How to sustain and enhance the importance of EU Academia in developing the chips of the future?

Free Silicon Conference

Julia Hess | *Project Manager Technology and Geopolitics*

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Who we are.

Stiftung Neue Verantwortung

independent | non-party | non-profit

Tech-Policy Think Tank

We are 98% funded by non-profit foundations and governments.

stiftung-nv.de/en/financial-transparency

What we are working on.

Semiconductors and Geopolitics

- **Analyze** characteristics and market dynamics within the global semiconductor ecosystem.
- **Assess** interdependencies, vulnerabilities and the effects of geopolitics.
- **Develop** recommendations for policy makers how to strengthen EU's semiconductor ecosystem.

14+ publications about chips & geopolitics since 2020.

https://bit.ly/SNVChips

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Our role in the semiconductor ecosystem

Bridging the gap between industry & policy, by

- ❑ providing **independent technical knowledge** that **informs pressing policy debates**
- ❑ conducting **multi-stakeholder** informed research & policy-development
- ❑ Interacting with **different policy levels** (EU Member States, EU Commission, EU Parliament) & **policy fields** (industrial policy, national security, innovation policy, environmental policy etc).

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Europe's competitiveness in semiconductors

Analysis of the EU Chips Act: The Crisis Response Toolbox
Jan-Peter Kleinhans and Julia Hess, September 2022
SNV Policy Paper Series: Government's Role in the Global Semiconductor Value Chain

Recommendation for the EU Chips Act: A long-term governmental mapping
Julia Hess and Jan-Peter Kleinhans, July 2022
SNV Policy Paper Series: Government's Role in the Global Semiconductor Value Chain

Analysis of the EU Chips Act: Challenges of government monitoring of the supply chain
Jan-Peter Kleinhans, Julia Hess, and Wiebke Denkena, June 2022
SNV Policy Paper Series: Government's Role in the Global Semiconductor Value Chain

The lack of semiconductor manufacturing in Europe: Why the 2 nm fab is a bad investment
Jan-Peter Kleinhans, April 2021
SNV Policy Paper

Understanding the global value chain

Who is funding the chips of the future?
Julia Hess, Wiebke Denkena, Jan-Peter Kleinhans and Pegah Maham, April 2023
SNV Policy Paper

Who is developing the chips of the future? RELOADED
Julia Hess, Laurenz Hemmen, Jan-Peter Kleinhans and Lisa Koeritz, June 2023
SNV Policy Paper

Understanding the global chip shortages: Why and how the semiconductor value chain was disrupted
Jan-Peter Kleinhans and Julia Hess, November 2021
SNV Policy Paper

Who is developing the chips of the future?
Jan-Peter Kleinhans, Pegah Maham, Julia Hess, and Anna Semenova, June 2021
SNV Policy Paper

The global semiconductor value chain: A technology primer for policymakers
Jan-Peter Kleinhans and Dr. Nurzat Baisakova, October 2020
SNV Policy Paper

Analyzing China & Chips

Challenges of a rising Chinese chip design ecosystem
Jan-Peter Kleinhans, John Lee, February 2023
Europe's Strategic Technology Autonomy from China

The EDA Chokepoint Dilemma? Openness, Oligopolies, and China's Ecosystem
Jan-Peter Kleinhans, December 2022
Working Paper, UC Institute on Global Conflict and Cooperation

China Semiconductor Observatory – Baseline Report
Jan-Peter Kleinhans, John Lee, December 2022
China Semiconductor Observatory

China's rise in semiconductors and Europe
Jan-Peter Kleinhans and John Lee, December 2021
SNV x MERICS Policy Paper

Mapping China's semiconductor ecosystem in global context: Strategic dimensions and conclusions
John Lee and Jan-Peter Kleinhans, June 2021
SNV x MERICS Policy Paper

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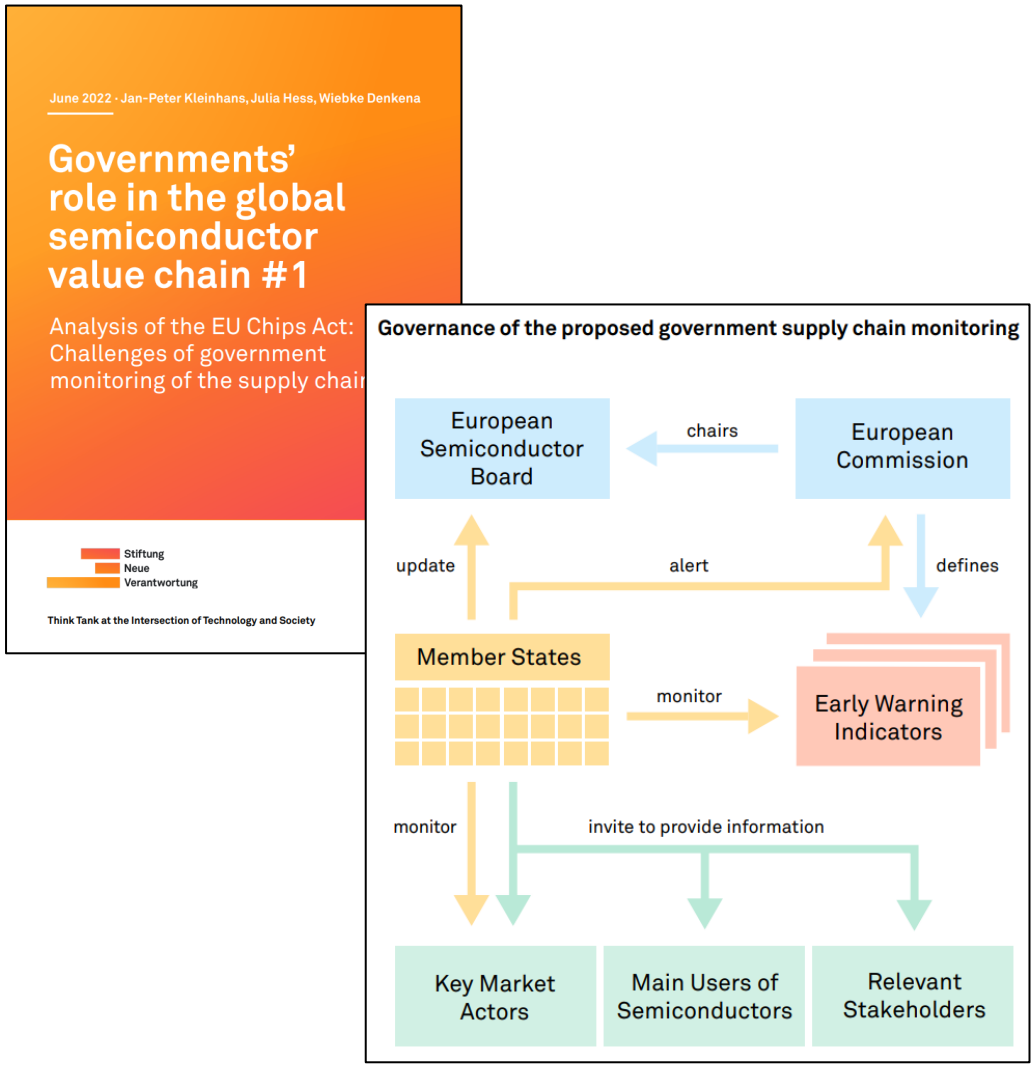
First example of our recent analysis on chips : Analysis of the EU Chips Act



