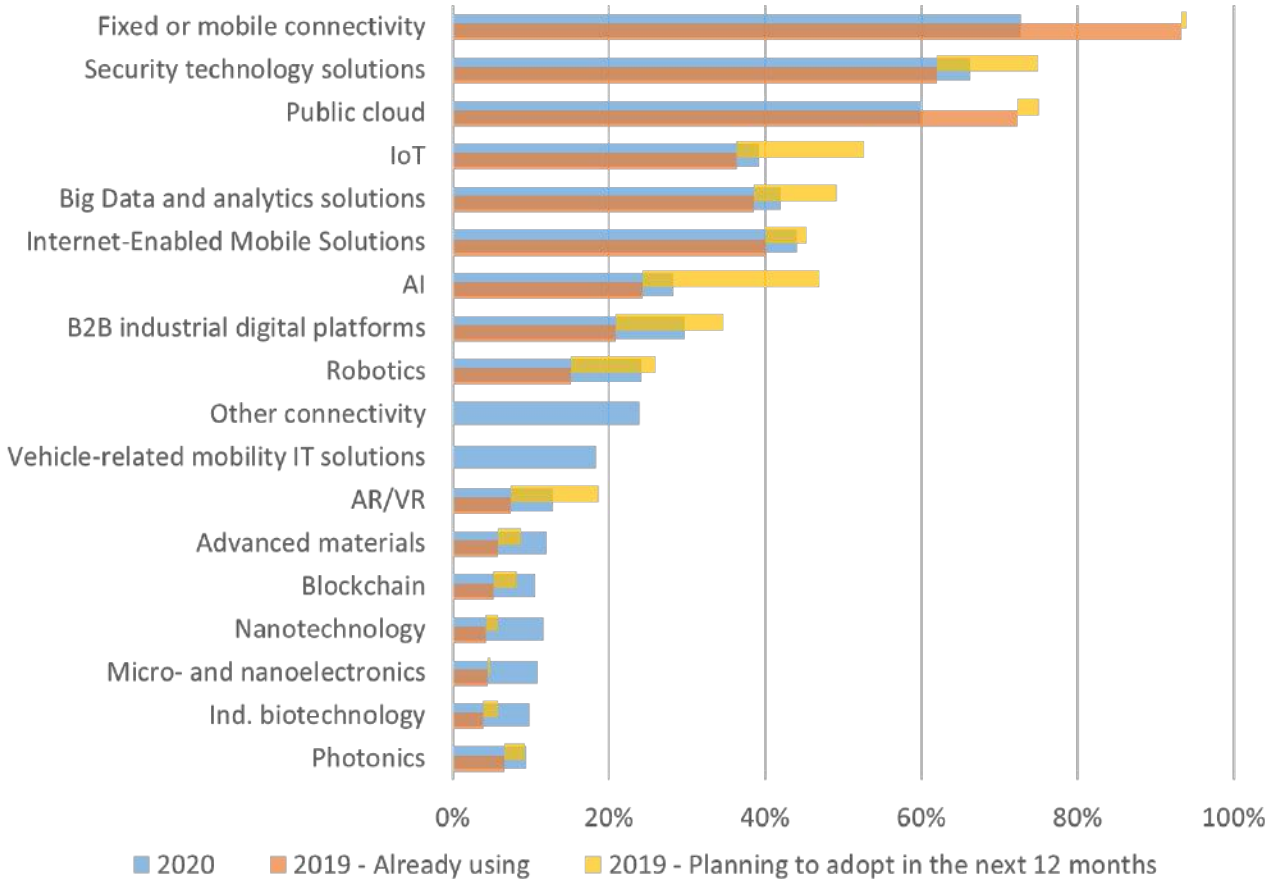
Advanced Technologies adoption across European Organisations



- **All advanced technologies show a higher level of adoption** compared to previous survey
- **Fixed and mobile connectivity**, **cloud, and Big data solutions** are at the core of the new normal imperatives such as process automation, agile customer interaction, and remote working
- **Industrial Digital Platforms** show a significant upsurge compared to last year, due to the increased need for collaboration between colleagues, peers, and employees

Source: Advanced Technologies for Industry Survey, *November 2020, % of respondents*

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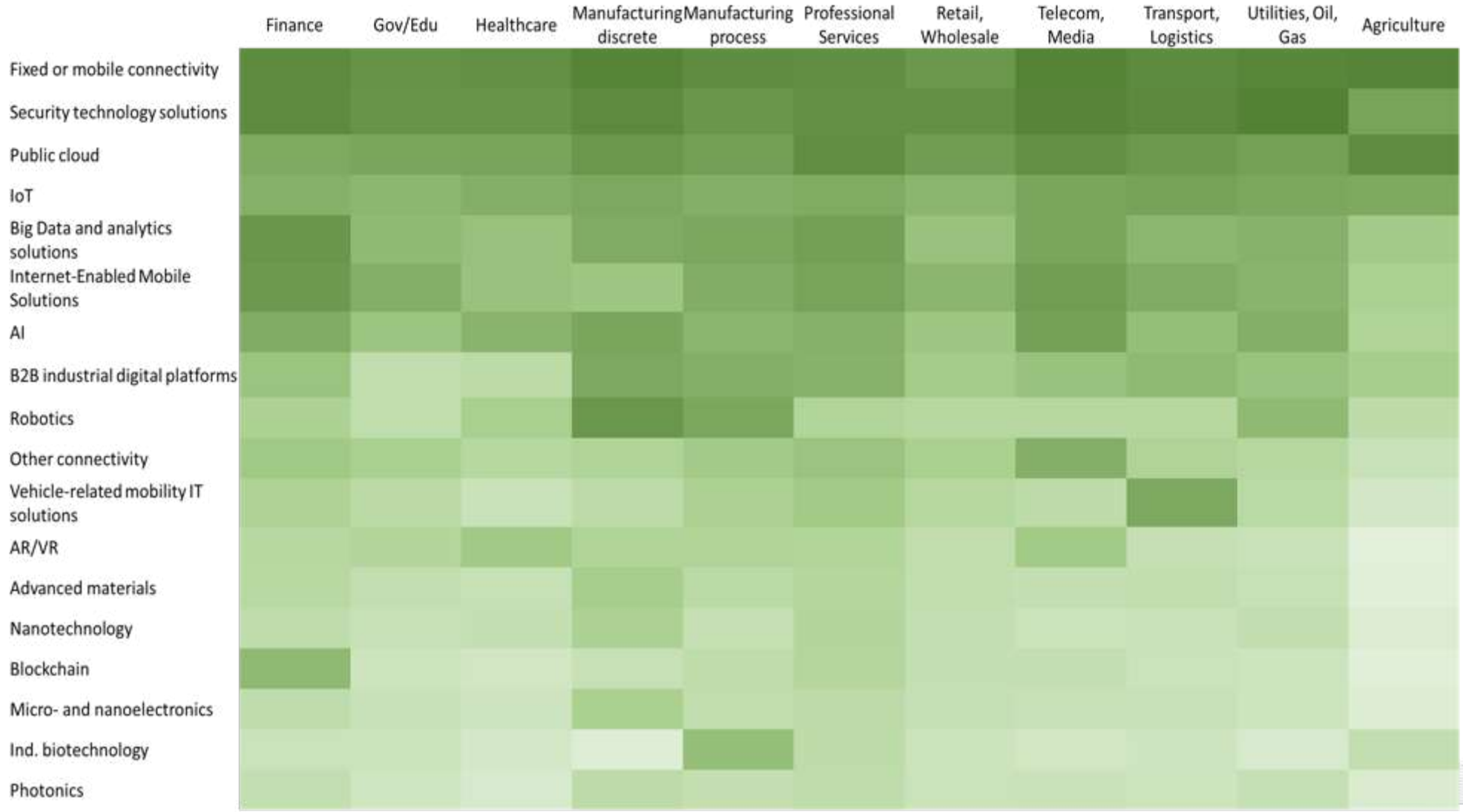
Advanced Technologies Uptake by European Industry



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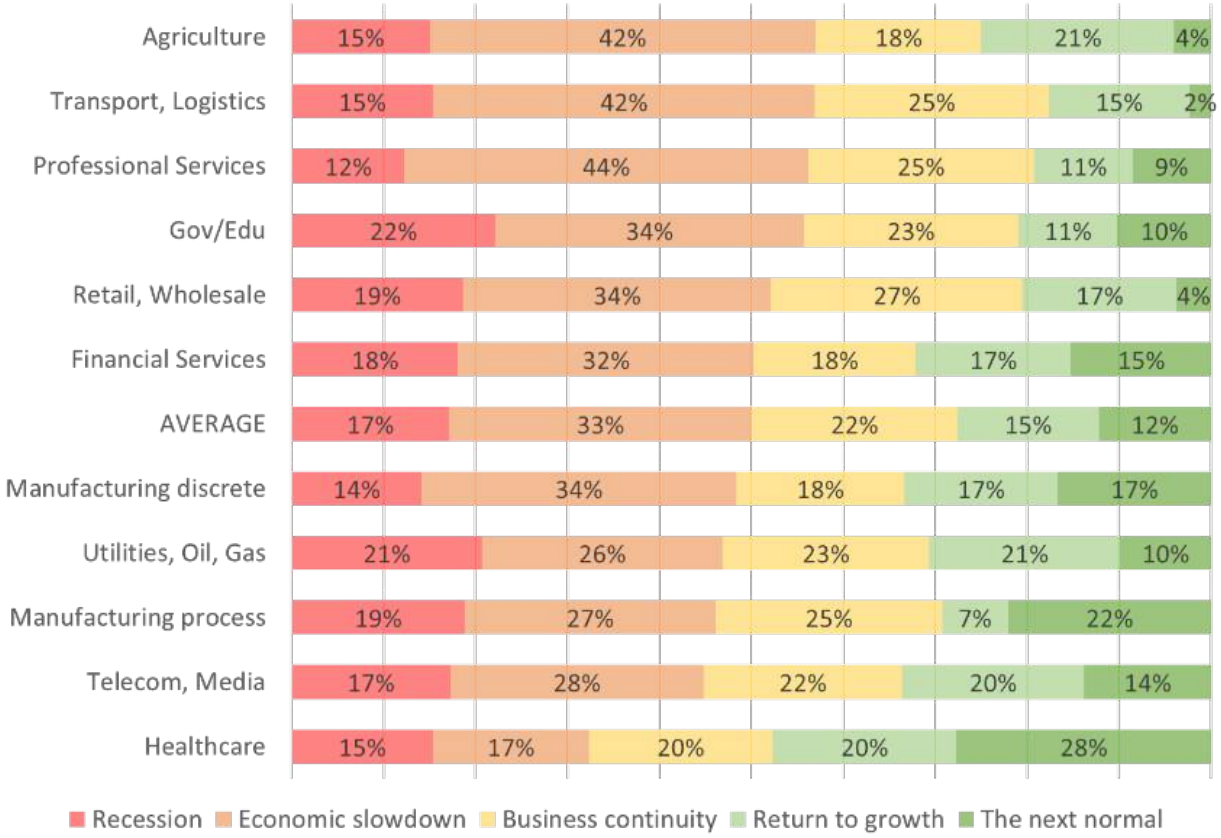
Source: Advanced Technologies for Industry Survey, *November 2020, % of respondents*

