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Türkiye Ekonomi Politikaları Araştırma Vakfı

Competing and Cooperating in the Asia-Pacific Region Amid a Changing Technology Landscape:

Leveraging Diversity for Technological Sovereignty and Complementary Strengths

Güven Sak

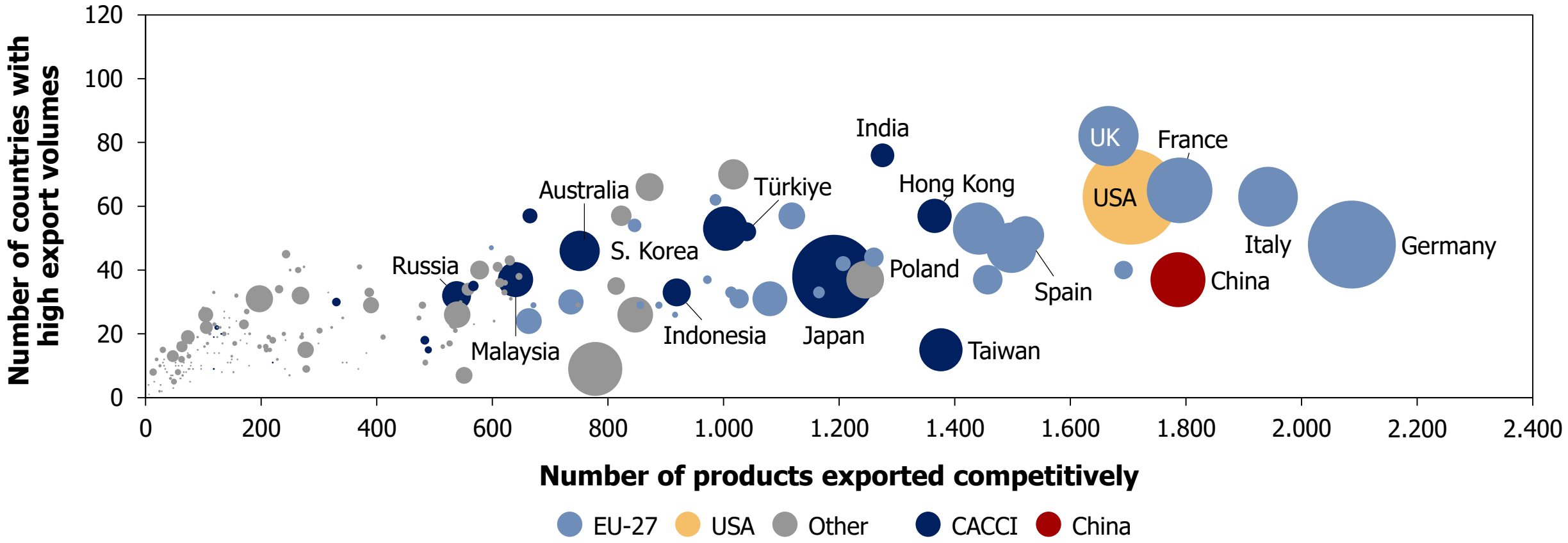
2 December 2025, CACCI

Framework

- The global landscape has fundamentally shifted
  - ➔ The global tech race is deepening: Technology reshapes economic and geopolitical power
  - ➔ There is a growing need to rethink new models of cooperation
- The new landscape brings both challenges and opportunities for CACCI
  - ➔ CACCI's positioning in the global technology era is diverse-heterogeneous and rapidly evolving
  - ➔ High-tech export growth ≠ technological sovereignty: Bridging the gap between scientific capability and industrial strength in critical technologies
  - ➔ CACCI's high-tech trade depends heavily on China and the US while high-tech trade within CACCI is limited
- Diversity and heterogeneity are assets, not obstacles, if leveraged for complementary specialization: Different members bring innovation, technology transfer capacity or market size
  - ➔ Building a CACCI Strategic Foresight Alliance
  - ➔ Establishing Joint R&D Platforms & CACCI Technology Investment Fund
  - ➔ Aligning standards and certification for critical technologies

In 1995, global competitiveness landscape was dominated by Western economies

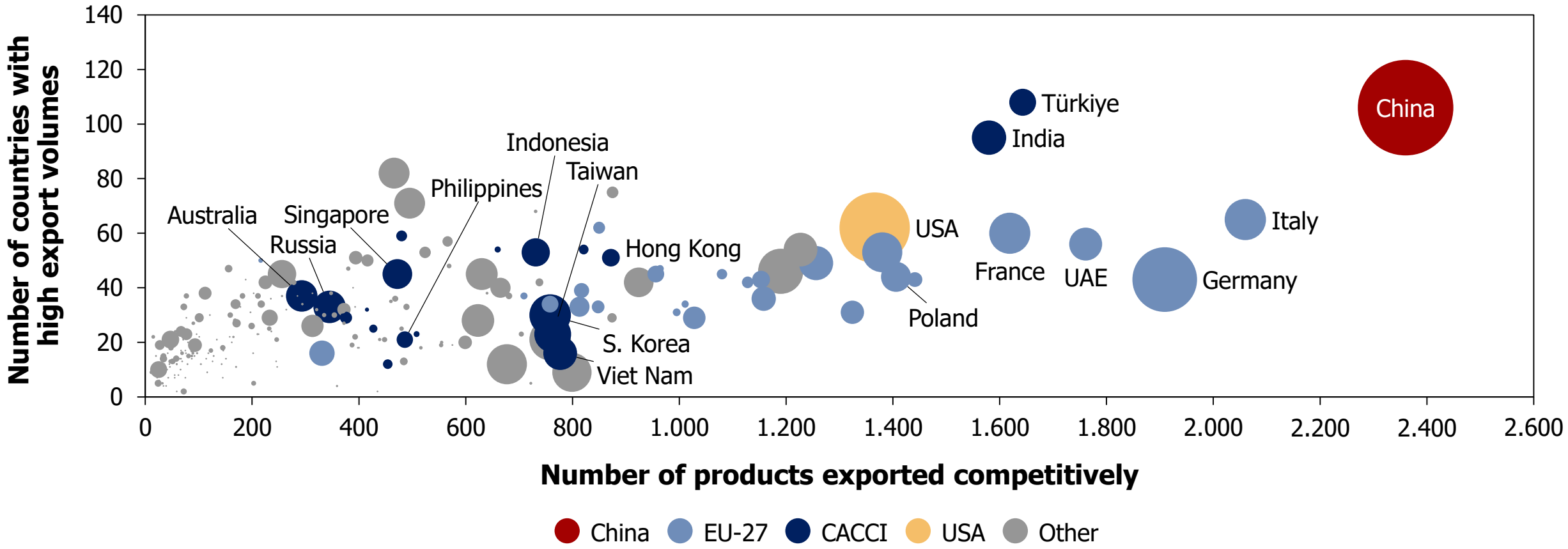
The state of global competitiveness, 1995