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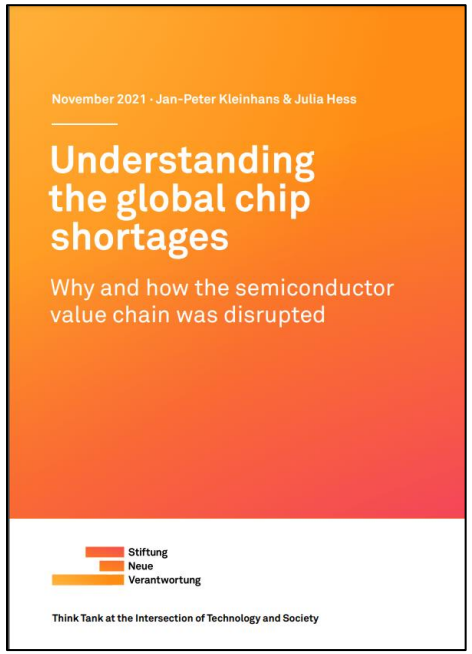
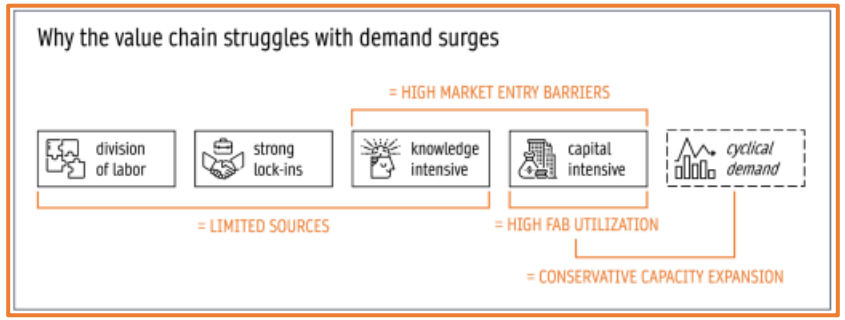
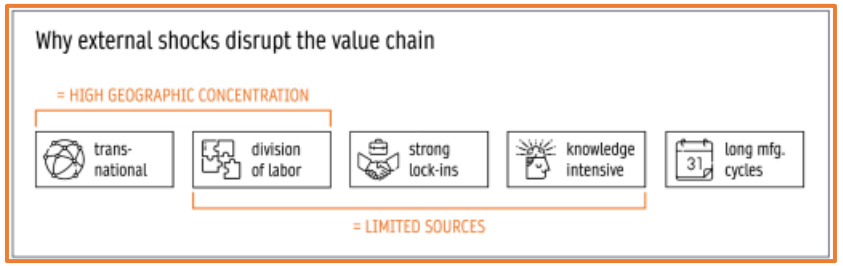
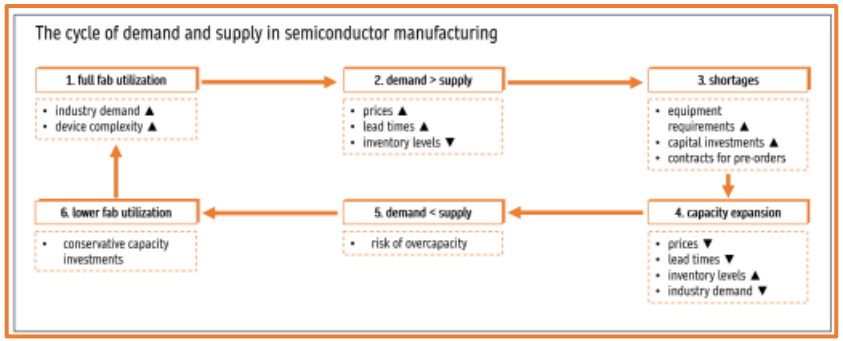
Second example of our recent analysis on chips: Understanding the global chip shortages









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Who is developing the chips of the future?

A quantitative analysis in collaboration between
The Chips & Geopolitics Team
(Julia Hess & Jan-Peter Kleinhans)
and
The Artificial Intelligence & Data Science Team
(Laurenz Hemmen & Lisa Koeritz)

Link: https://www.stiftung-nv.de/de/publication/who-developing-chips-future-reloaded

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Methodology: Data basis

- Metadata of academic papers published at **IEDM, ISSCC & VLSI** (Technology and Circuits) conferences between 1995-2022
- Collection of author affiliations via **IEEE Xplore API**
- Mitigation of missing data via each paper's digital object indentifier (DOI) on **OpenAlex**
- Result: extraction of institution name & country from each affiliation → then inferred ist headquarters' location & type

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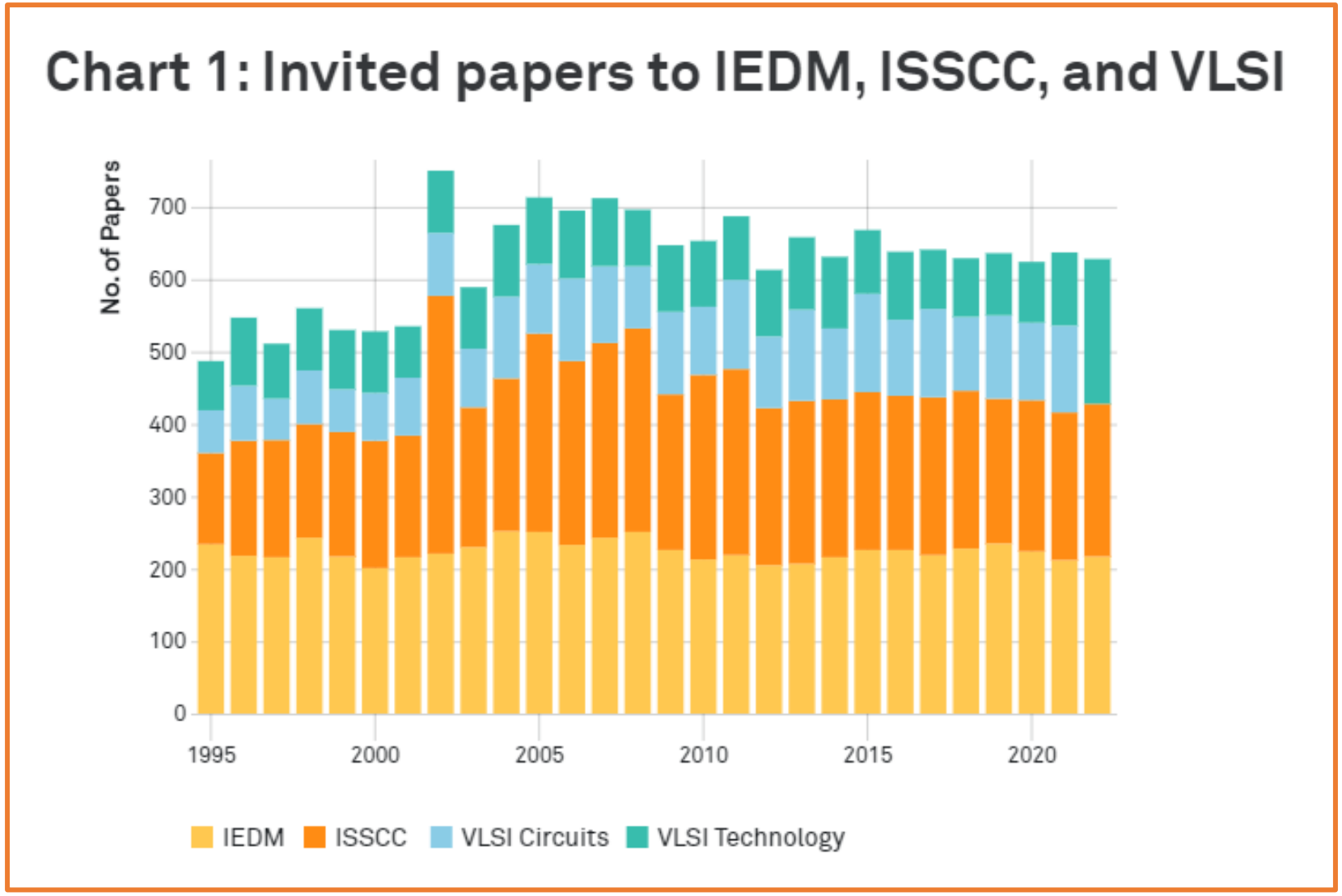
We analyzed 28 years of invited papers (total 17,518) to IEDM (6299), ISSCC (6030) & VLSI (5183).



