Bocconi

EUROPE'S BIG AI GAP

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Main points

AI is the part of the software industry that is now the focus of attention.

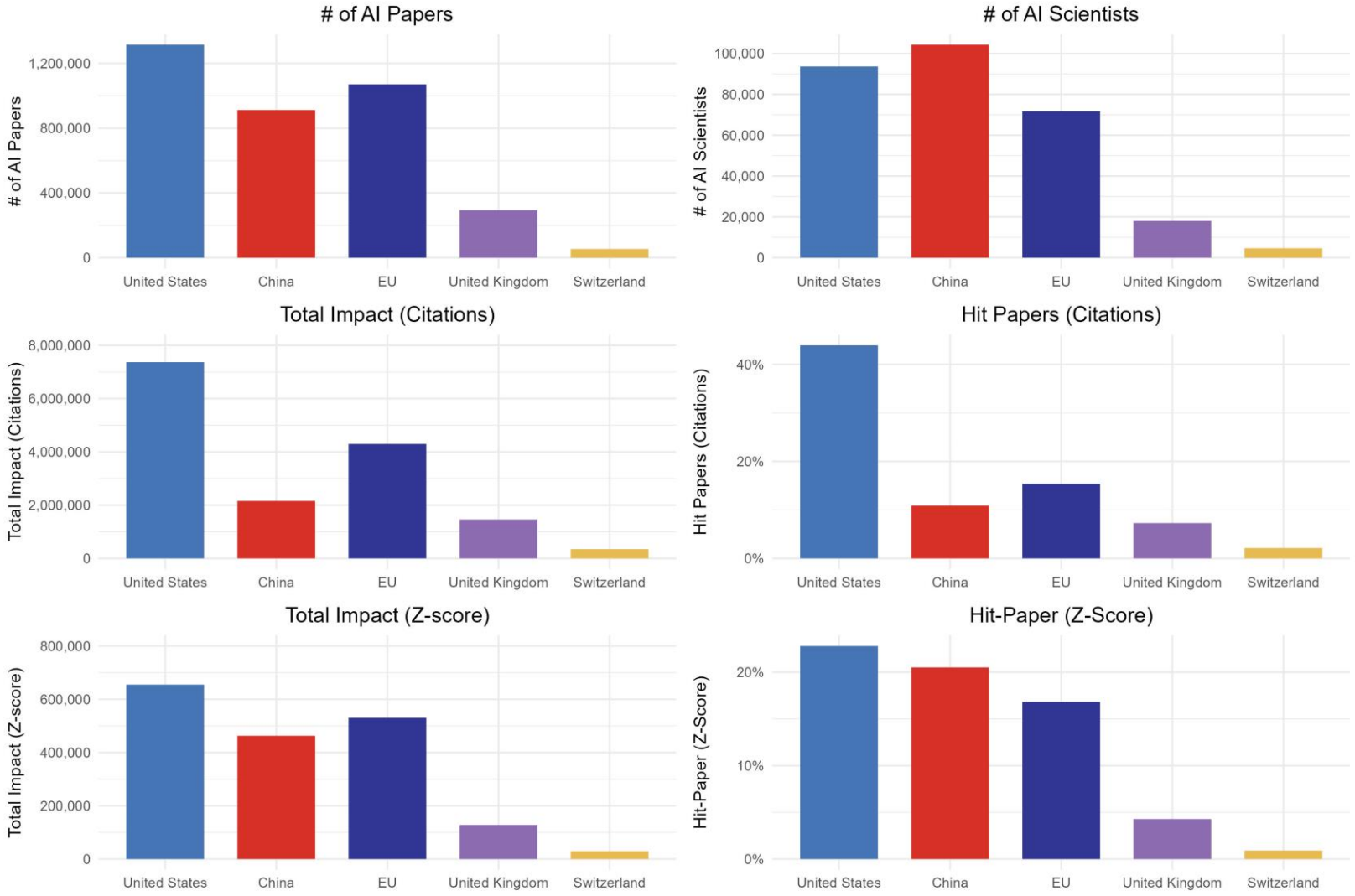
- In terms of research output EU does not do badly compared to US and Europe (=EU+UK+CH) is at similar level.
- But almost absolute dominance of US firms in AI, especially generative AI.
- This is the result of decades of gradual growth based on high business investment in R&D of US firms (not public support).
- EU firms spend as much as US on R&D as a percentage of sales. But the software sector is much smaller in Europe.
- EU software sector consists essentially in one firms, SAP, that sells BtoB products.
- Many of European deep tech start ups (and most of those financed by the EIC) are also in BtoB.