Note: The areas of the circles represent the country's export volumes.
Source: CEPII BACI

By 2023, the global supplier landscape has been shifted

The state of global competitiveness, 2023

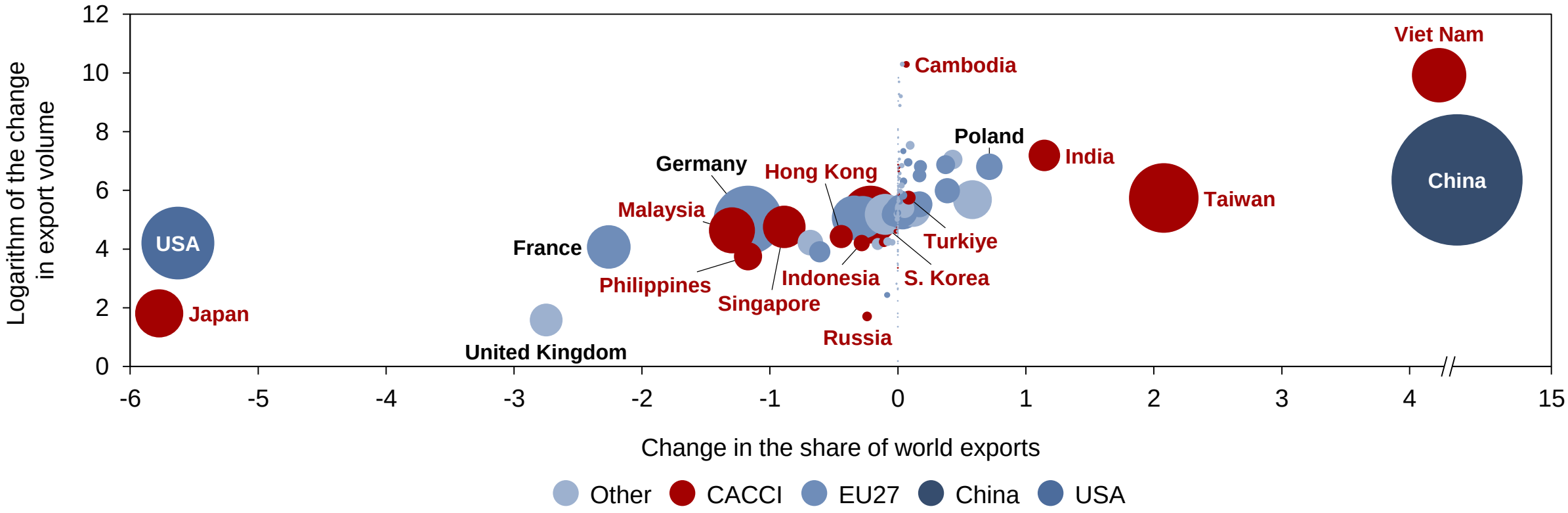


Note: The areas of the circles represent the country's export volumes.
Source: CEPII BACI

Who leads high-tech exports?

China is clearly the world's leading high-tech supplier and CACCI members have also shown remarkable performance in this new landscape

The global competitiveness outlook for high-technology sectors, 2003-2023

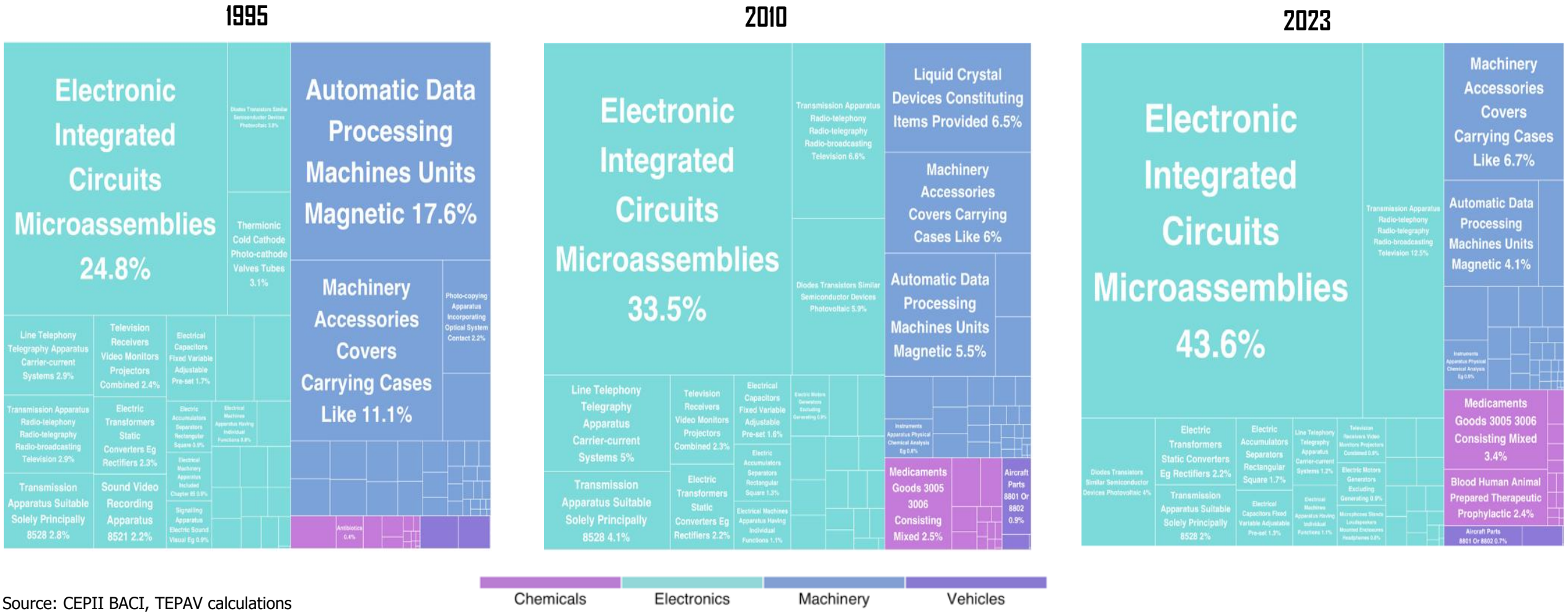


Note: The areas of the circles represent the country's export volumes.
Source: CEPII BACI