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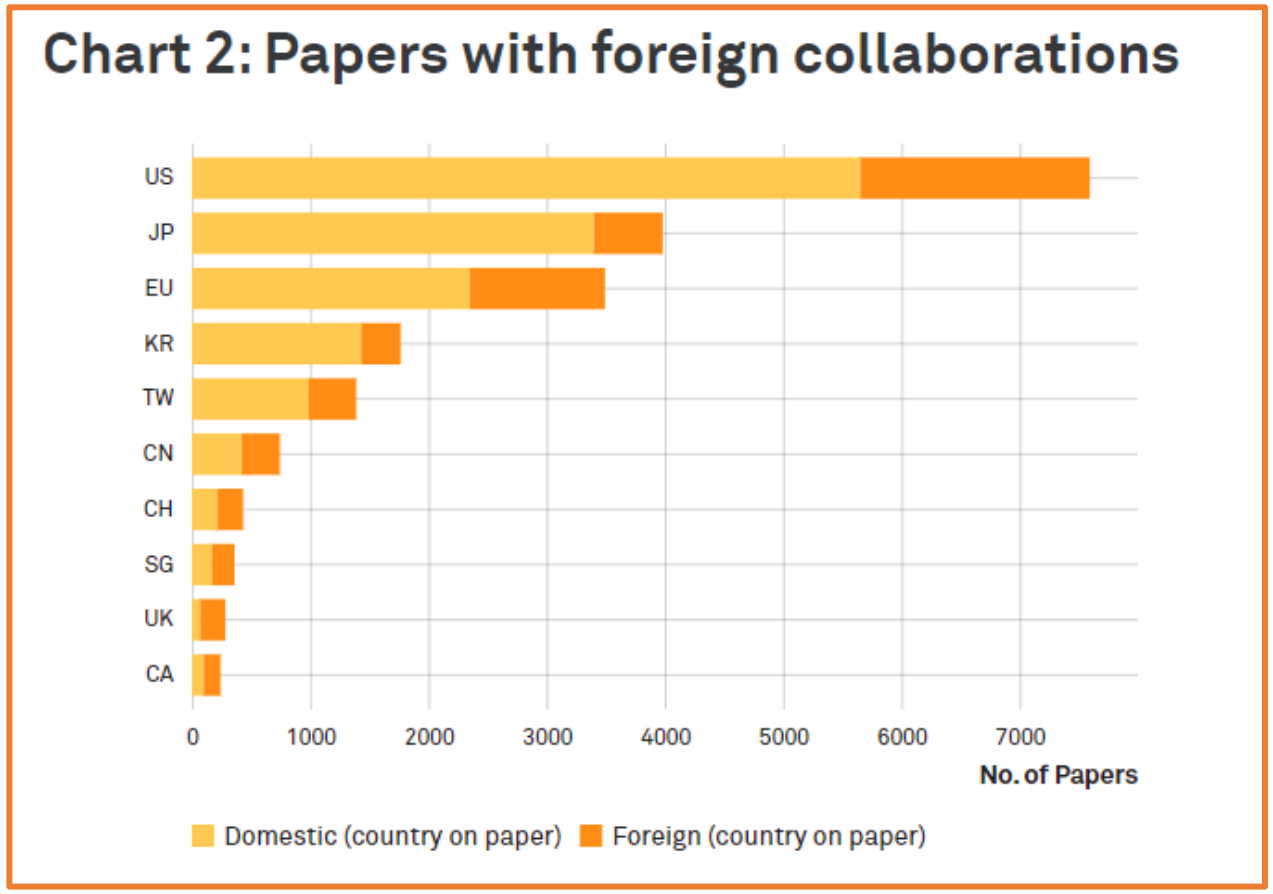
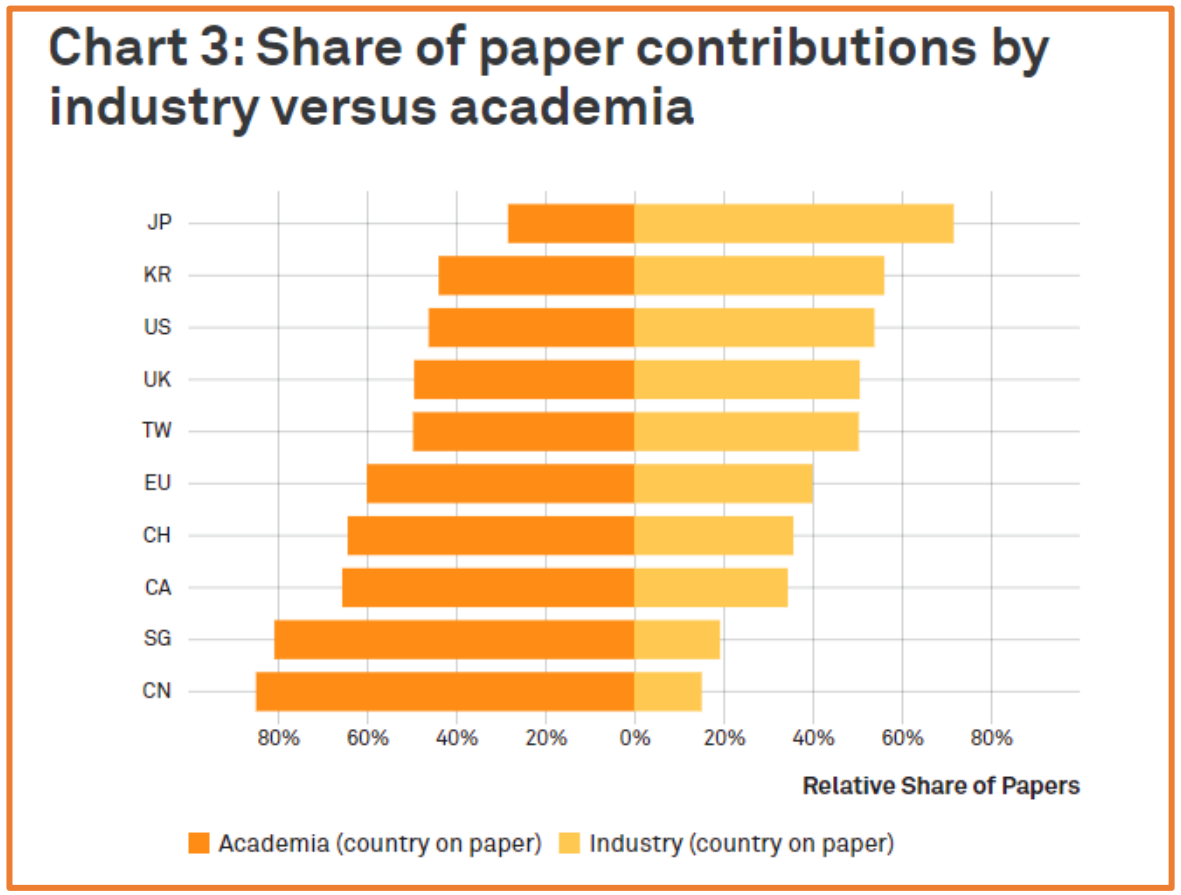
Different role of foreign collaborations & types of research power per country