AI: indicators of research

Europe (EU+UK+CH) does not do badly in research on AI.

Commercial applications close to zero.

=> Not quite old story of invented here but produced elsewhere (in Asia).



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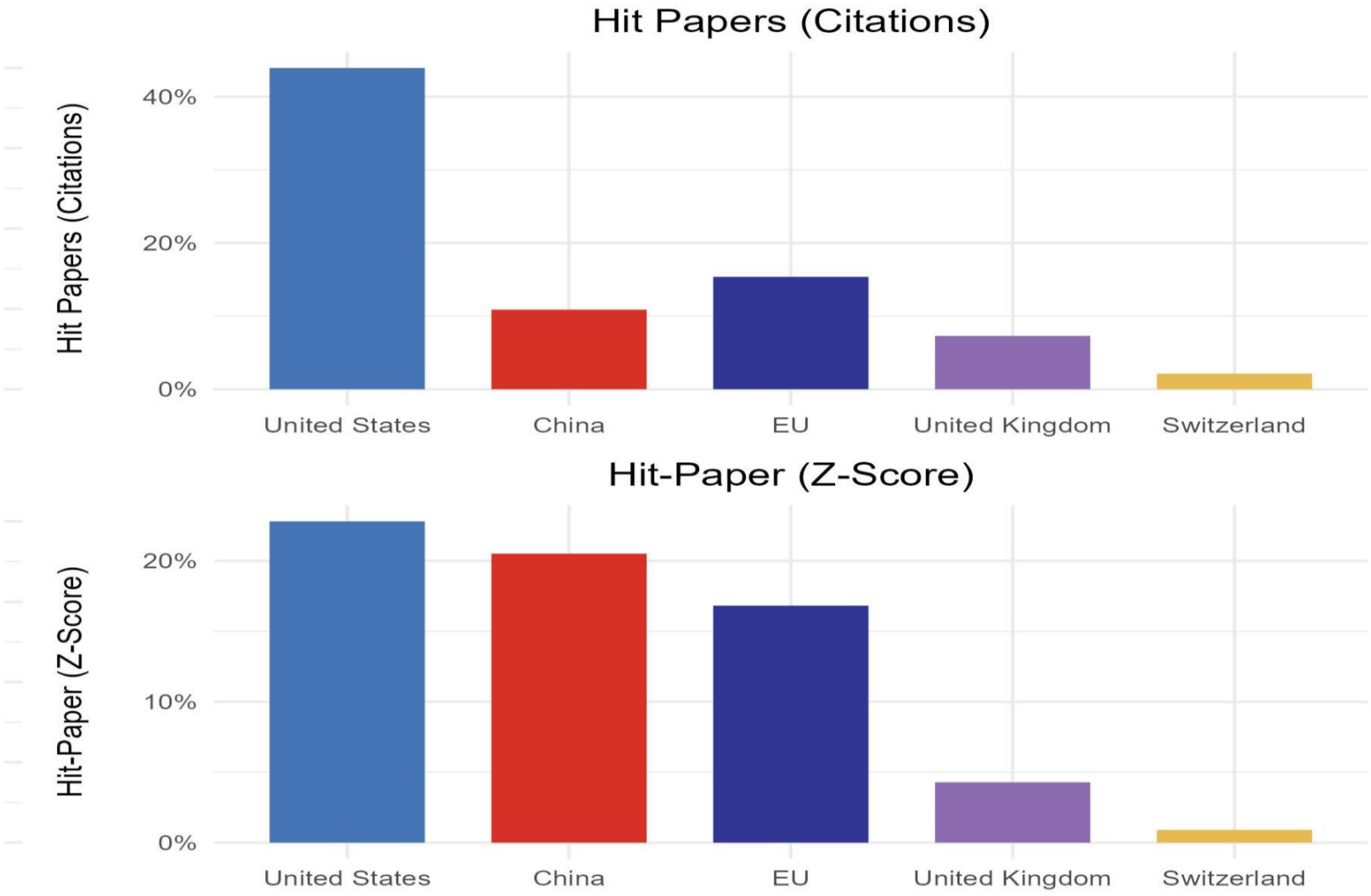