Where are European Industries along the COVID-19 return to growth curve?



Source: Advanced Technologies for Industry Survey, *November 2020, % of respondents*

- Although one of the most hit sectors, **Manufacturing** was able to preserve the resiliency of the supply chain and its production
- Sectors such as **Healthcare** are already setting back to the path of growth and are getting ready for the new normal
- **Telecom & Media** is another sector who is showing an above-average percentage of firms who were able to keep their business running or are back to growth and stabilizing towards the new normal

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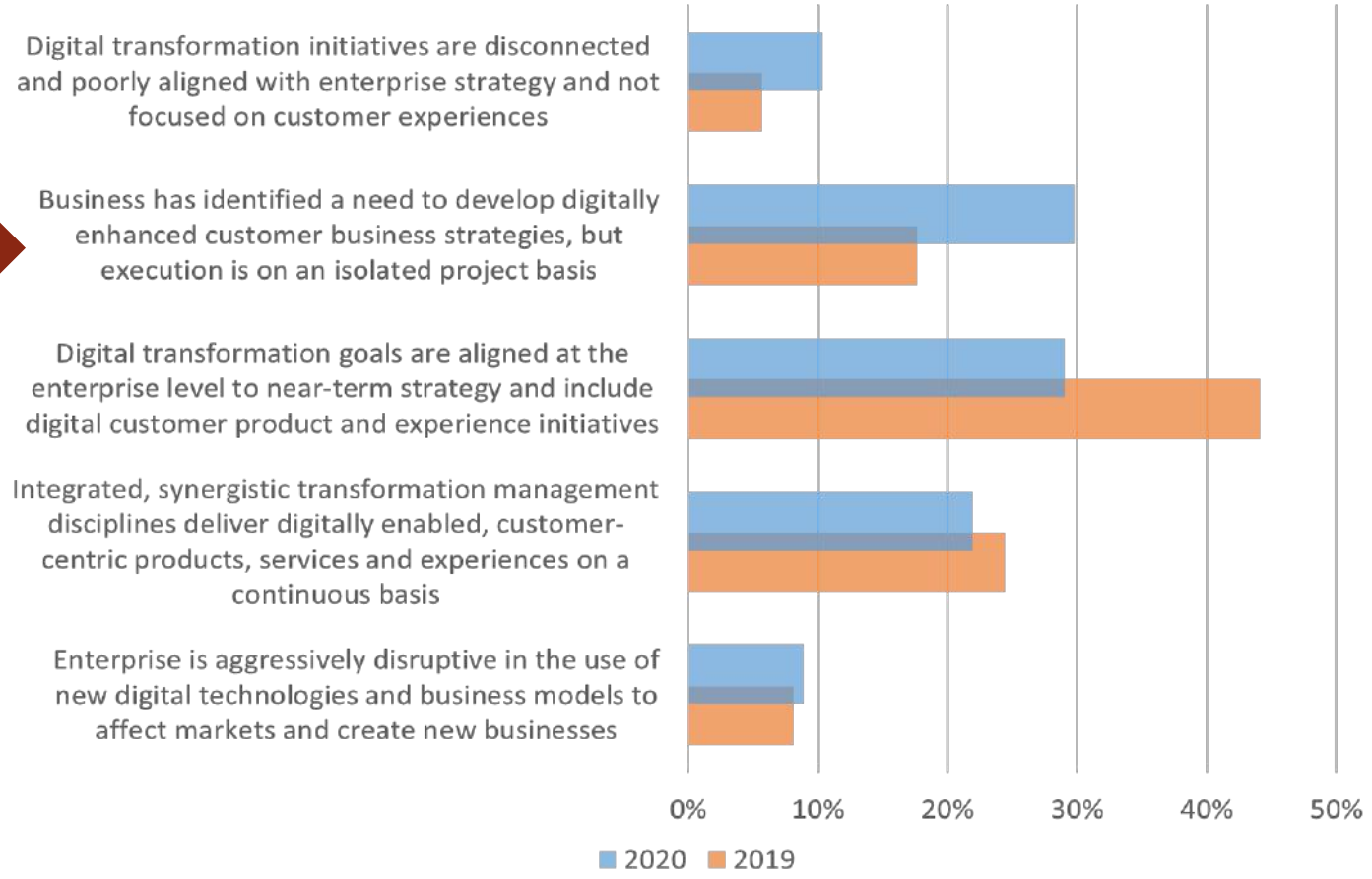
European Organizations' approach to digital transformation



- Strong **shift back** towards early-stage digital maturity
- The crisis dramatically tested industry's digital strategy and maturity, **highlighting some latent challenges in organizations**' digital backbone
- The number of firms that identified the need for a solid digital business strategy is 50% higher than the previous survey, showing **the role of the pandemic as a digital transformation forcing driver**

Source: Advanced Technologies for Industry Survey, *November 2020, % of respondents*

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Conclusions

- Overall increase of Advanced Technologies Uptake in 2020, vs. 2019
- But… 2019 expectations have been dashed by the pandemic, as priorities shifted while European organisations were facing economic slowdown or clear-cut recession
- In terms of industry, very similar picture as in 2019 with Connectivity, Cloud, and Security solutions spread across all sectors and other Advanced Technologies clearly much more sector specific (blockchain, advanced materials, nanotechnologies, industrial bio-technologies)
- The pandemic has put European organisations' digital transformation plans to the test: some current initiatives have become obsolete overnight but, at the same time, digitisation is more needed than ever.

Thank you!

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International outlook: USA and China

Prof. Pierre Alexandre Balland, Utrecht University & Artificial and Natural Intelligence Toulouse Institute - focus on USA