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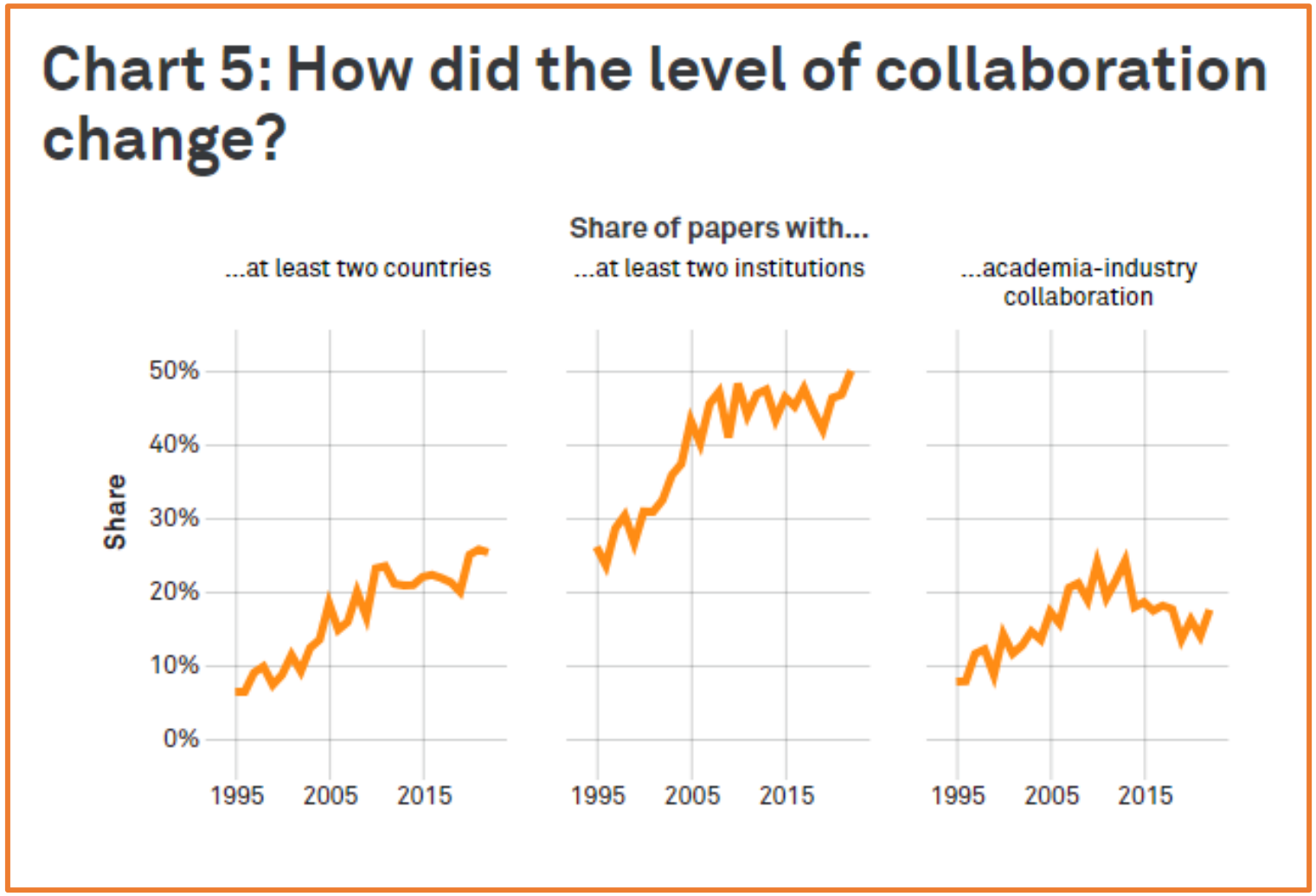
Decrease in collaborations between academia & industry, stagnation in foreign collaborations



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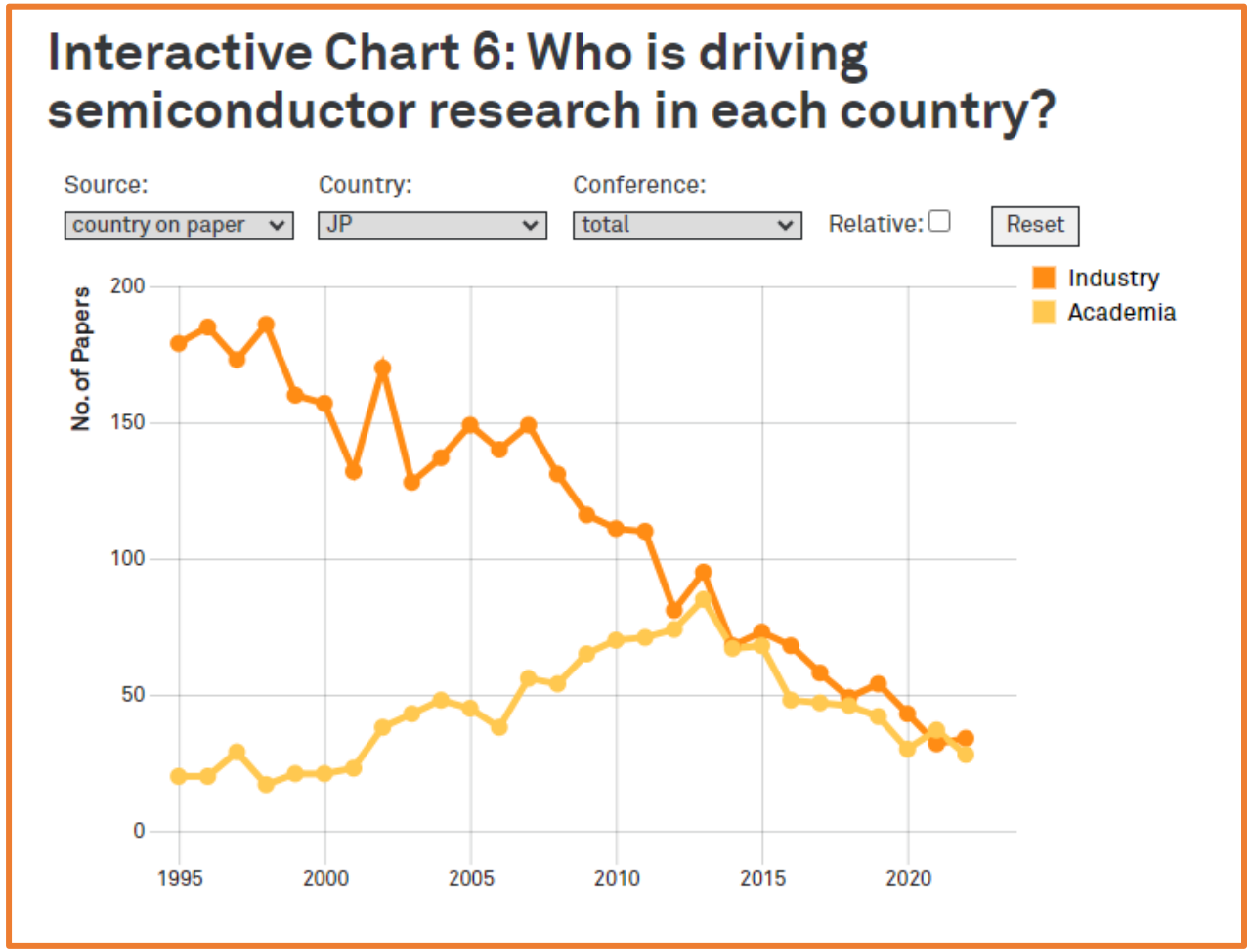
Two opposite directions: Japan's declining role