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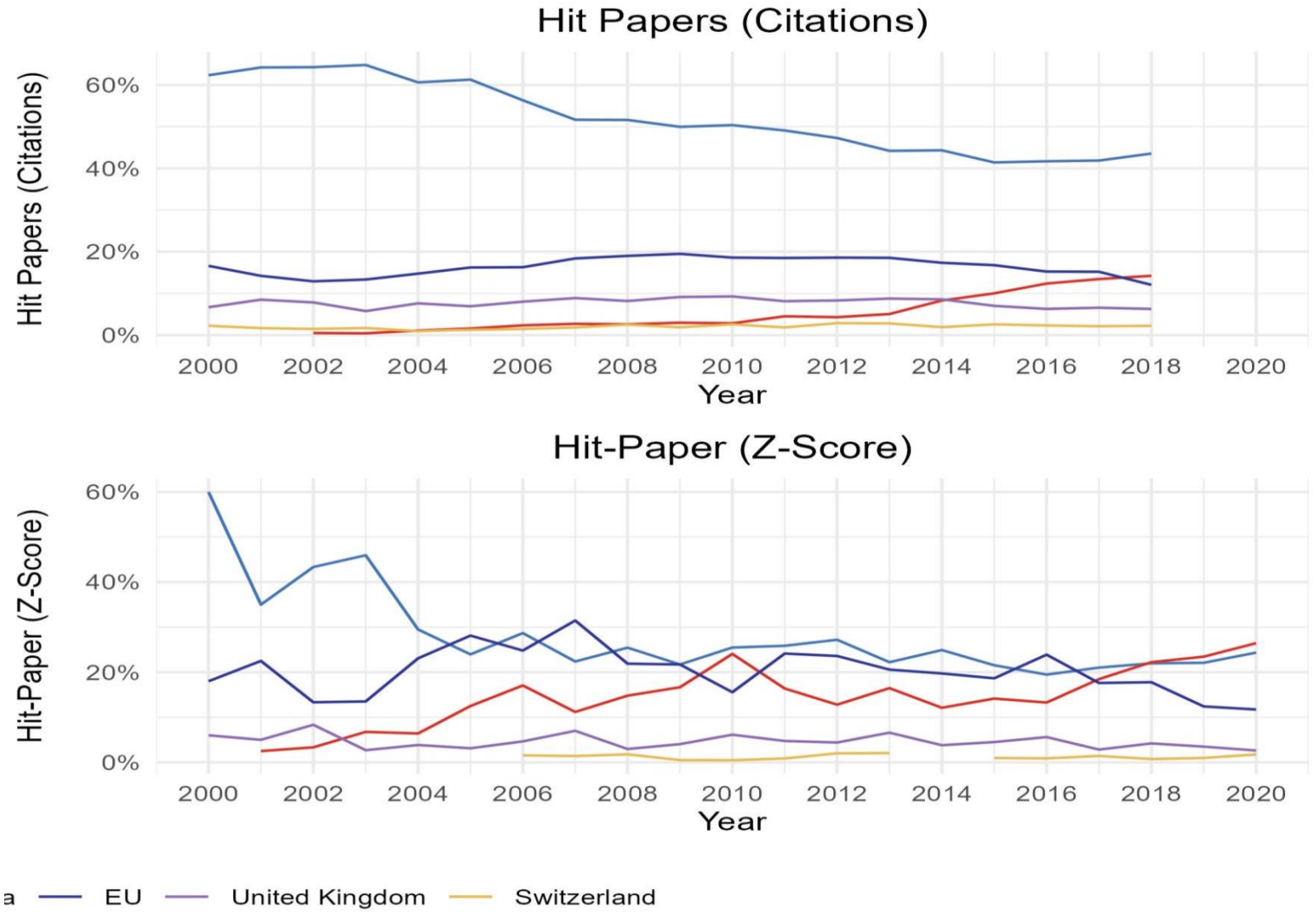
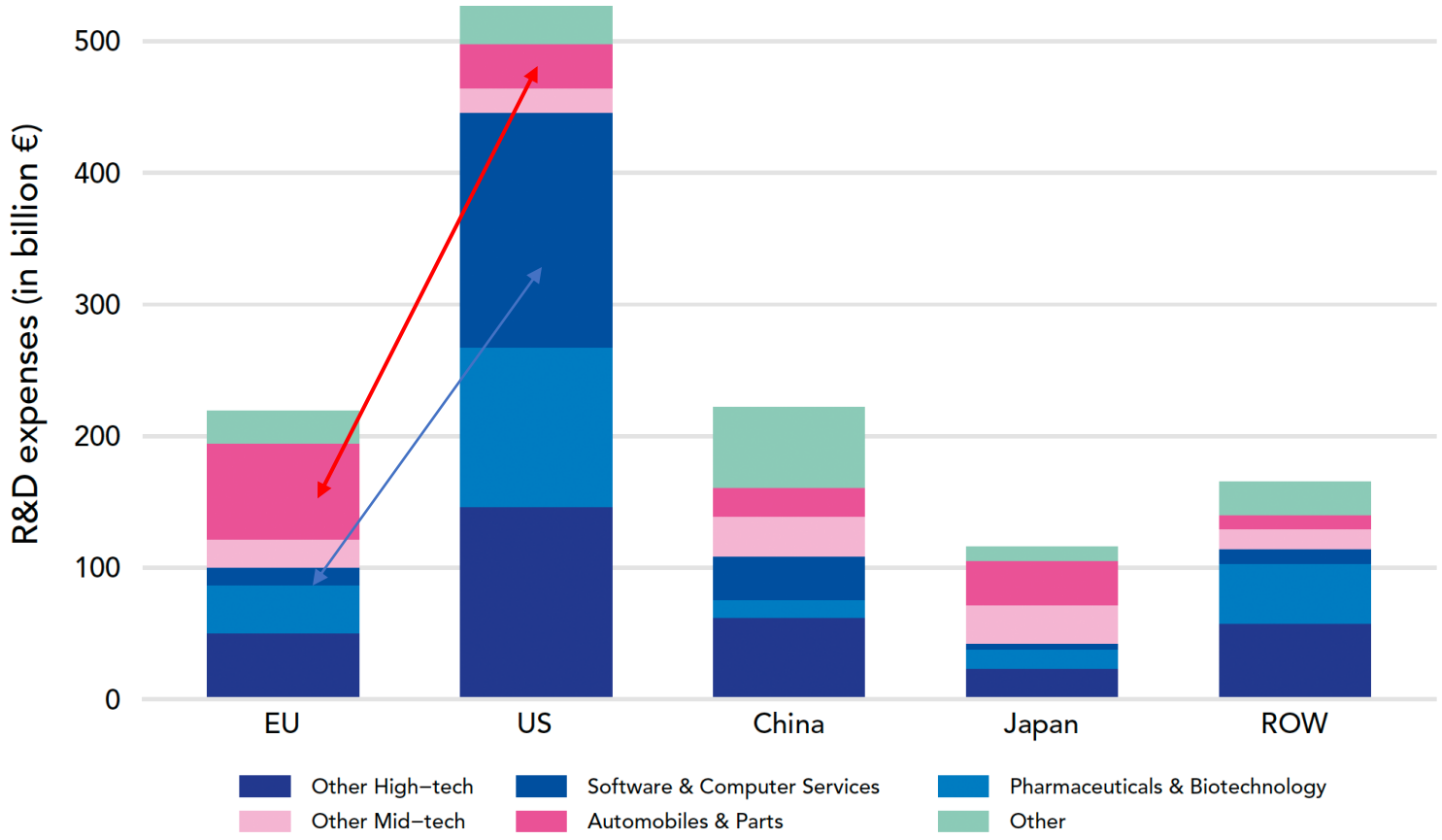