Dr. habil. Henning Kroll, Fraunhofer ISI - focus on China

In-depth Report on USA

International Reports, Series 2021

European Commission

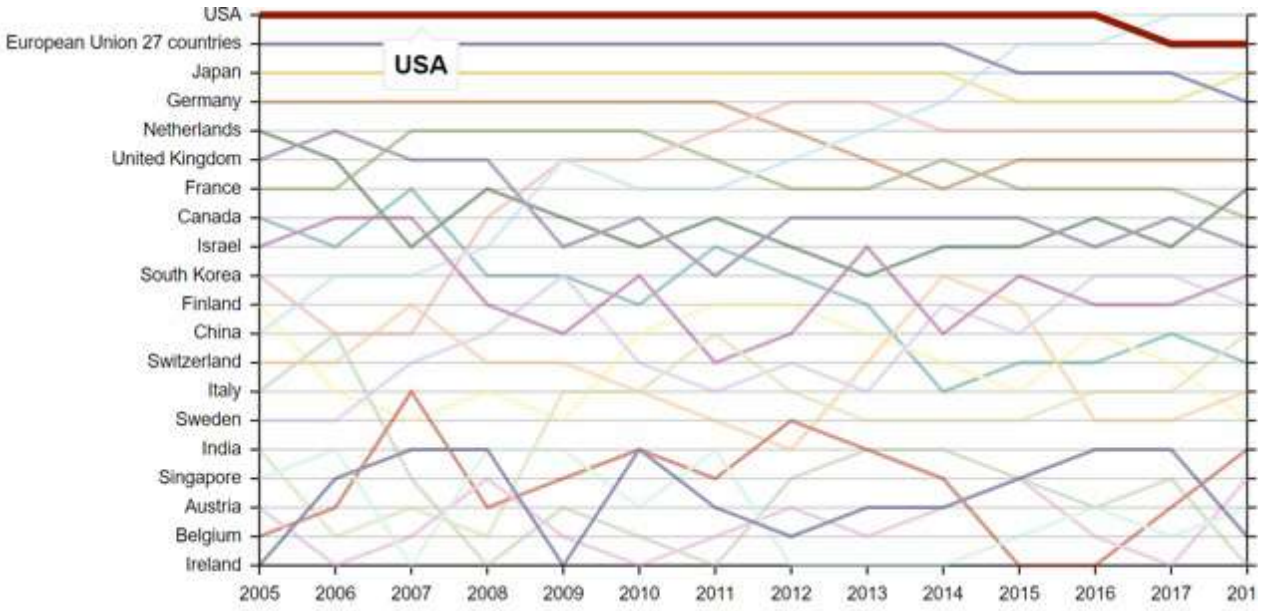
THE AI ECOSYSTEM IN THE USA

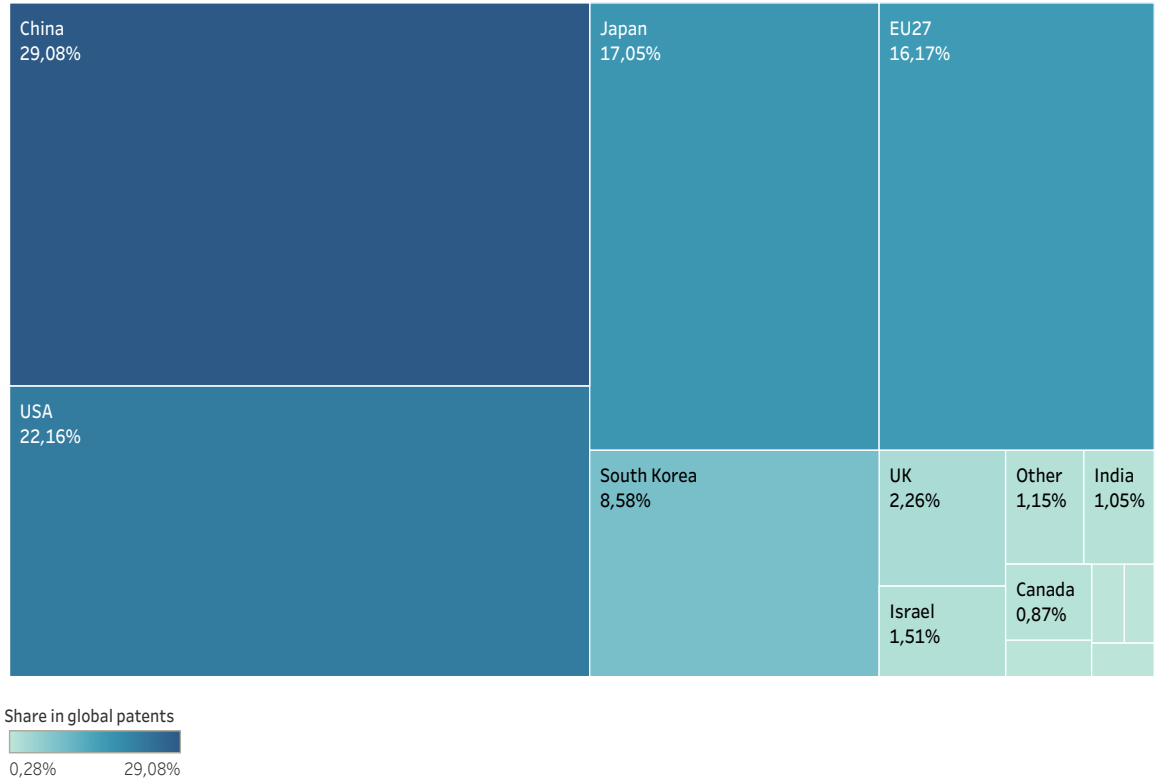
PIERRE-ALEXANDRE BALLAND

UTRECHT UNIVERSITY
ARTIFICIAL AND NATURAL INTELLIGENCE TOULOUSE INSTITUTE
ARGOS STRATEGY GROUP

European Commission

The United States has led the first wave of the AI revolution





Source: Fraunhofer ISI calculations

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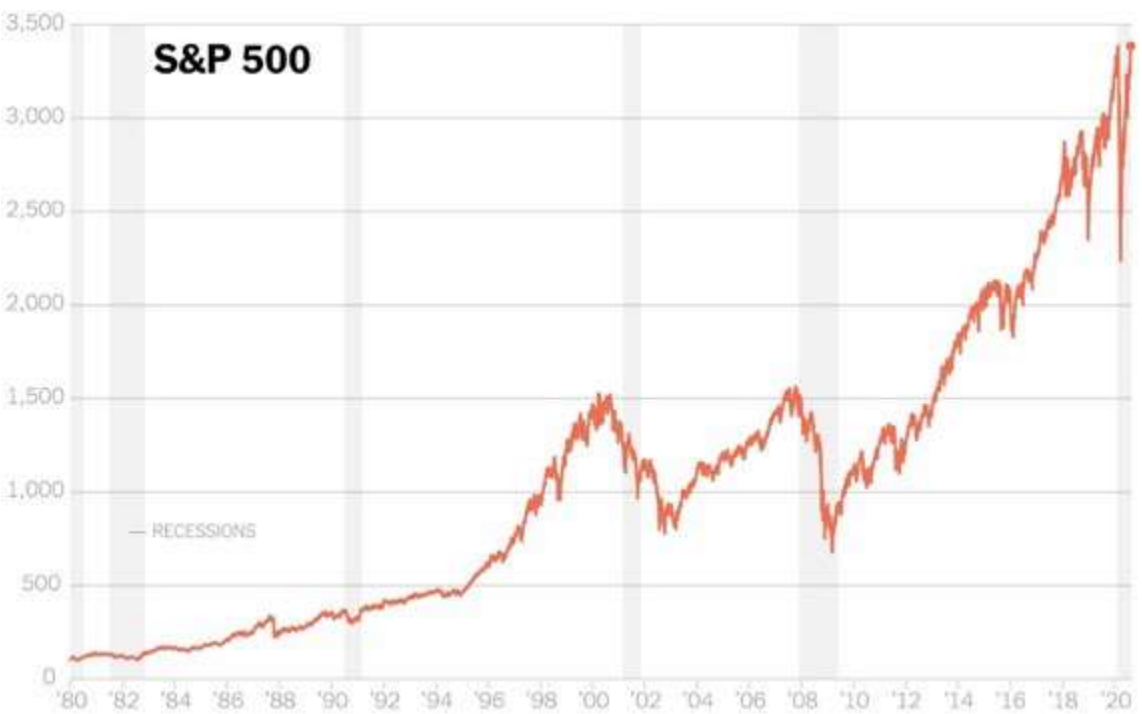
The top 5 AI champions are the largest US companies and account for 25% of the S&P 500



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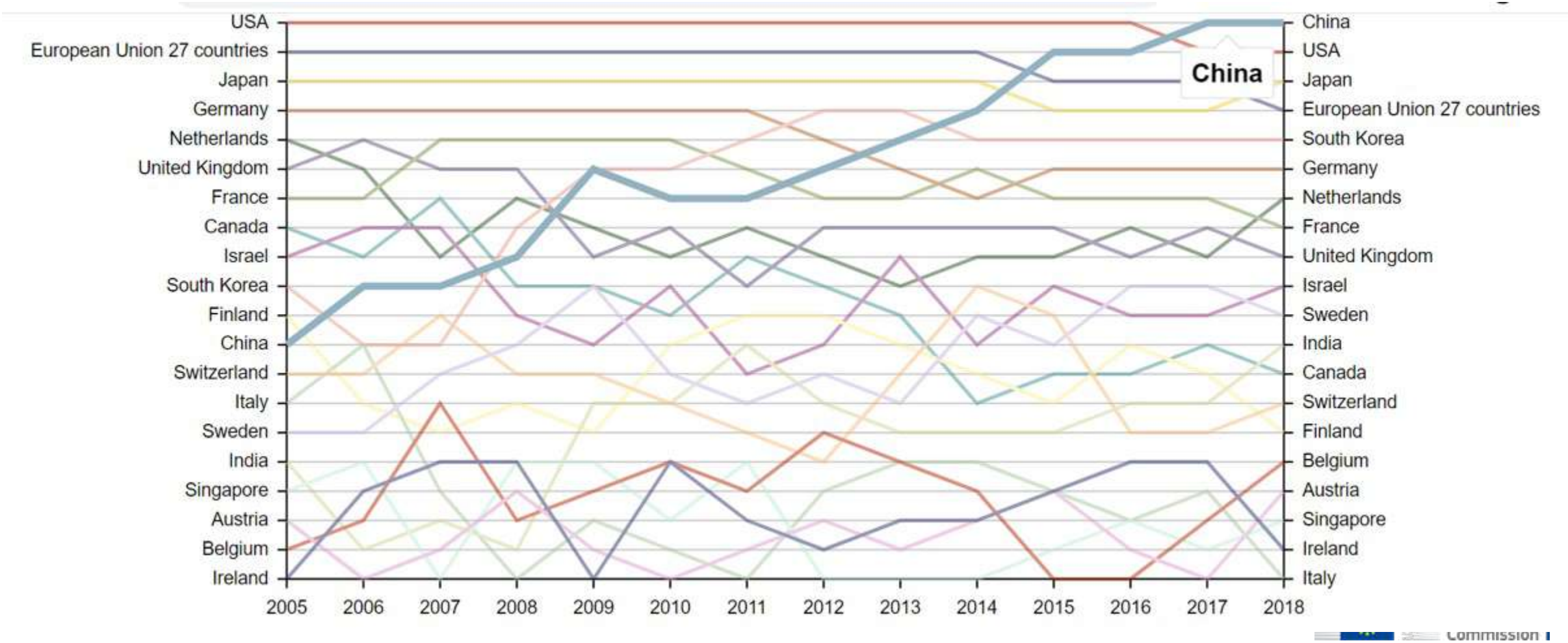
The EU/US gap is growing while China is quickly catching up