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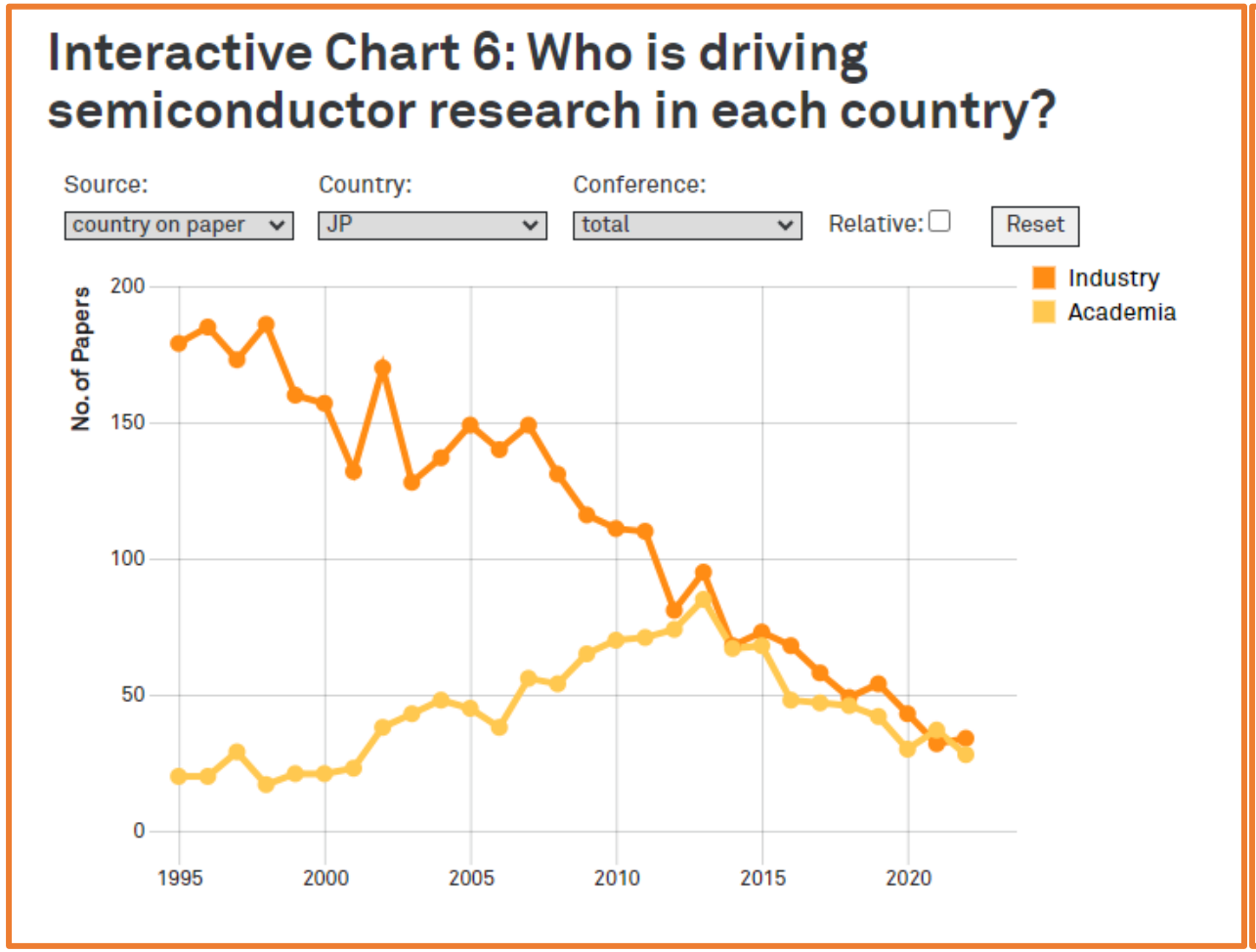
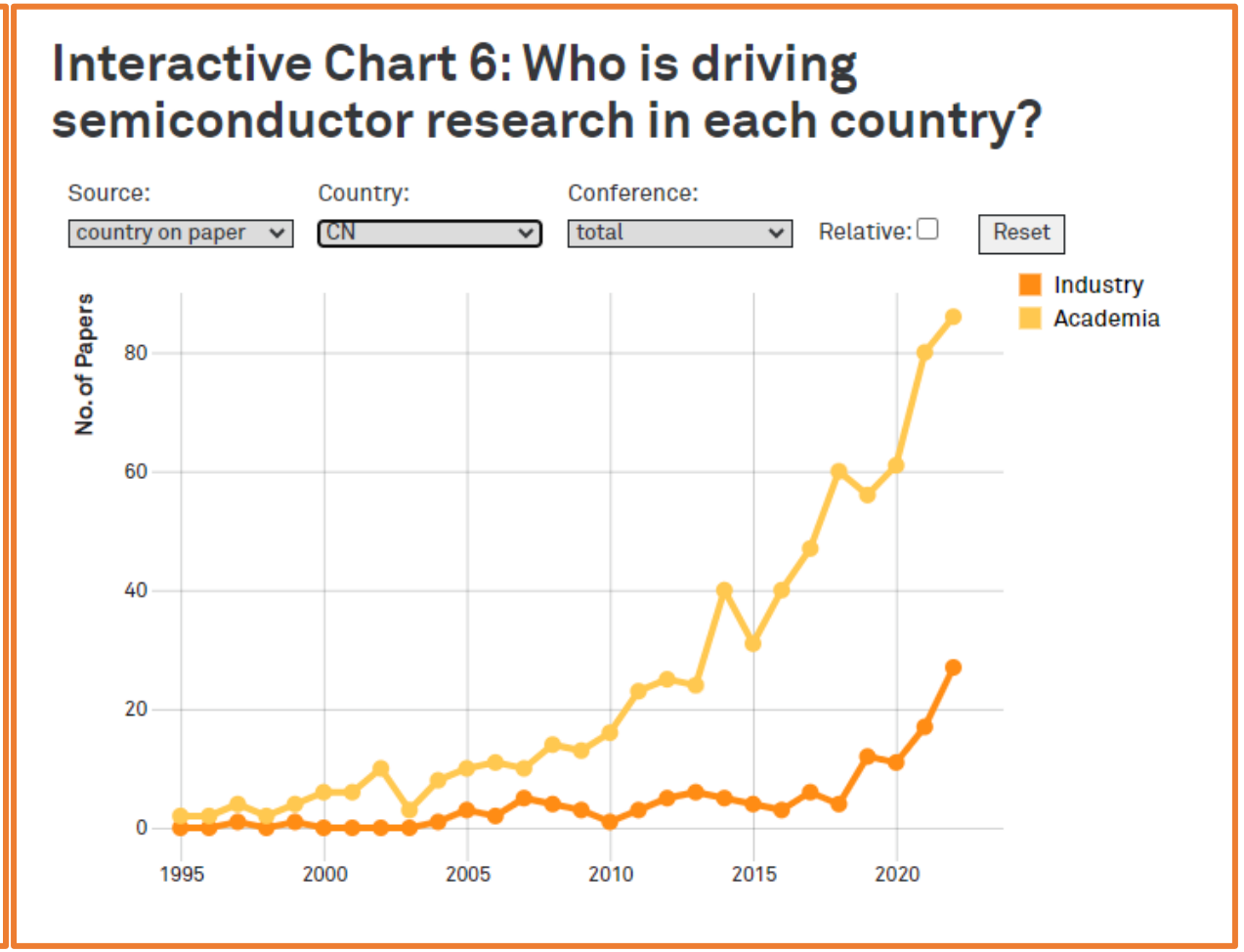
Two opposite directions: Japan's declining role vs. China catching up