What CACCI exports in high-tech

Electronics have become increasingly central in CACCI trade

Sectoral distribution of CACCI's high-tech exports, 1995-2010-2023

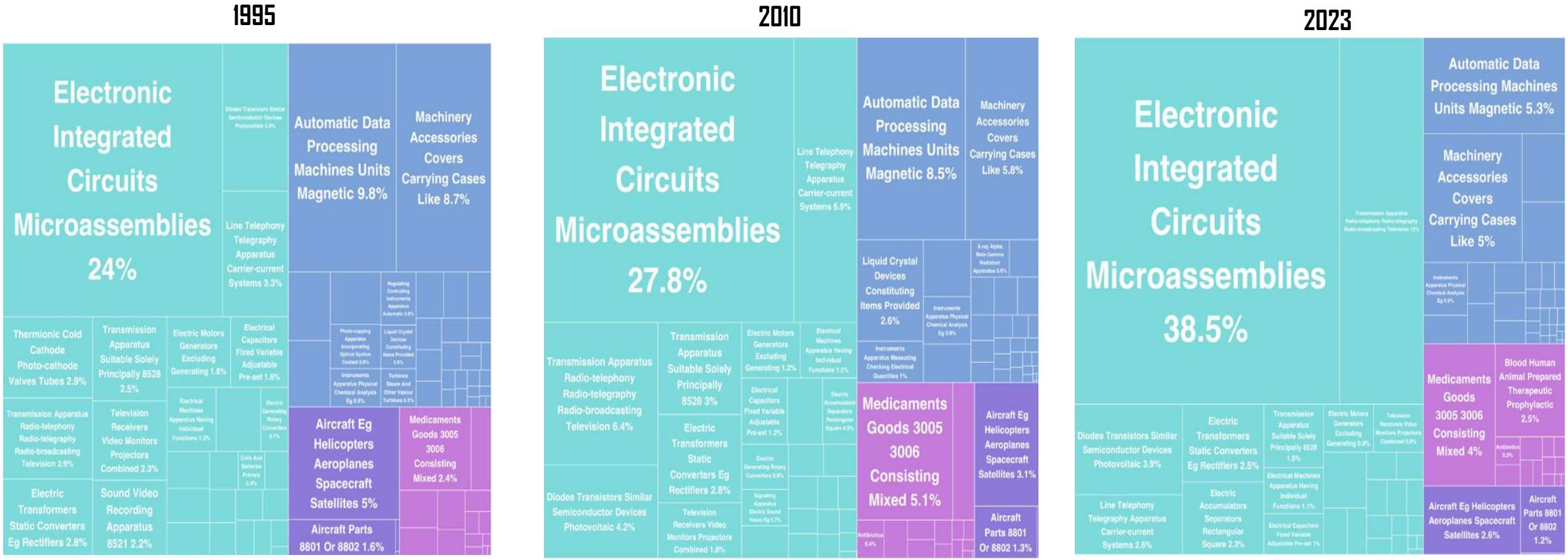


Source: CEPII BACI, TEPAV calculations

CACCI's high-tech exports and imports were nearly balanced in 2023

Exporting high-tech electronics requires importing high-tech components?

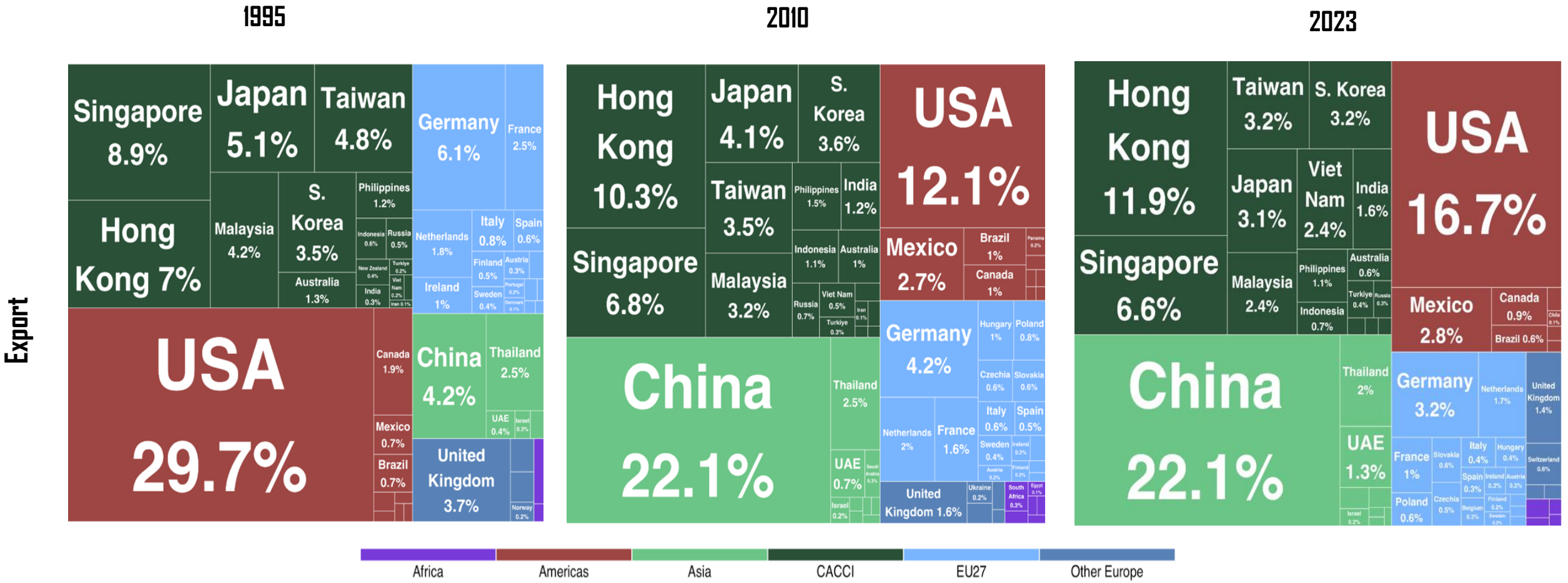
Sectoral distribution of CACCI's high-tech imports, 1995-2010-2023