Innovation key to US success while the EU is stuck in a mid-tech trap

- Public suppport to innovation in the EU is comparable to US (similar 0.7 % GDP)
- The big difference is in private, business R&D spending (1.2% GDP in EU; in US it is 2.3%)
- Key overlooked element: composition is different.
- EU business R&D concentrates in mid-tech (e.g. automotive), rather than high-tech (e.g. software)
- Mid-tech industries grow less than high-tech
- Evidence of path dependency

The sectoral composition of Business R&D is key

BERD by Tech-level 2022 (Top 2,500 companies)



Source: Industrial R&D Investment Scoreboard (2023).

Total BERD US 3 times larger than EU.

EU > US in mid tech.
US >> in high tech

EU absent in software

EU specialization similar pattern as Japan and China.

China similar in absolute values to EU, but would be much higher in PPP terms (Chinese researchers much cheaper)

First conclusion

- Contest for supremacy in software (including AI) is lost. US software firms have outspent EU by hundreds of billions over decades => cumulated advantage is in thousands of billions.
- Applications for business (economies of scale less prevalent) represent most promising niche.
- N.b. Since composition of business R&D spending makes the difference the 3 % GDP target of R&D for EU impossible to reach in short run. Not even desirable for EU mid tech to spend much more on R&D (like Japan).