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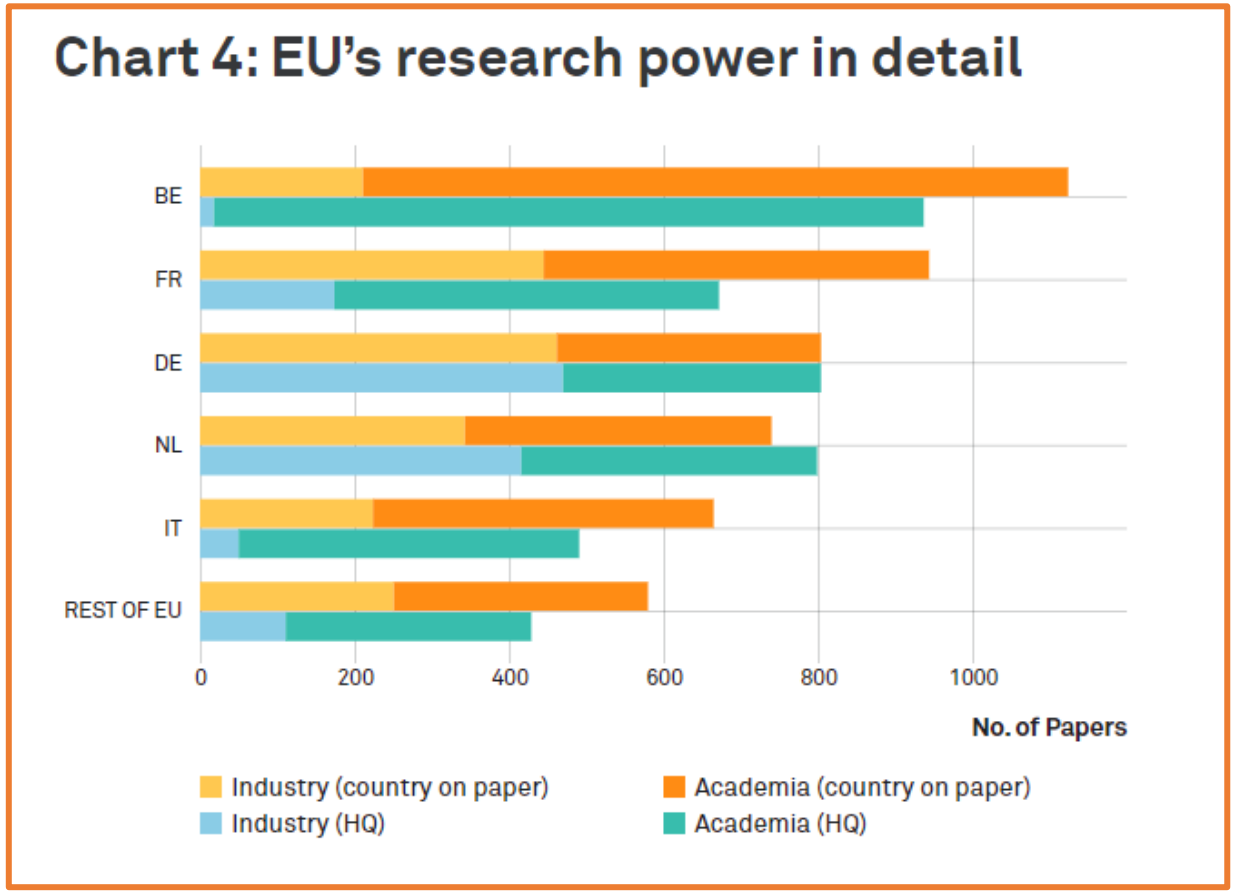
Only a handful member states account for the lion's share of EU's research power. Belgium leading in academia, Germany & France in industry R&D.



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EU industrial research power declines since 2010.

Chart 4: EU's research power in detail

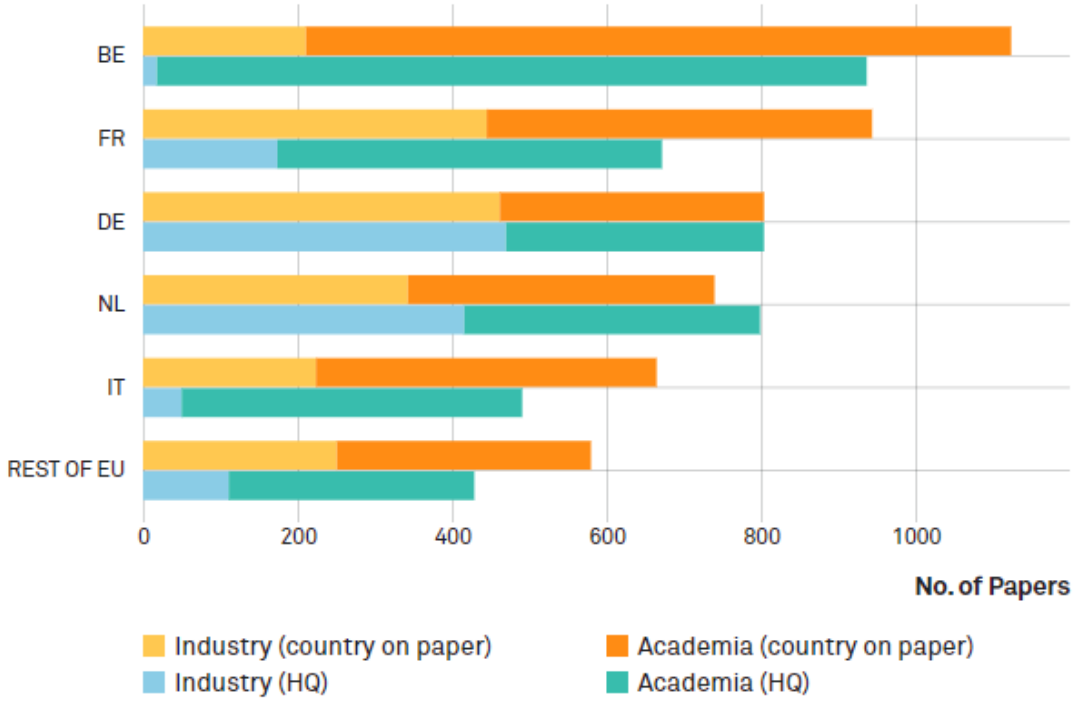
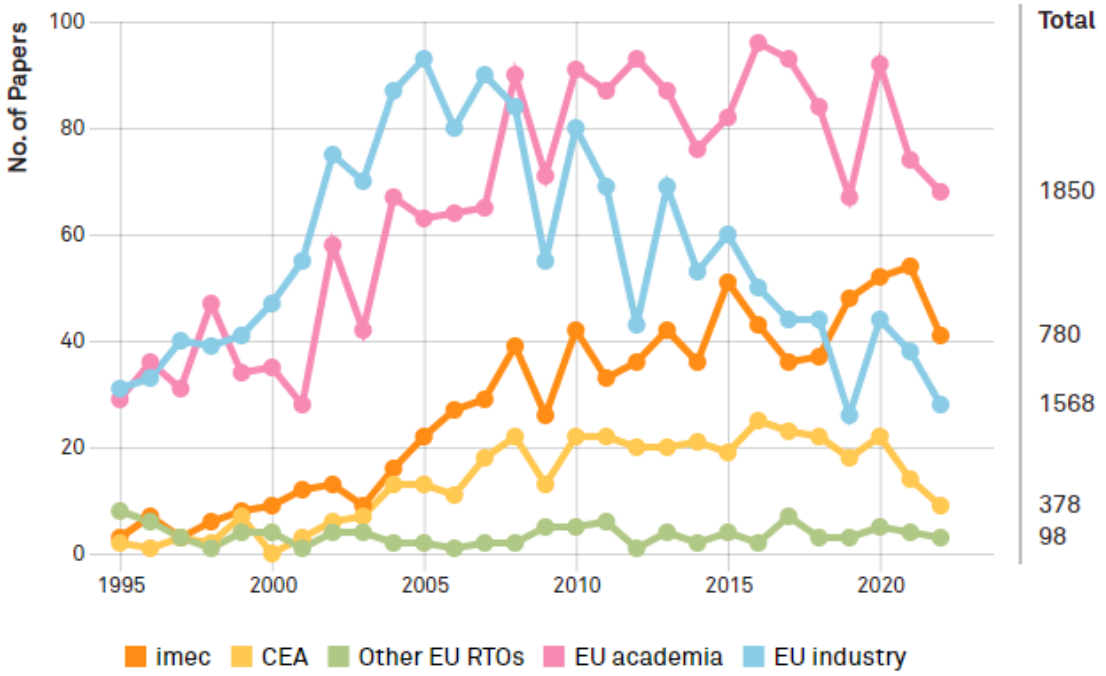