Source: CEPII BACI, TEPAV calculations

CACCI's high-tech trade partners have changed significantly

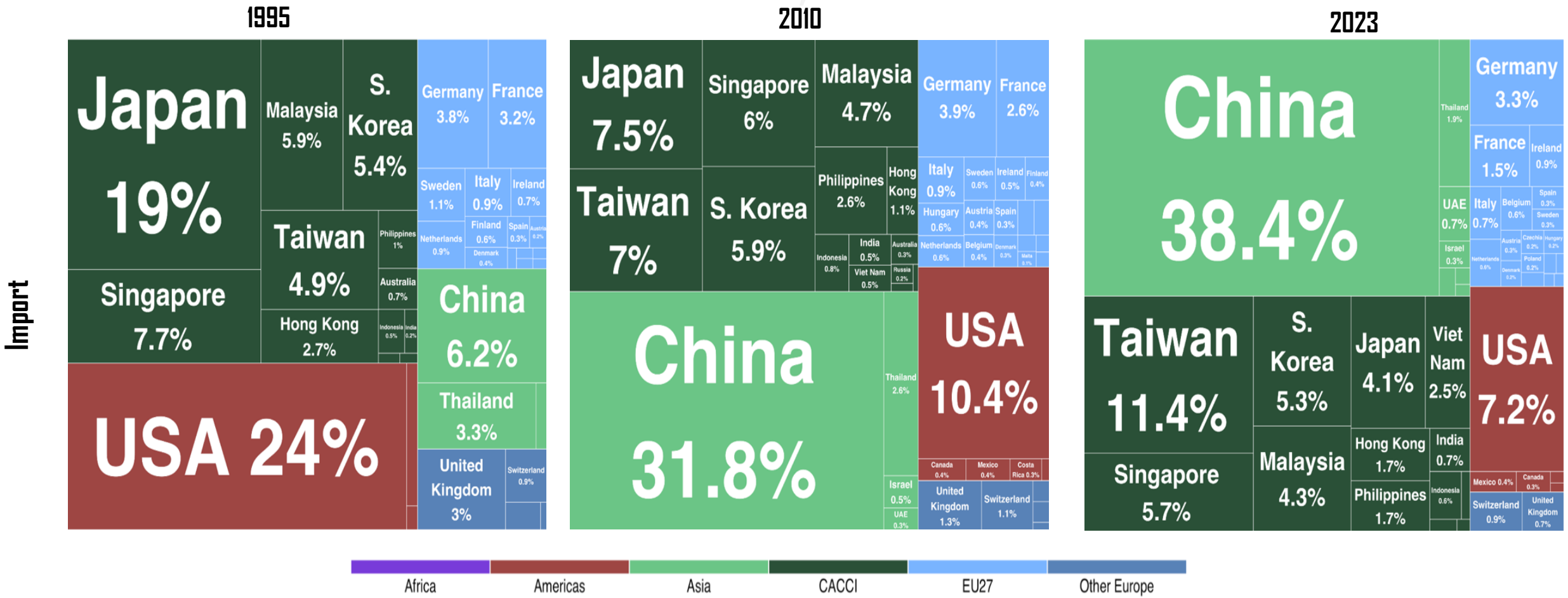
CACCI's high-tech trade partners by country, 1995-2010-2023



Source: CEPII BACI, TEPAV calculations

China's growing dominance in CACCI's high-tech imports

CACCI's high-tech trade partners by country, 1995-2010-2023



Source: CEPII BACI, TEPAV calculations

The technology level of new export products is as important as diversification itself

Number of competitive products added to the export basket and their total values between 2008 and 2023

Country	New products	USD per capita	USD (million, total value)
Australia	2	$4	$102
Azerbaijan	8	$976	$9,890
Bangladesh	9	$2	$283
Georgia	28	$85	$318
Hong Kong	6	$174	$1,310
Indonesia	16	$6	$18,000
India	17	$7	$9,410
Iran	39	$14	$1,200
Japan	4	$1	$118
Cambodia	49	$452	$7,690
S. Korea	16	$215	$11,100
Sri Lanka	14	$2	$181
Mongolia	2	$53	$186
Malaysia	24	$358	$11,800
Nepal	10	$2	$78
New Zealand	2	$1	$7
Pakistan	23	$7	$1,650
Philippines	25	$36	$3,990
Papua N.G.	2	$421	$5,180
Russia	15	$112	$16,300
Singapore	12	$1,250	$7,420
Tajikistan	12	$15	$155
Turkiye	32	$75	$6,400
Taiwan	7	$31	$714
Uzbekistan	68	$59	$2,140
Viet Nam	37	$712	$71,400

Source: The Growth Lab at Harvard University, TEPAV visualization

Who is ready to use and adapt new technologies?

High-tech export volume does not always align with critical technology capacity

Frontier Technology Readiness Index - CACCI Countries' Rankings

	2010	2017	2023
Australia	11	15	16
Azerbaijan	94	100	102
Bangladesh	122	108	111
Cambodia	152	113	109
Georgia	76	73	78
Hong Kong	20	17	14
India	56	53	35
Indonesia	78	74	75
Iran	79	77	72
Japan	9	20	20
Malaysia	44	38	42
Mongolia	106	106	94
Nepal	117	120	95
New Zealand	22	24	23
Pakistan	116	133	121
Papua New Guinea	151	150	140
Philippines	60	52	60
Russia	35	28	33
S. Korea	3	8	7
Singapore	10	5	5
Sri Lanka	98	87	87
Tajikistan	123	140	154
Turkiye	47	48	43
Uzbekistan	102	115	86
Viet Nam	66	62	64

- **High readiness:** South Korea, Singapore, Australia, Hong Kong, Japan
- **Moderate readiness:** New Zealand, India, Türkiye, Malaysia, Russia
- **Emerging readiness:** Vietnam, Iran, Indonesia, Philippines
- **Limited readiness:** Azerbaijan, Bangladesh, Cambodia, Georgia, Mongolia, Nepal, Pakistan, Papua New Guinea, Sri Lanka, Tajikistan, Uzbekistan

Source: UNCTAD Frontier Technology Index 2023 Data, TEPAV visualization

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Corporate R&D: Who leads the frontier technologies and global innovation landscape?