Source: Fraunhofer ISI calculations

The US AI ecosystem is dominated by a very small number of very big players

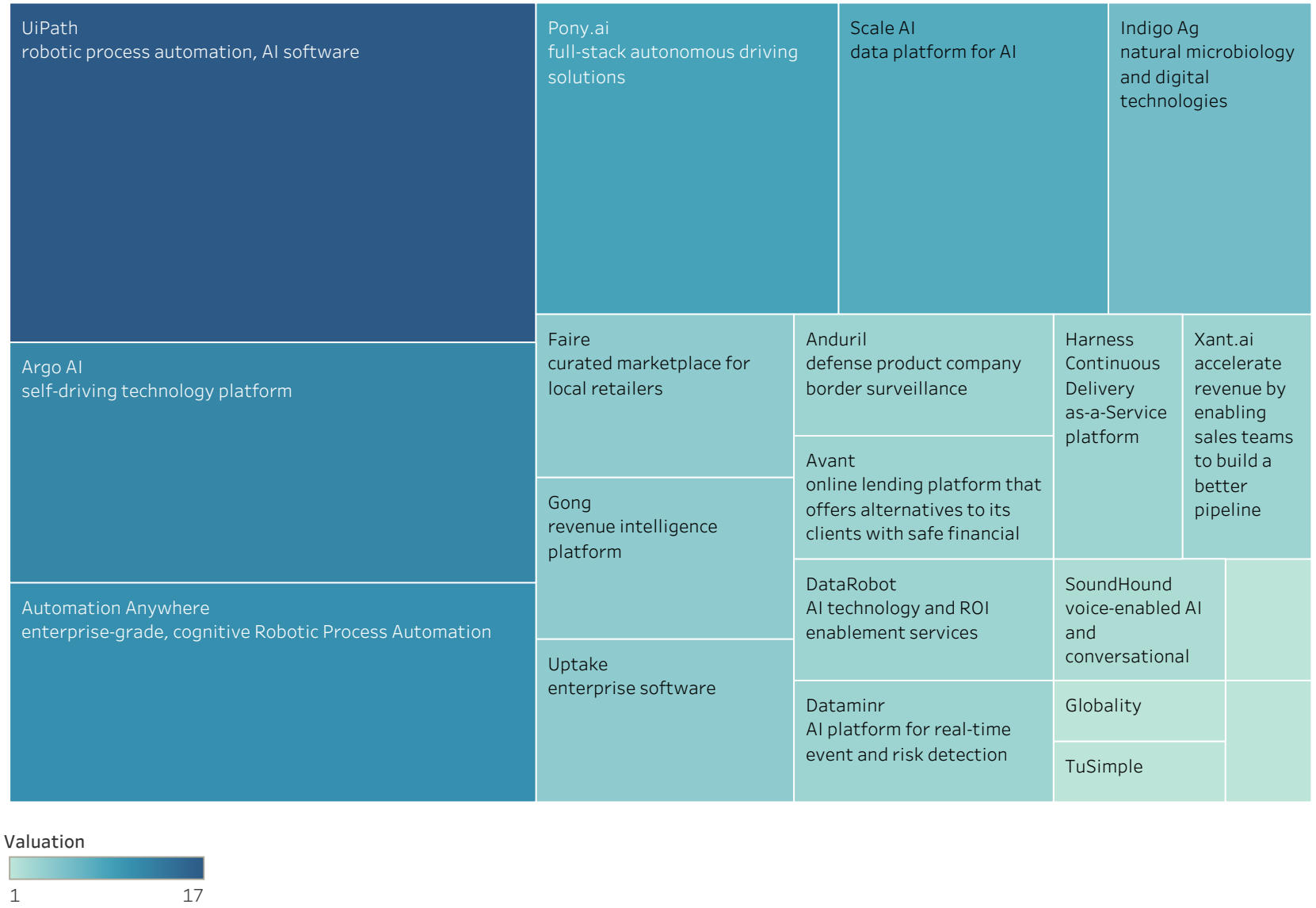
The winner-takes-all AI ecosystem

- A fundamental feature of the development and adoption of AI technologies is a winner-takes-all ecosystem arising from **network effects**
- A small initial comparative advantage will compound into a **monopoly** in AI
- Other big AI players include older organizations that were historically more involved in the production of **hardware** (Intel Corporation, IBM, the NEC Labs America research center, Qualcomm)

An AI unicorn scene worth $61.5 Billion

Second AI wave:
- corporate data instead of internet data
- office automation & digital workers
- largest valuation for start-ups disrupting medical & healthcare, banking and finance sectors

Digital + physical with autonomous vehicles & autonomous robots



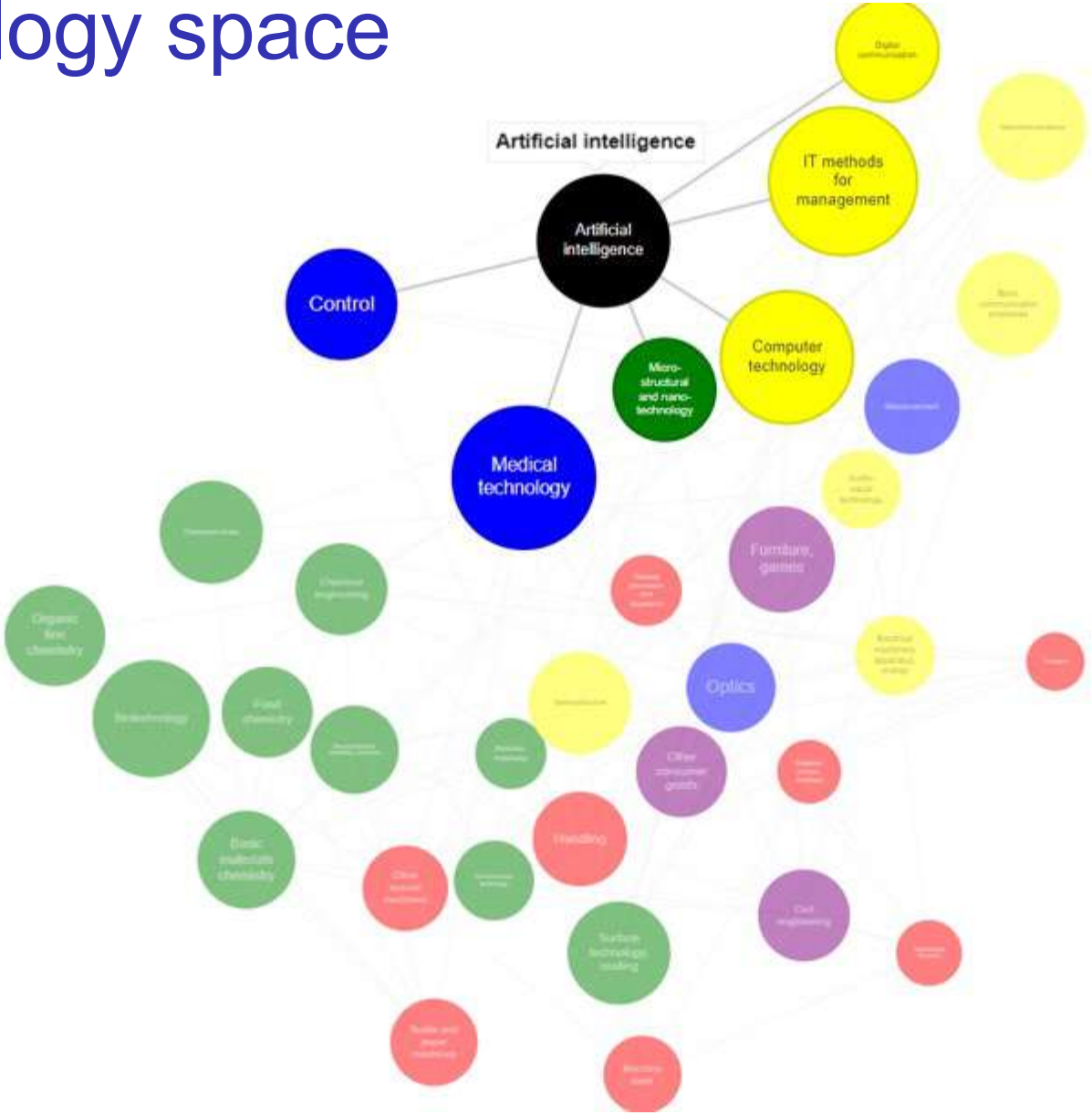
Source: Crunchbase

American universities = AI talent + capital (VC/endowments) + entrepreneurial spirit