Chart 9: EU's research power – RTOs, academia, and industry



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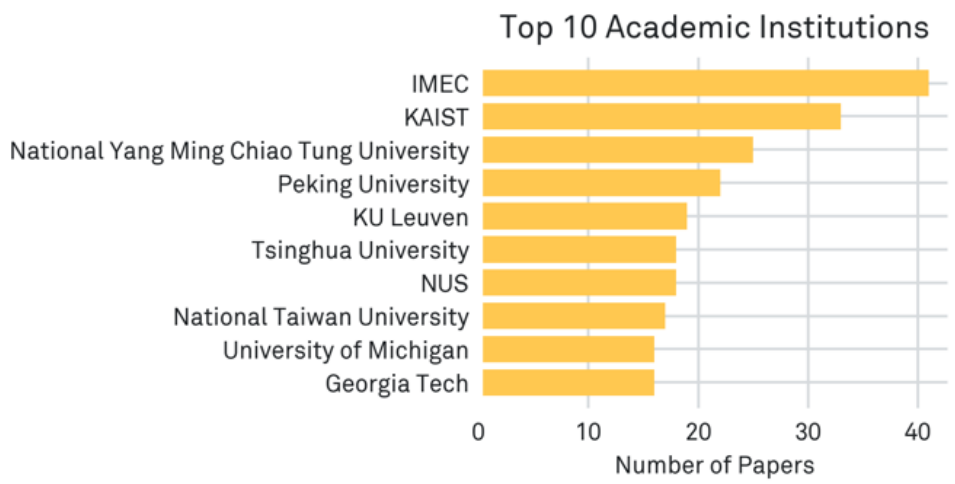
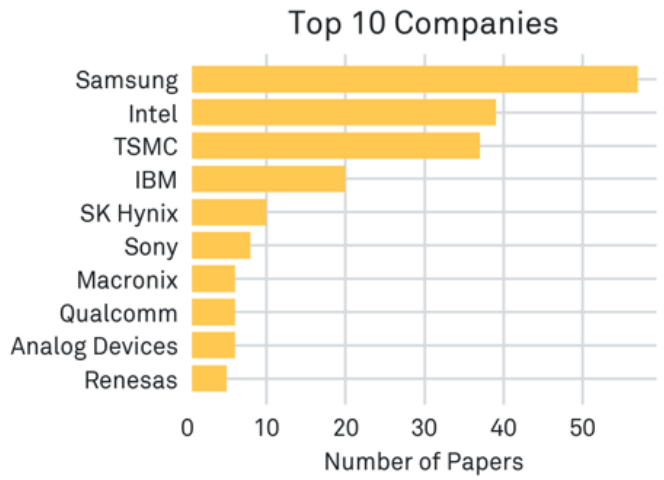
Global top 10 in academia & industry in 2022: EU at forefront of academic research





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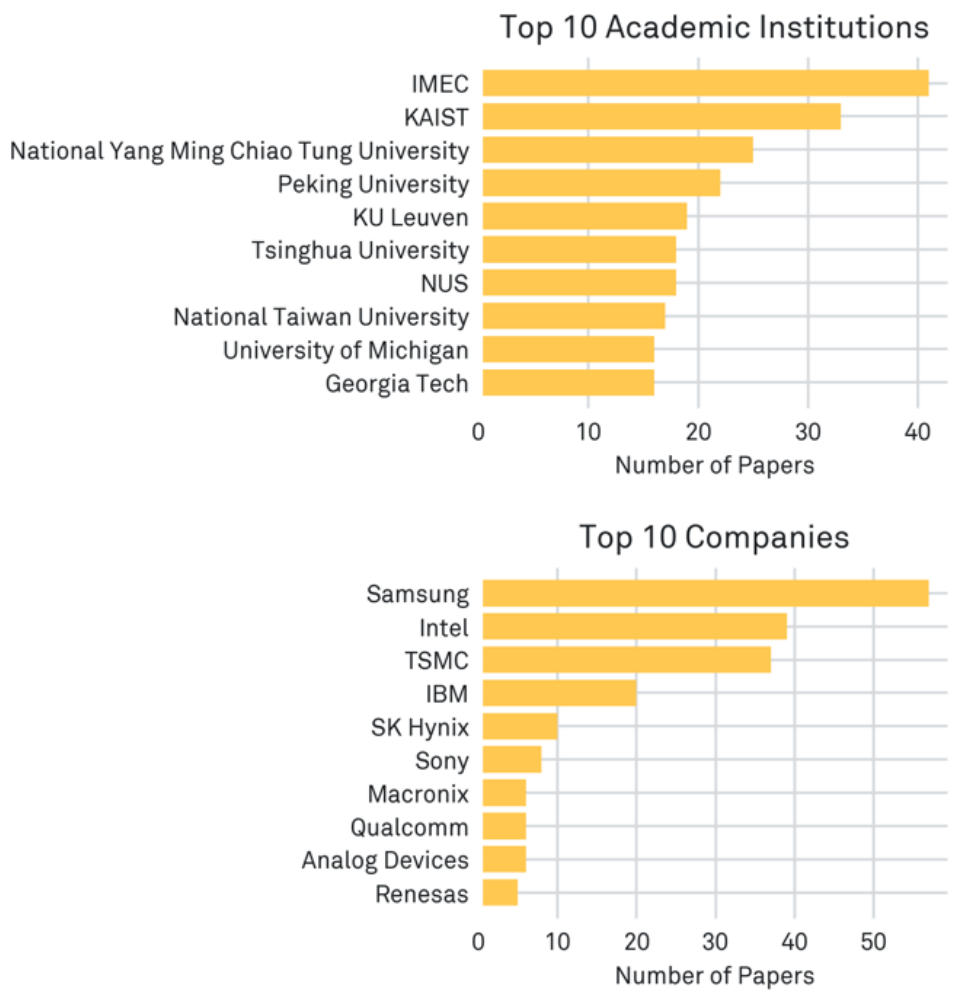
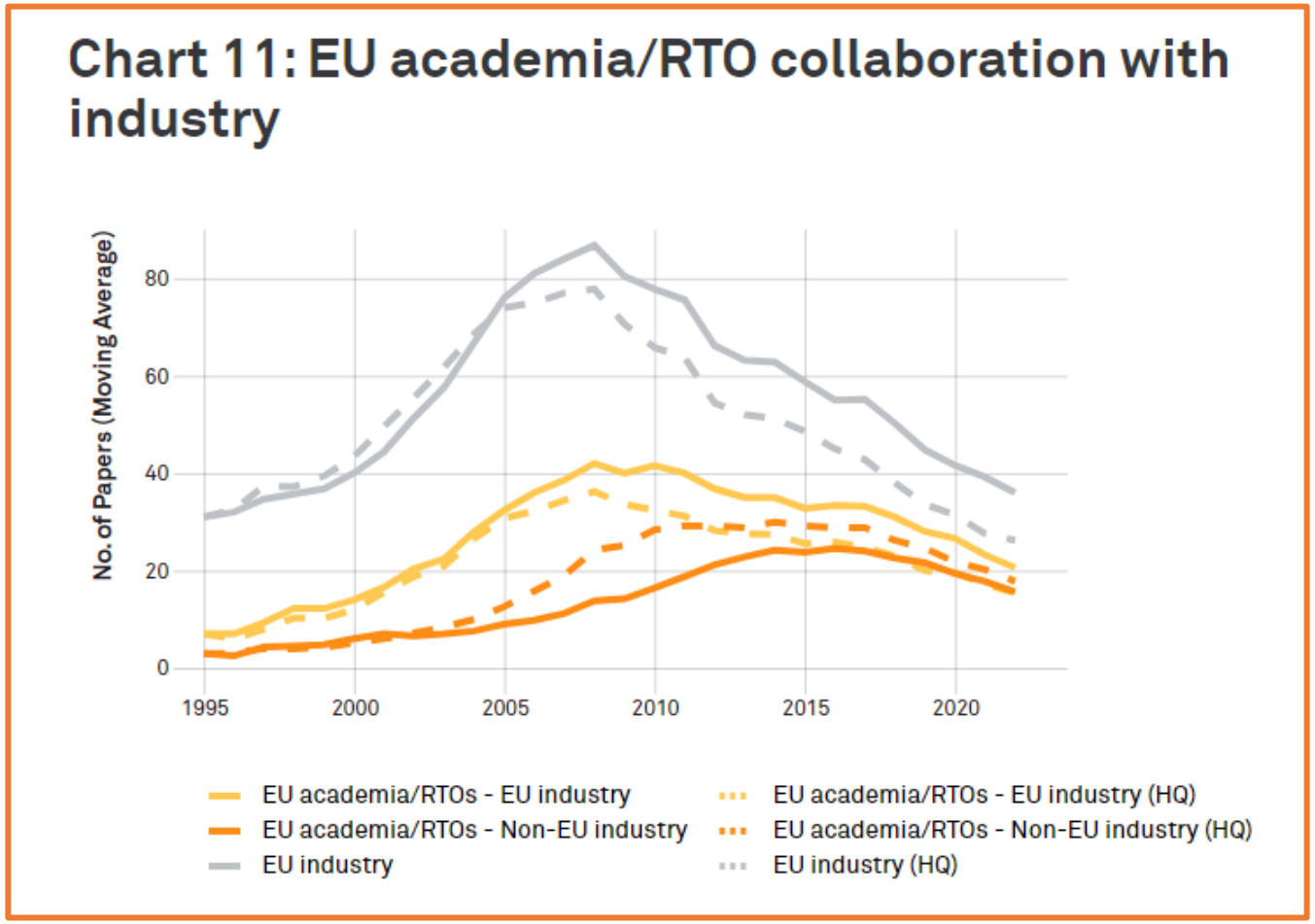
Global top 10 in academia & industry in 2022: EU at forefront of academic research, but increasingly cooperating with foreign companies.