85% of global private-sector R&D spending from just 2,000 firms

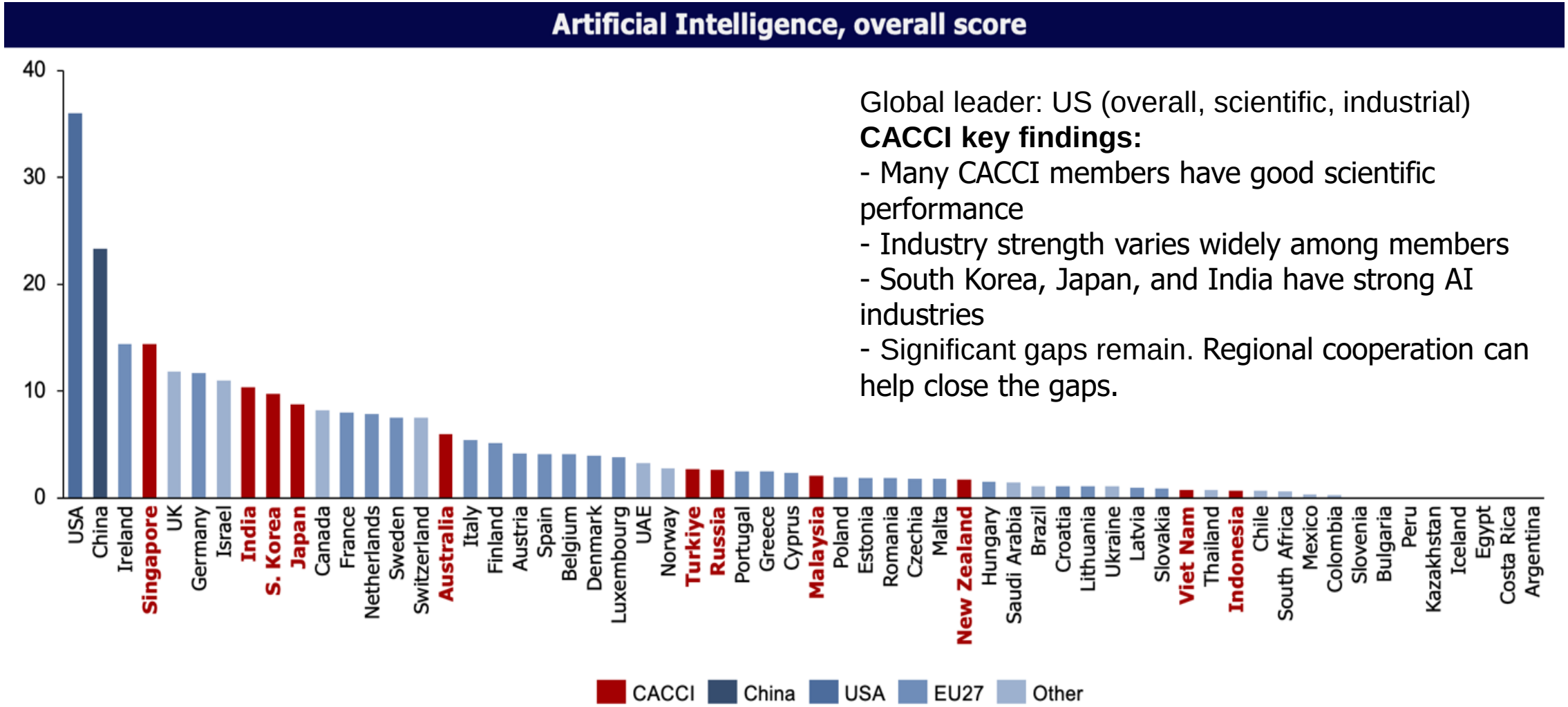
Distribution of companies with the highest R&D expenditures, 2024

Country	Region	Total R&D Expenditure (€ milllion)	Number of Company
USA	USA	531858.3	681
China	China	215813.8	524
Japan	CACCI	104790.5	185
Germany	EU27	111923.2	106
UK	Other	35441.9	63
Taiwan	CACCI	24794.9	55
France	EU27	33675.1	50
S. Korea	CACCI	42548.4	40
Switzerland	Other	36214.7	39
Netherlands	EU27	29853.7	33
Canada	Other	8241.9	24
Ireland	EU27	10371.9	24
Denmark	EU27	9878.3	23
Sweden	EU27	15278.0	22
Israel	Other	3713.3	19
Italy	EU27	5427.7	17
India	CACCI	5318.7	15
Spain	EU27	5666.9	11
Austria	EU27	1952.0	11
Finland	EU27	5426.4	9

Country	Region	Total R&D Expenditure (€ milllion)	Number of Company
Belgium	EU27	3169.6	9
Singapore	CACCI	2694.2	8
Australia	CACCI	4167.1	7
Brazil	Other	1751.9	4
Luxembourg	EU27	1910.2	3
Saudi Arabia	Other	1666.1	2
Norway	Other	784.7	2
New Zealand	CACCI	327.3	2
Türkiye	CACCI	263.7	1
Colombia	Other	494.6	1
UAE	Other	335.9	1
Hungary	EU27	204.5	1
Thailand	Other	102.5	1
Indonesia	CACCI	205.6	1
Malta	EU27	94.8	1
Portugal	EU27	222.3	1
Slovenia	EU27	178.6	1
Vietnam	CACCI	95.5	1
Iceland	Other	94.5	1
Liechtenstein	Other	489.1	1

Source: EU Industrial R&D Scoreboard 2024 , TEPAV visualization

CACCI's position in critical technologies:
I. Artificial Intelligence: CACCI's Competitive Position