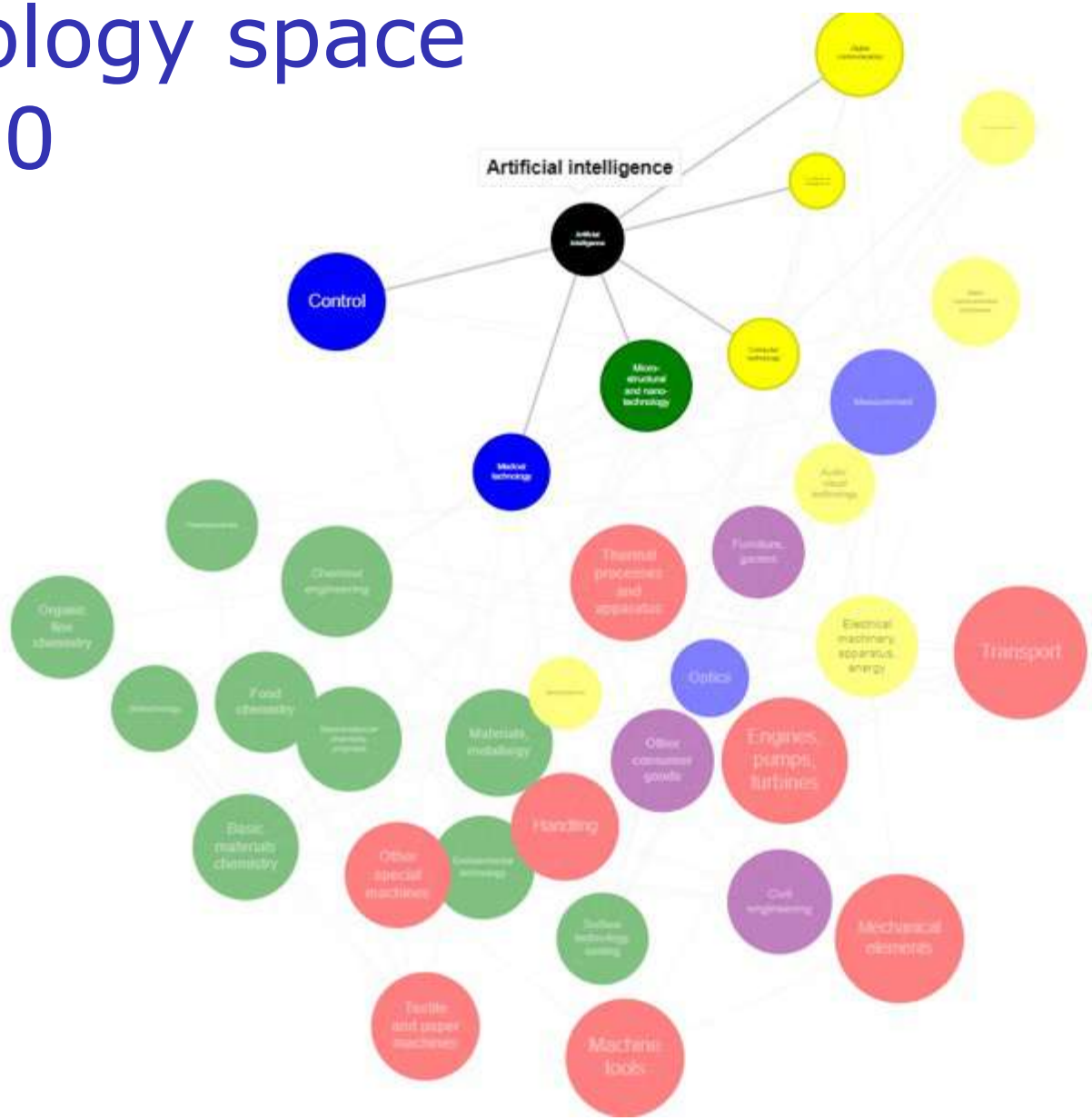
Source: Data USA & Integrated Postsecondary Education Data System (IPEDS) Completions

The dramatic growth of the US ecosystem can mainly be explained by the extension of early advantage in computing technology and the ability to harvest global internet data.

US technology space 2005-2010

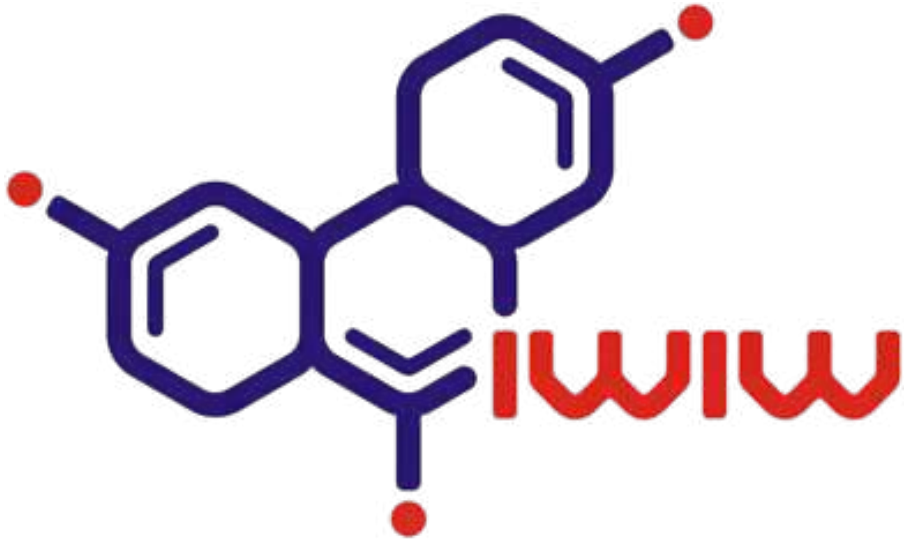


EU technology space 2005-2010



Large internal market data + global data

amazon



Cdiscount

N'ÉCONOMISEZ PAS VOTRE PLAISIR.

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To compete with the US AI ecosystem in the coming decade, other parts of the world will need to catch-up in terms of supporting AI technologies, private or public venture capital, risk-taking mindset, depth and breadth of internet and corporate data, and high-skilled migrant policy.

US AI policy

US AI policy arrived arguably late

Feb 2019 Executive Order: American Artificial Intelligence Initiative - the United States' national strategy for maintaining American leadership in AI

1 - Investment in AI research and development

2 - Prepare the American workforce for an AI-dominated world

3 - Increase trust in AI technologies and sets AI technical standards

4 - Provide high-quality cyberinfrastructure and data

The American AI policy is defensive and geopolitical by nature. The ban of Chinese AI in the US echoes China's Internet censorship that has been in place since 1996

Lessons for Europe

- Europe needs an **integrated** and **ambitious** AI strategy
- Overall public **R&D spending** needs to increase significantly
- Europe needs to **retain** and **attract** top AI talent
- European data should be used in **priority** by European AI companies

In-depth Report on China

International Reports, Series 2021

Dr. Henning Kroll, Fraunhofer ISI

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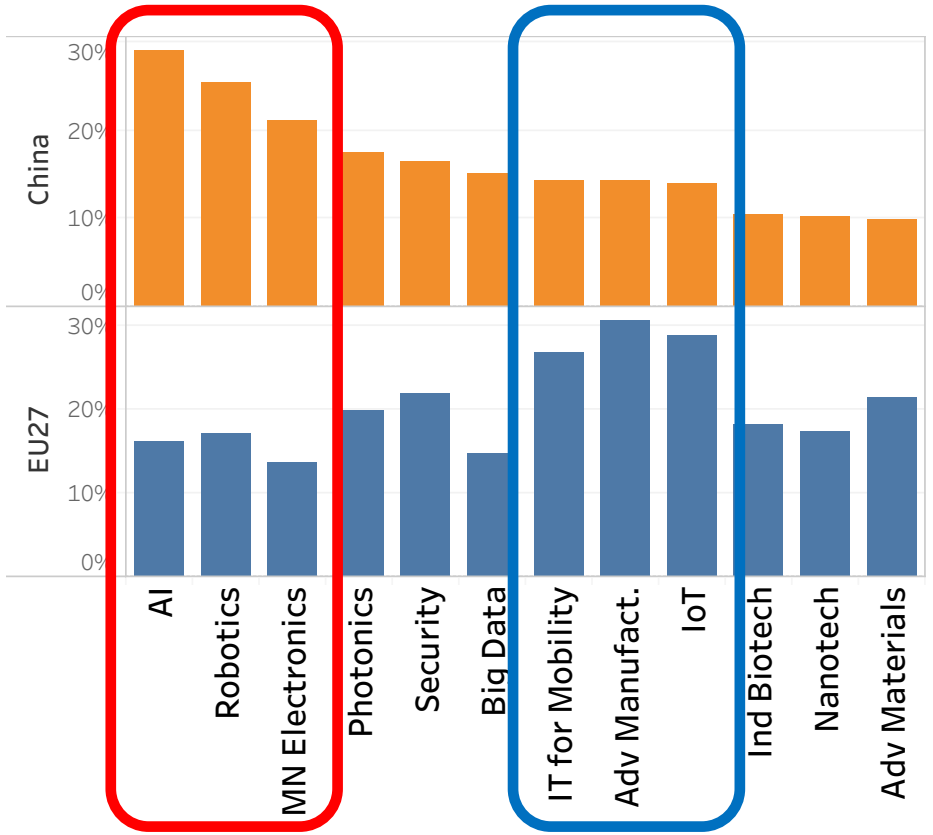
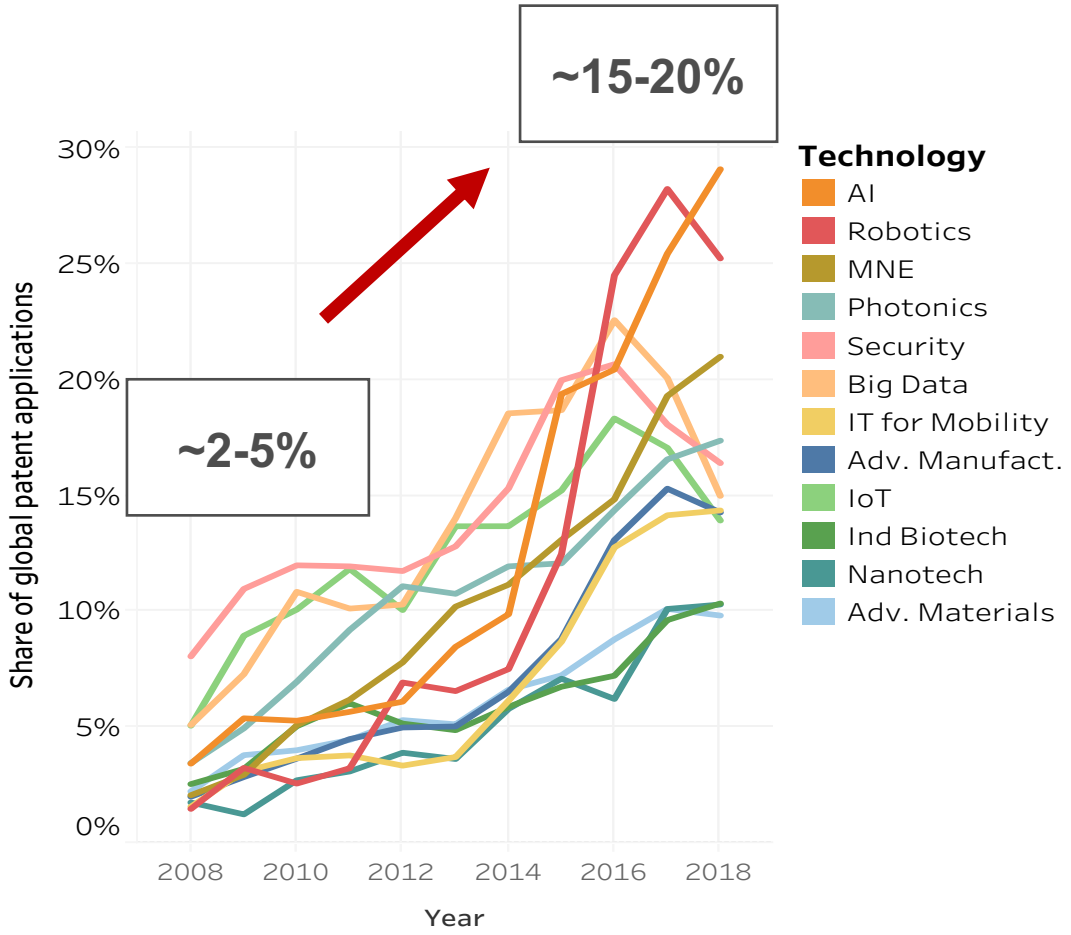
Global Share and Development of Technological Activities