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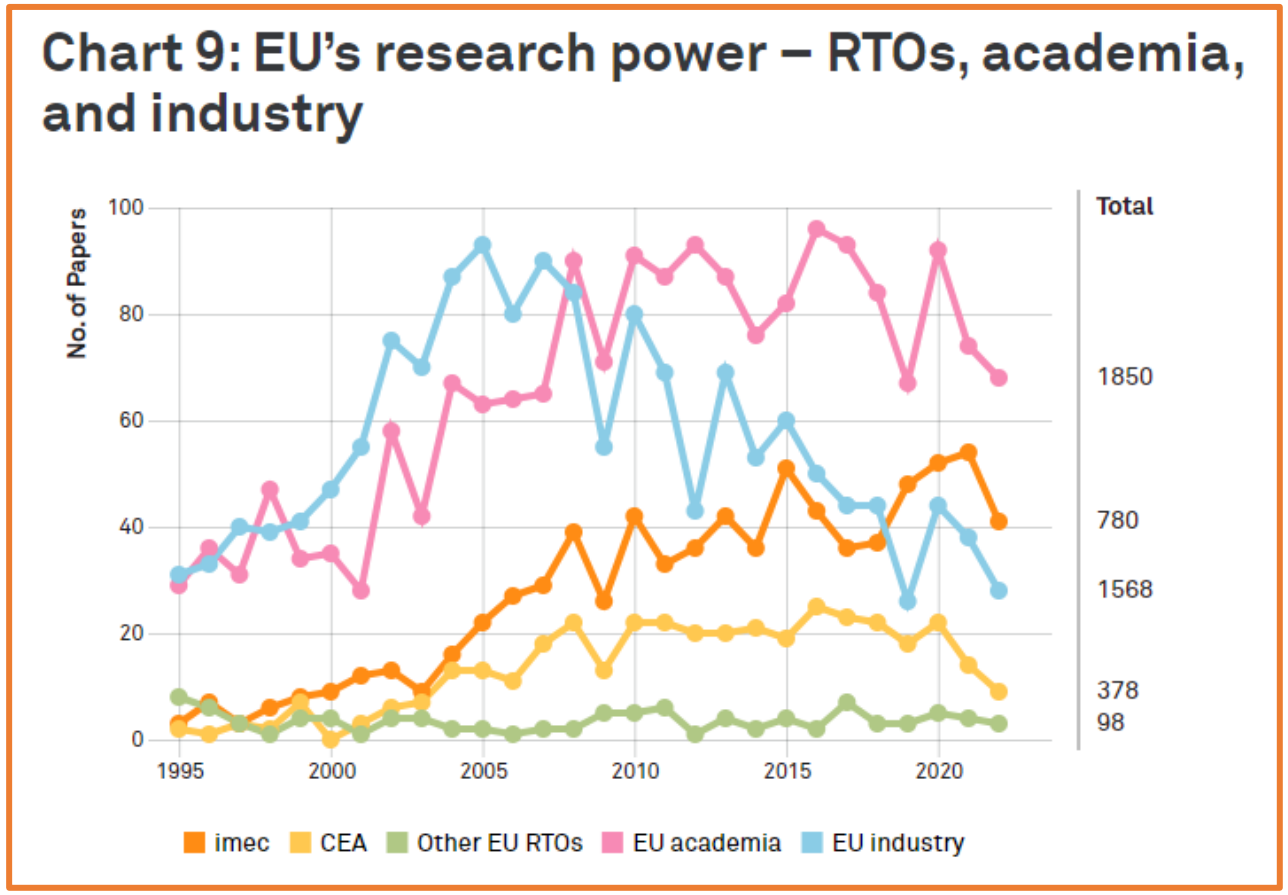
Take-away from the analysis: EU Academia stagnates, EU Industry declines



Parallel development of

a) a **downward trend in EU industrial research power** since 2010

a) a **stagnation of EU academic research power** (besides imec) since 2010

indicates that we need to **strengthen academic research power in EU now** to make sure that EU does not follow in the footsteps of Japan.

Conclusion: Open Silicon as one way to strengthen EU academic research power

Open Silicon (OSH, Open-EDA, Open-PDK) has the potential to democratize chip design.

- Lower barriers to entry, less capital-intensive, collaboration-oriented
- Clear potential: growing chip demand, shift from general-purpose to application-specific chips
- BUT importance and strength of EU Academia is currently politically underestimated & EU Chips Act overly focused on front-end manufacturing
- We need more capacity & attention within the Commission, e.g. in DG Connect and more attention from the Member States such as the open call for Open EDA from the German Ministry of Education and Research