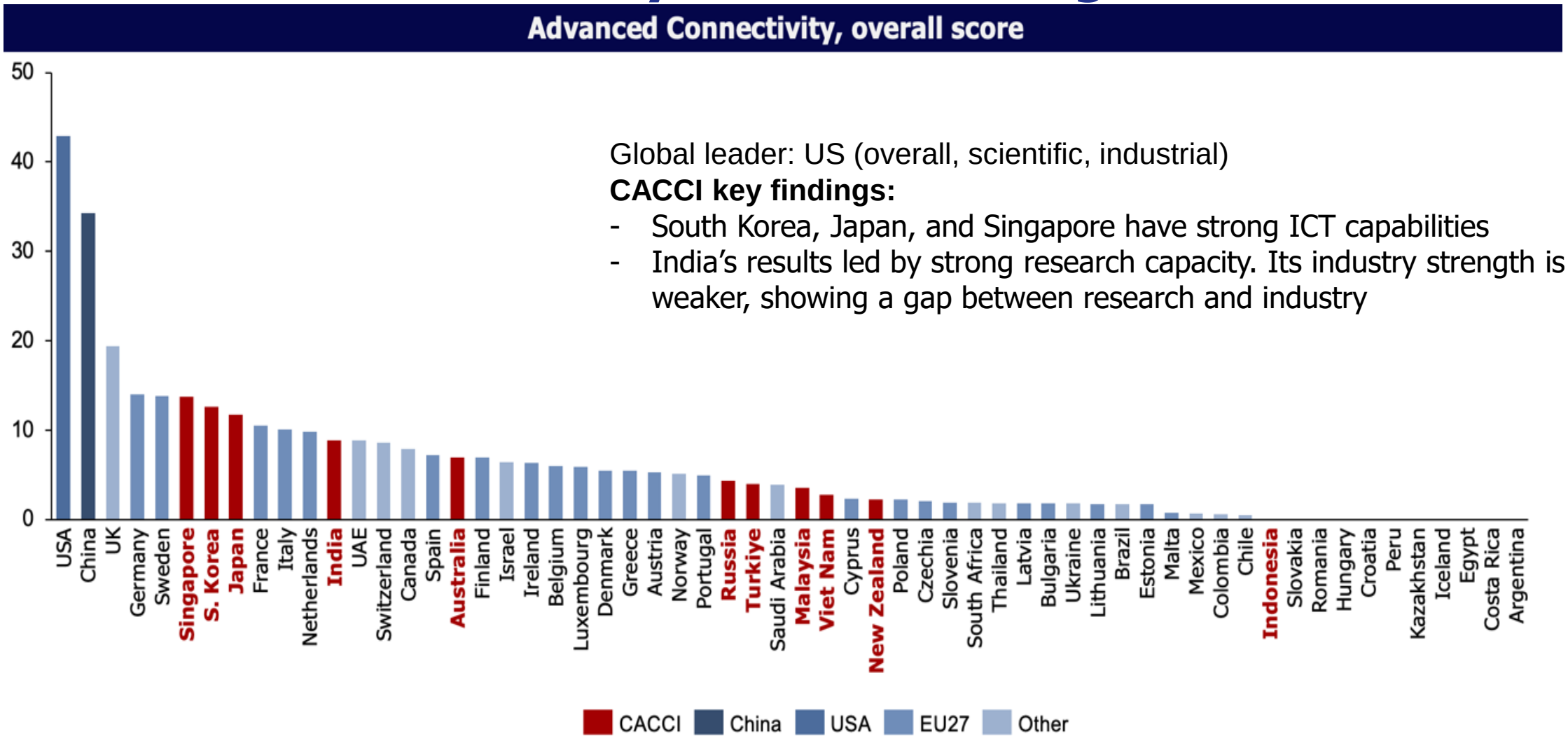
Global leader: US (overall, scientific, industrial)

CACCI key findings:

- Many CACCI members have good scientific performance
- Industry strength varies widely among members
- South Korea, Japan, and India have strong AI industries
- Significant gaps remain. Regional cooperation can help close the gaps.

Source: OECD Statistics, TEPAV calculations

CACCI's position in critical technologies:
II. Advanced Connectivity: CACCI's Stronger Domain



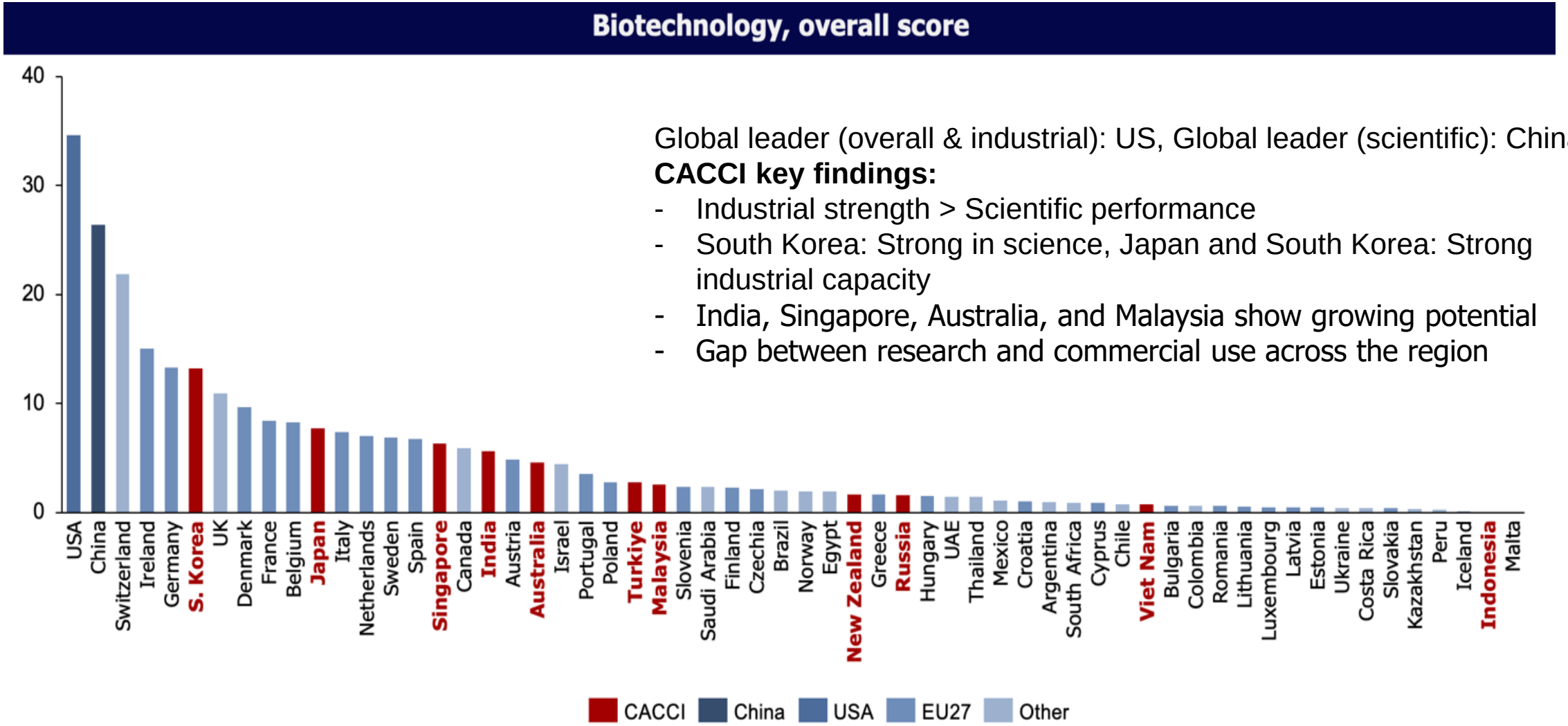
Global leader: US (overall, scientific, industrial)