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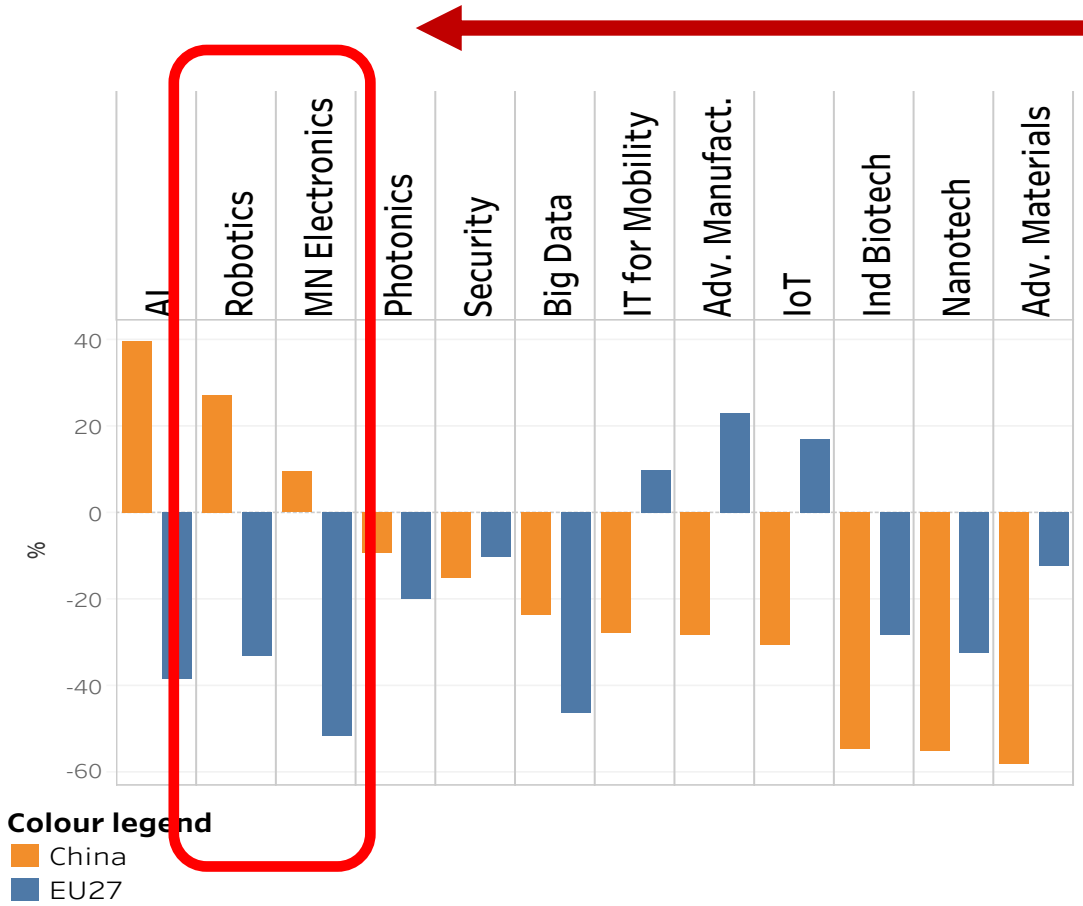