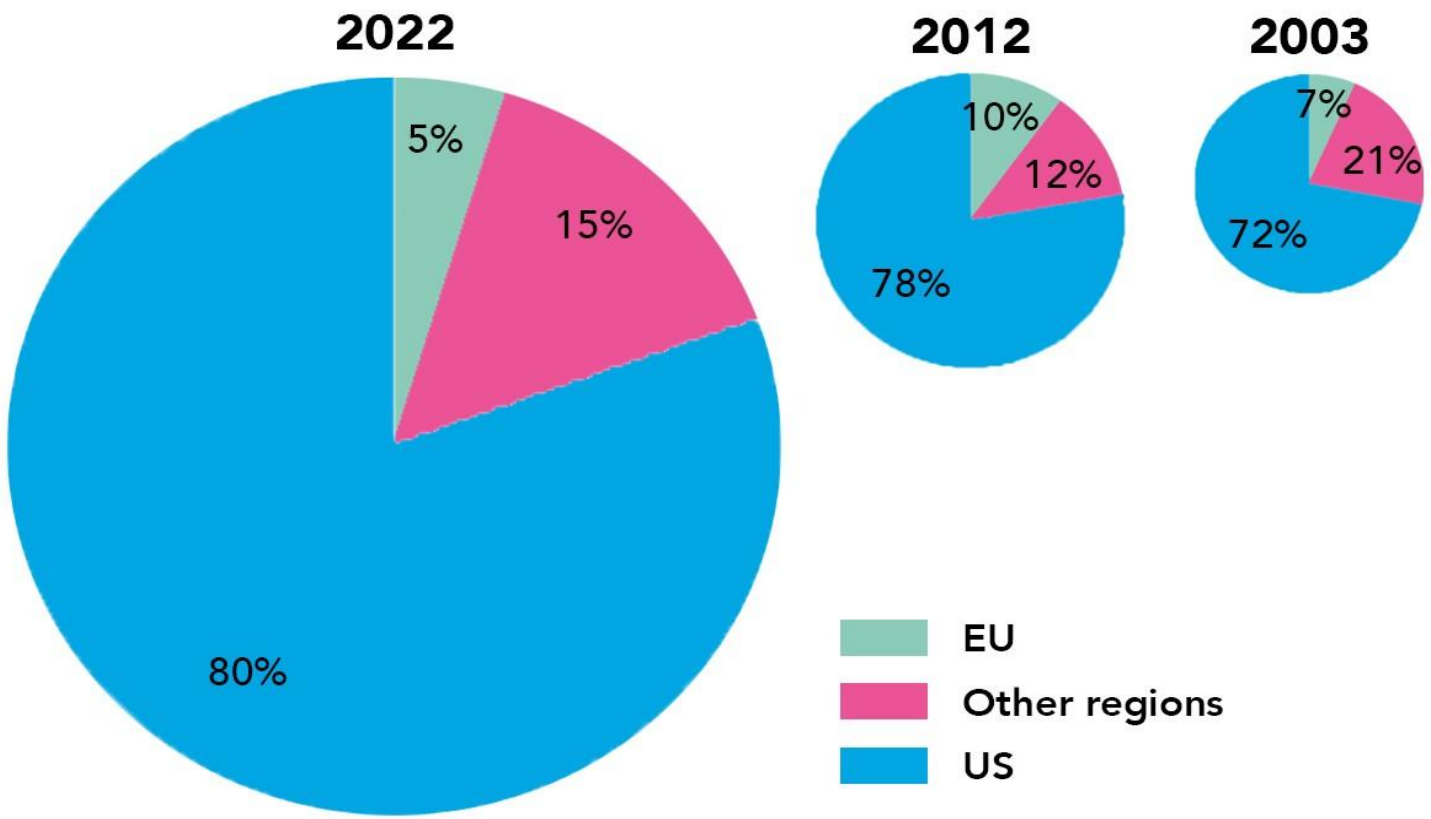
Top-3 R&D spenders and their industries compared over time

	2003	2012	2022
US			
	Ford	Microsoft	Alphabet
	Pfizer	Intel	Meta
	GM	Merck	Microsoft
EU			
	Mercedes-Benz	VW	VW
	Siemens	Mercedes-Benz	Mercedes-Benz
	VW	Bosch	Bosch

Source: Industrial R&D Investment Scoreboard (2004, 2013 and 2023).

Path dependency?

Country share of total interational BERD: Software & Computer Sciences



US firms dominated the then small software sector already in 2003.