CACCI key findings:

- South Korea, Japan, and Singapore have strong ICT capabilities
- India's results led by strong research capacity. Its industry strength is weaker, showing a gap between research and industry

Source: OECD Statistics, TEPAV calculations

CACCI's position in critical technologies:
III. Biotechnology: Where CACCI needs to catch up



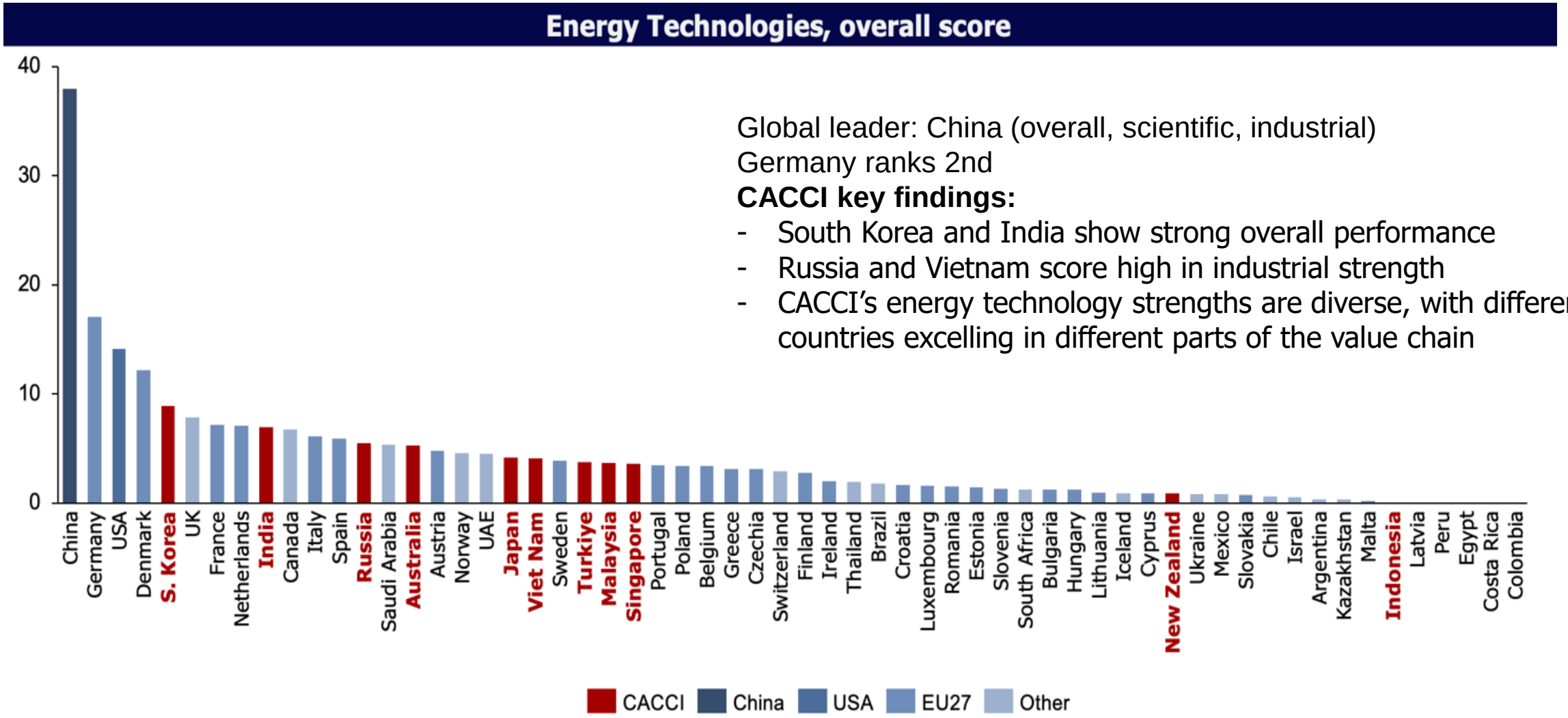
Global leader (overall & industrial): US, Global leader (scientific): China

CACCI key findings:

- Industrial strength > Scientific performance
- South Korea: Strong in science, Japan and South Korea: Strong industrial capacity
- India, Singapore, Australia, and Malaysia show growing potential
- Gap between research and commercial use across the region

Source: OECD Statistics, TEPAV calculations

CACCI's position in critical technologies:
IV. Energy Technologies: CACCI's relatively weak overall performance



Global leader: China (overall, scientific, industrial)
Germany ranks 2nd

CACCI key findings:

- South Korea and India show strong overall performance
- Russia and Vietnam score high in industrial strength
- CACCI's energy technology strengths are diverse, with different countries excelling in different parts of the value chain

Source: OECD Statistics, TEPAV calculations

CACCI is relatively closer to the global frontier in AI (52%) and Advanced Connectivity (61%)

Overall CACCI proximity to global best practice in AI and Advanced Connectivity

AI	Overall score	Scientific Performance (Weight 33%)	Industry Strength (Weight 67%)
CACCI	52%	47%	55%
China	49%	81%	33%
EU27	62%	57%	64%
USA	73%	70%	75%

ADVANCED CONNECTIVITY	Overall score	Scientific Performance (Weight 33%)	Industry Strength (Weight 67%)
CACCI	61%	60%	62%
China	63%	69%	60%
EU27	71%	68%	72%
USA	73%	71%	74%

Source: OECD Statistics, TEPAV calculations

CACCI faces more serious gaps in Biotechnology (28%) and Energy Technologies (43%)

Overall CACCI proximity to global best practice in Biotechnology and Energy Technologies

BIOTECHNOLOGY	Overall score	Scientific Performance (Weight 33%)	Industry Strength (Weight 67%)
CACCI	28%	30%	27%
China	51%	95%	30%
EU27	65%	54%	70%
USA	64%	48%	72%