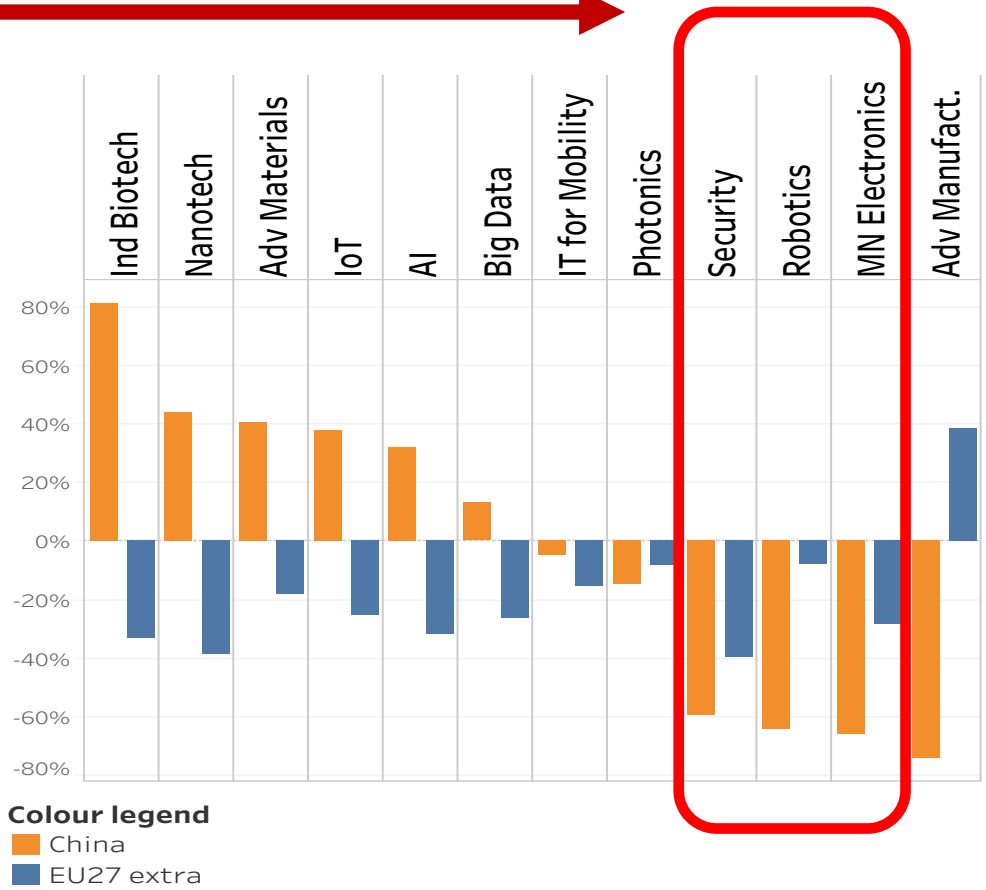

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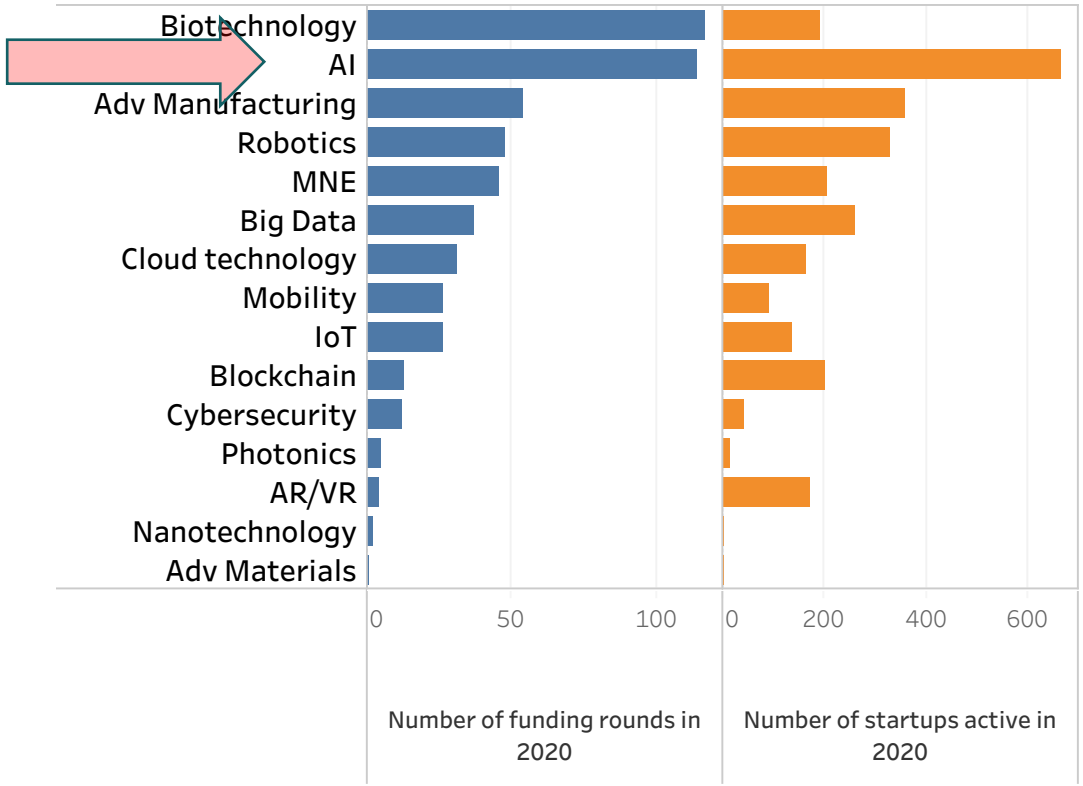
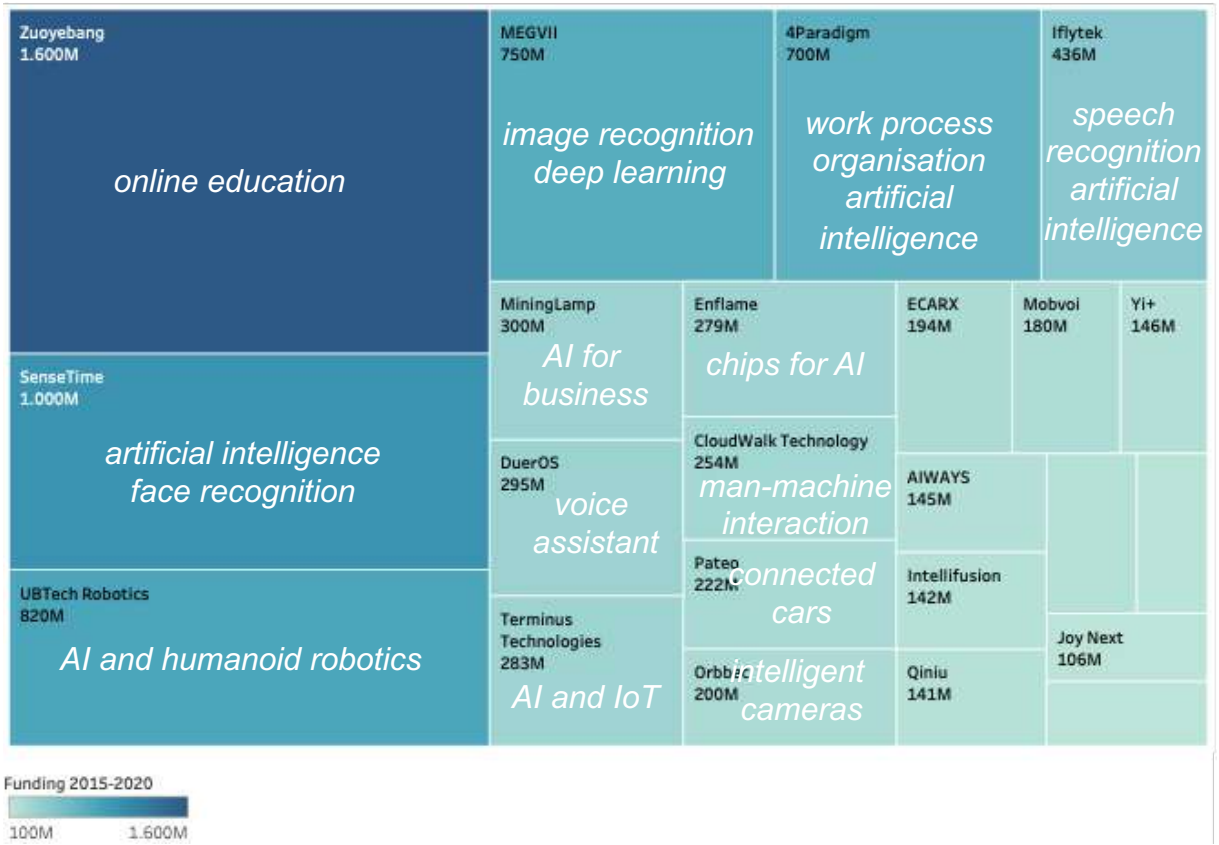
Funding Rounds for Startups





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Overview of Centres of Development

Source: The Economist (2018)

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Artificial Intelligence and Big Data

Major Government Authorities and Strategies

Type	Organisations
Ministries **Government Authorities**	Ministry of Science and Technology (MOST) - New Generation AI Strategy Advisory Committee - National New Generation AI Governance Expert Committee
	National Development and Reform Commission (NDRC)
	Ministry of Industry and Information Technology (MIIT) - China Academy of Information and Communications Technology (CAICT)
Authorities for Regulation and IPR	Chinese National Intellectual Property Administration (CNIPA)
	Standardisation Administration of China (SAC) - National Artificial Intelligence Standardisation General Working Group - National Artificial Intelligence Standardisation Expert Advisory Group
	China Electronics Standardisation Institute (CESI)

- Internet Plus (2015 -)
- Big Data Industry Development Plan (2016-2020)
- Three-Year Action Plan to Promote Development of a New Generation AI Industry (2018-2020)
- New Generation of AI Development Plan (2020 -)

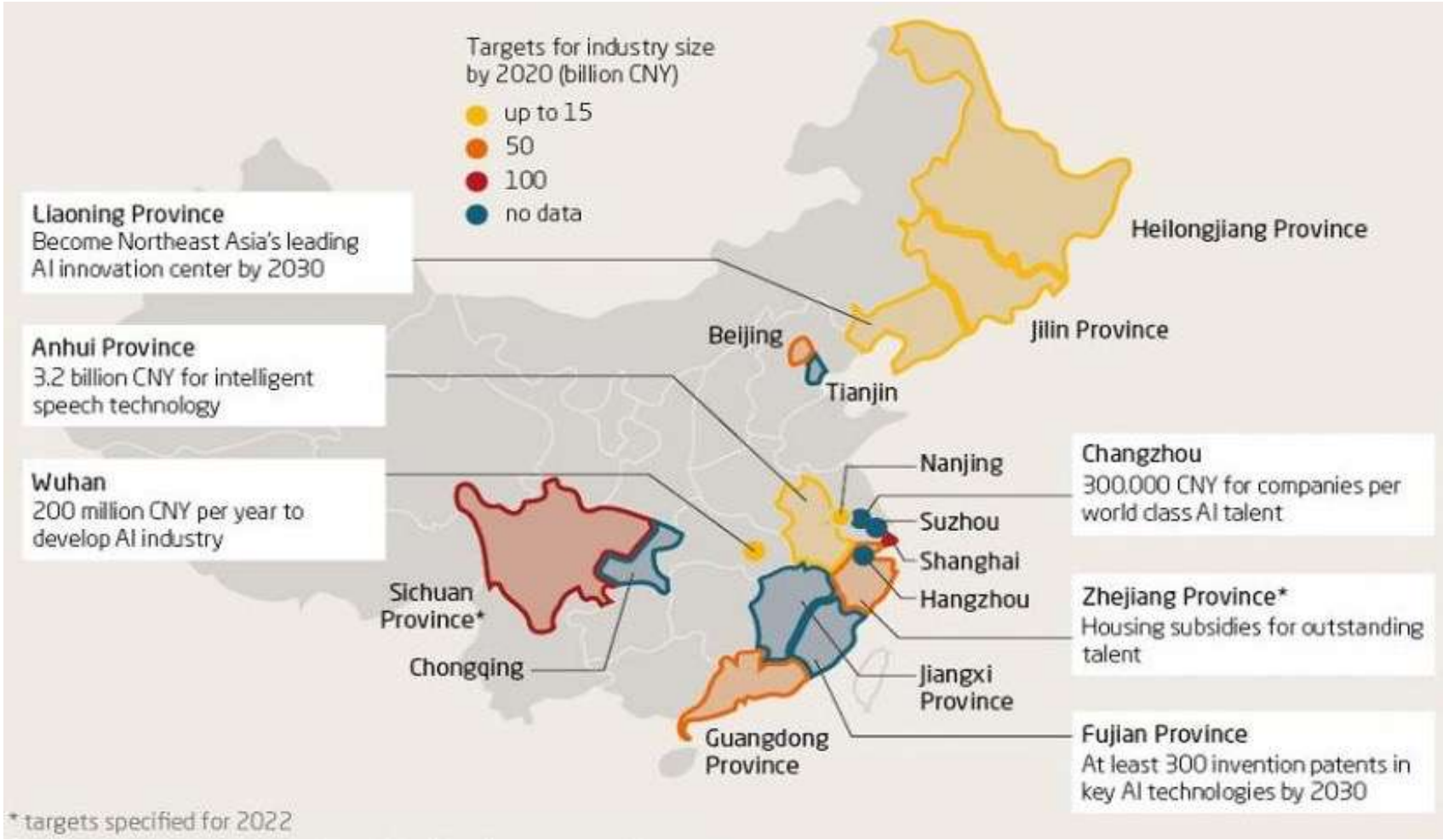
Major Companies

- Tencent Holdings Ltd., 1998, Shenzhen
- iFlyTek Co., Ltd., 1999, Hefei
- Baidu Co., Ltd., 2000, Bejing
- Alibaba Group Holding Ltd., 2007, Hangzhou
- Megvii Technology Ltd., 2011, Beijing
- SenseTime Group Ltd., 2014, Hong Kong
- iCarbonX Co., Ltd., 2015, Shenzhen
- CloudWalk Technology Co., Ltd. , 2014, Guangzhou

Pilot Zones for AI Development

- Guiyang City (in Guizhou province) has proactively promoted the integration of AI in its economy since 2014. In 2017, the city set itself a series of goals to be achieved by 2020 in order to become China's 'Big Data Valley'
- a total of eleven 'AI Pilot Zones' had been publicly announced and established by the MOST in Beijing, Shanghai, Hangzhou, Hefei, Shenzhen, Tianjin, Deqing County, Chengdu, Chongqing, Jinan and Xi'an
- rovinces and municipalities have developed AI plans, which set their individual, local targets. Beijing, Shanghai and Shenzhen, in particular, stand out as tech hubs and home to some of China's largest digital pioneers. By 2020, e.g., Shanghai aims to generate a core AI industry of ¥100 bn

Pilot Zones for AI Development



Source: Ives and Holzmann (2018)