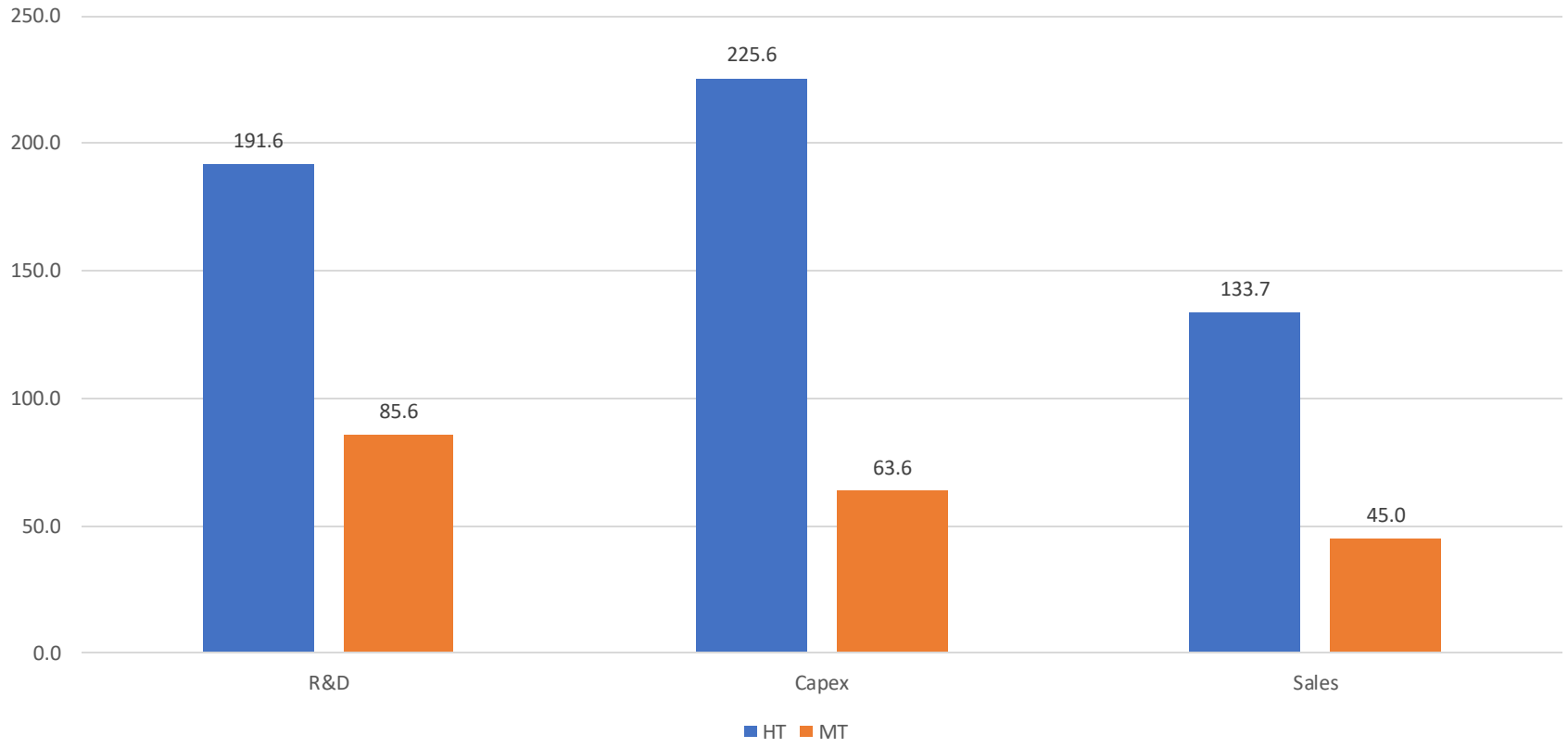
Dominance has increased even as sector has become 10 times bigger.

Pie size proportional to global total for software.

N.b. Distribution of revenues follow same pattern.

Growth rates of high and mid-tech industries

(2022-2012, in %)



High tech (defined as industries with R&D ratio higher than 10 %) grow more across all metrics.

N.b. Mid-tech defined as R&D/sales above 3, below 10 %.

Conclusions:

1. Near total dominance of US companies in the field of AI stands in jarring contrast with the near parity of Europe in terms of research output.
2. Diffusion of AI (as a general-purpose technology) key, but not something public sector, especially at EU, can influence and should not subsidize.
3. Big push for public investment not needed and unlikely to succeed.
4. European start ups seem to concentrate on BtoB aspects of AI. Promising area, but diffusion of AI to EU corporate sector hindered by preponderance of small companies and for medium to large ones, by rigid labor laws and regulations in most EU countries.