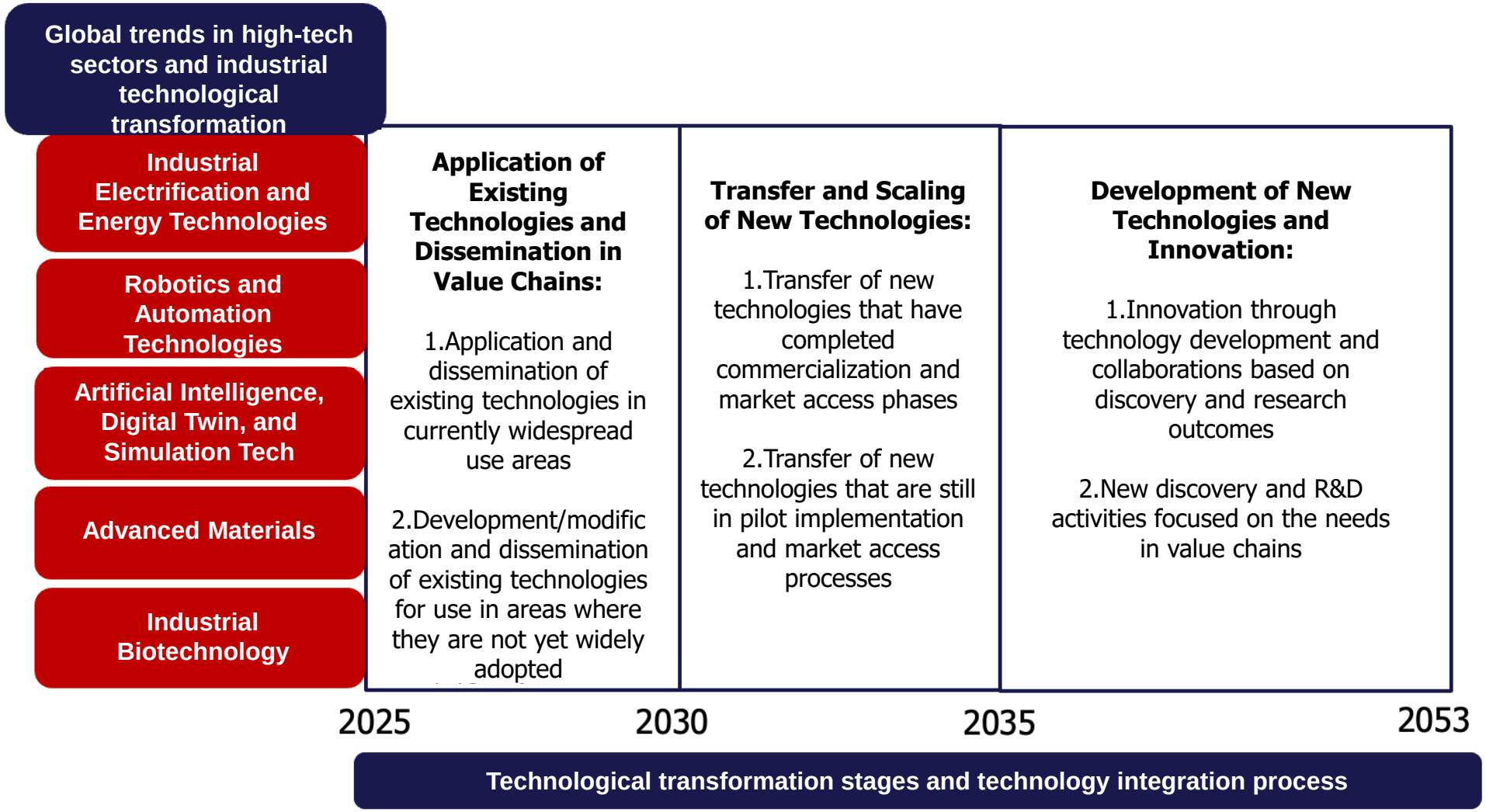
ENERGY TECHNOLOGIES	Overall score	Scientific Performance (Weight 33%)	Industry Strength (Weight 67%)
CACCI	43%	39%	44%
China	78%	99%	67%
EU27	69%	62%	72%
USA	46%	53%	42%

Source: OECD Statistics, TEPAV calculations

Key takeaways

- CACCI's mix of technology leaders, growing technology ecosystems, and developing members is a strength. It allows for partnerships where different countries can specialize in different parts of a broader technology ecosystem
- High-tech export success does not automatically reflect strong technology ecosystems or long-term innovation capacity in critical technologies
- CACCI countries are more connected to global powers like China and the US in high-tech trade than to each other
- A recurring pattern is the gap between CACCI's scientific performance and its industrial strength

Innovation is no longer linear, new technologies require different capabilities and policy tools at different stages



Rethinking targeted industrial policy and technology cooperation in CACCI: Where to start?

Building a CACCI Strategic Foresight Alliance

- Shared data systems, trend monitoring tools, scenario planning capabilities, help member countries align strategies
- Public-private dialogue
- Benefits:

Better coordination among member countries
Faster response to global shifts
Early warning mechanisms for risks
Evidence-based decision making in critical technologies

Joint R&D Platforms in critical technologies and CACCI Technology Investment Fund

- Support early-stage R&D and commercialization efforts jointly
- Risk-sharing mechanisms for early-stage technologies
- Focus early-stage R&D (Biotechnology and Energy technologies, where gaps are largest) and scale-up (AI and Advanced connectivity to increase industrial competitiveness
- Promote cross-border technology clusters in selected critical technology areas
- Platforms as knowledge exchange and learning mechanisms
- Co-funding schemes for private-sector cooperation

*Complements Joint R&D platforms and Foresight Alliance

Aligning standards and certification for critical technologies

Regulatory alignment:

- Harmonize technical standards
- Align testing procedures
- Create unified certification systems for selected technologies
- Public-private dialogue mechanism

Benefits:

- Speed up product/technology deployment-diffusion
- Enable joint product/technology development

Conclusion: Rethinking targeted industrial policy and technology cooperation

- There is a growing need to rethink new models of cooperation
  - ➔ In the deepening global technology race, competitiveness now depends on building capabilities in new technologies and deploying new technologies in major global markets
- CACCI's diversity is an asset if leveraged for complementary specialization and technology cooperation
  - ➔ Innovation is no longer linear: new technologies need different skills, tools, and policies at each stage of development and diffusion
  - ➔ Strong science alone is not enough, success depends on turning research into real industry impact
  - ➔ Export growth does not always mean domestic innovation strength, technology capacity building remains essential
- There is a need to move from a single national approach to collaborative regional ecosystems
  - ➔ Cross-border technology clusters, joint R&D platforms, and shared investment funds can turn diversity into strength
  - ➔ Building shared technology capabilities and policy alignment can increase technological sovereignty in critical technologies