European Commission

Advanced Manufacturing & Robotics

Major Government Authorities and Strategies

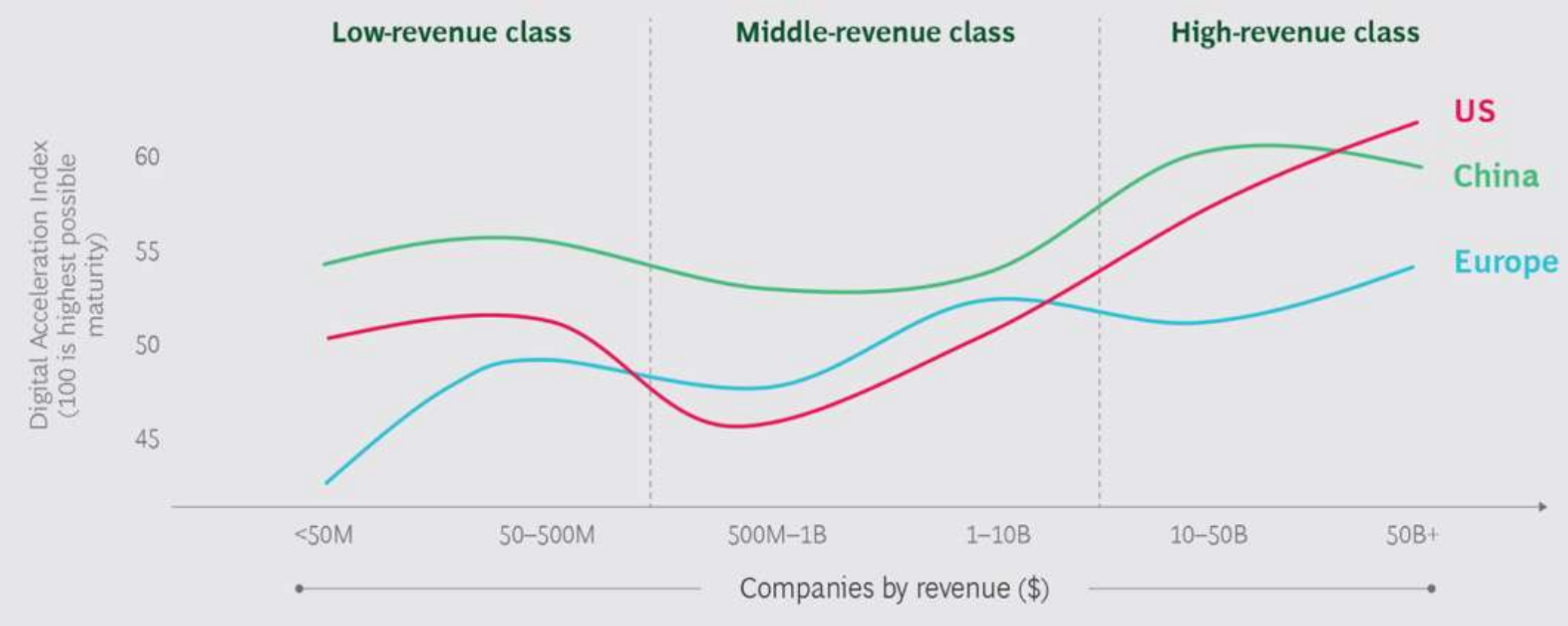
Type	Organisations
Ministries **Government Authorities**	Ministry of Industry and Information Technology (MIIT) - National Manufacturing Strategy Advisory Committee (NMSAC)
	National Development and Reform Commission (NDRC)
Authorities for Regulation and IPR	Chinese National Intellectual Property Administration (CNIPA)
	Standardisation Administration of China (SAC) - National Artificial Intelligence Standardisation General Working Group - National Artificial Intelligence Standardisation Expert Advisory Group
	China Electronics Standardisation Institute (CESI)
	China Robot Industry Alliance (CRIA)

- Manufacturing in China 2025
- National Advanced Manufacturing Investment Fund
- Guidelines for the ‘Key Special Programme on Intelligent Robots’
- Guideline for Shared Manufacturing Platforms
- National Innovation Centres

Major Companies

- Midea Group Co., Ltd., 1968, Foshan
- Estun Automation Co., Ltd., 1993, Nanjing
- SIASUN Robot & Automation Co., Ltd., 2000, Shanyang
- Da-Jiang Innovations Science and Technology Co., Ltd. (DJI) , 2006, Shenzhen
- UBTech Robotics Inc., 2012, Shenzhen
- Intelligent Steward Co., Ltd. (ROOBO), 2014, Beijing
- CloudMinds Technology Inc. , 2015, Beijing
- Geekplus Technology Co., Ltd., 2015, Beijing

Digital Maturity of Countries

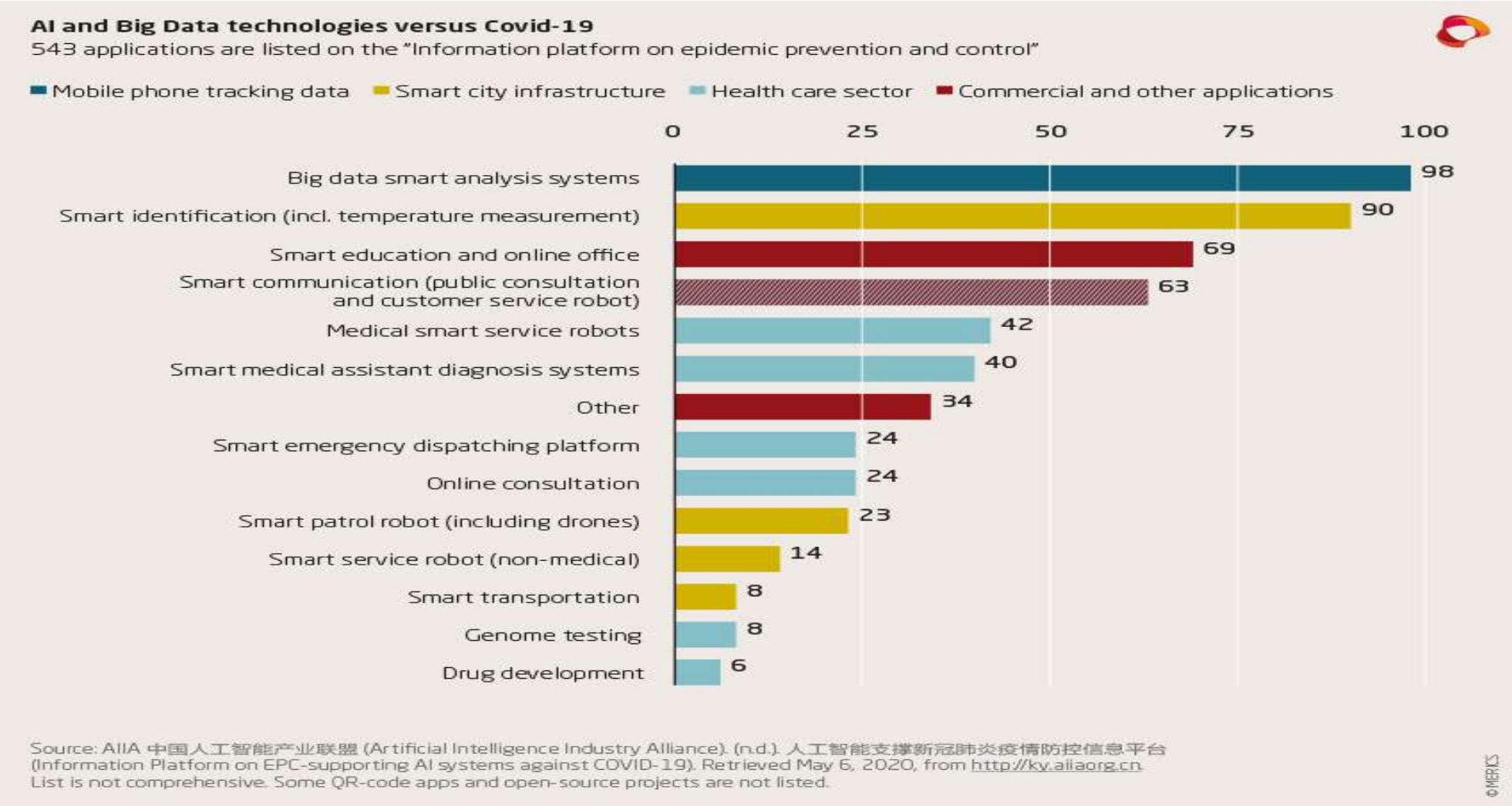


Source: Candelon et al. (2020)

Lessons Learned

- Europe needs to ascertain a broad availability of data to train & develop AI applications
- The EU should seek to actively promote and enable the diffusion of AI and Big Data.
- Transnational clusters could strengthen European development in AI and Big Data
- The EU needs to work further towards a unified strategy for the development of Advanced Manufacturing and Robotics on an international level
- European clusters should facilitate and coordinate technological development across national borders to gain international visibility and relevance
- The digital maturity of European firms has to be increased on a broad basis
- The EU should seek to improve citizens / businesses openness for AI and Big Data as well as automatisation and robotics

Leveraging Technologies for Covid-Response



Source: Carnap et al. 2020

European Commission

Roundtable discussion

Leena Sarvaranta, Director European Affairs, VTT Finland

Prof. Pierre Alexandre Balland, Utrecht University

Dr. habil. Henning Kroll, Fraunhofer ISI

European Commission

Questions

What are the key areas related to securing global leadership in advanced technologies where you still see a policy gap in the EU27?

- What would be the necessary steps to address the scaleup gap between the EU and its major competitors?
- What would be the necessary steps to address the technology adoption gap between the EU and its major competitors?
- What would be the necessary steps to address the skills gap between the EU and its major competitors?

Closing

Evangelos Meles, European Commission DG GROW

European Commission