

Analysis of the International Economic Landscape to Identify Cooperation Opportunities

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To learn more about the chip ecosystem, please refer to the
ICOS reports on which this presentation is based



Economic analysis of the EU and International semiconductor ecosystem

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Project Acronym: ICOS
Project Title: International Cooperation On Semiconductors
Responsible: DECISION Etudes & Conseil
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 icos-semiconductors.eu



Monitoring semiconductor value chains: Implications for International Cooperation

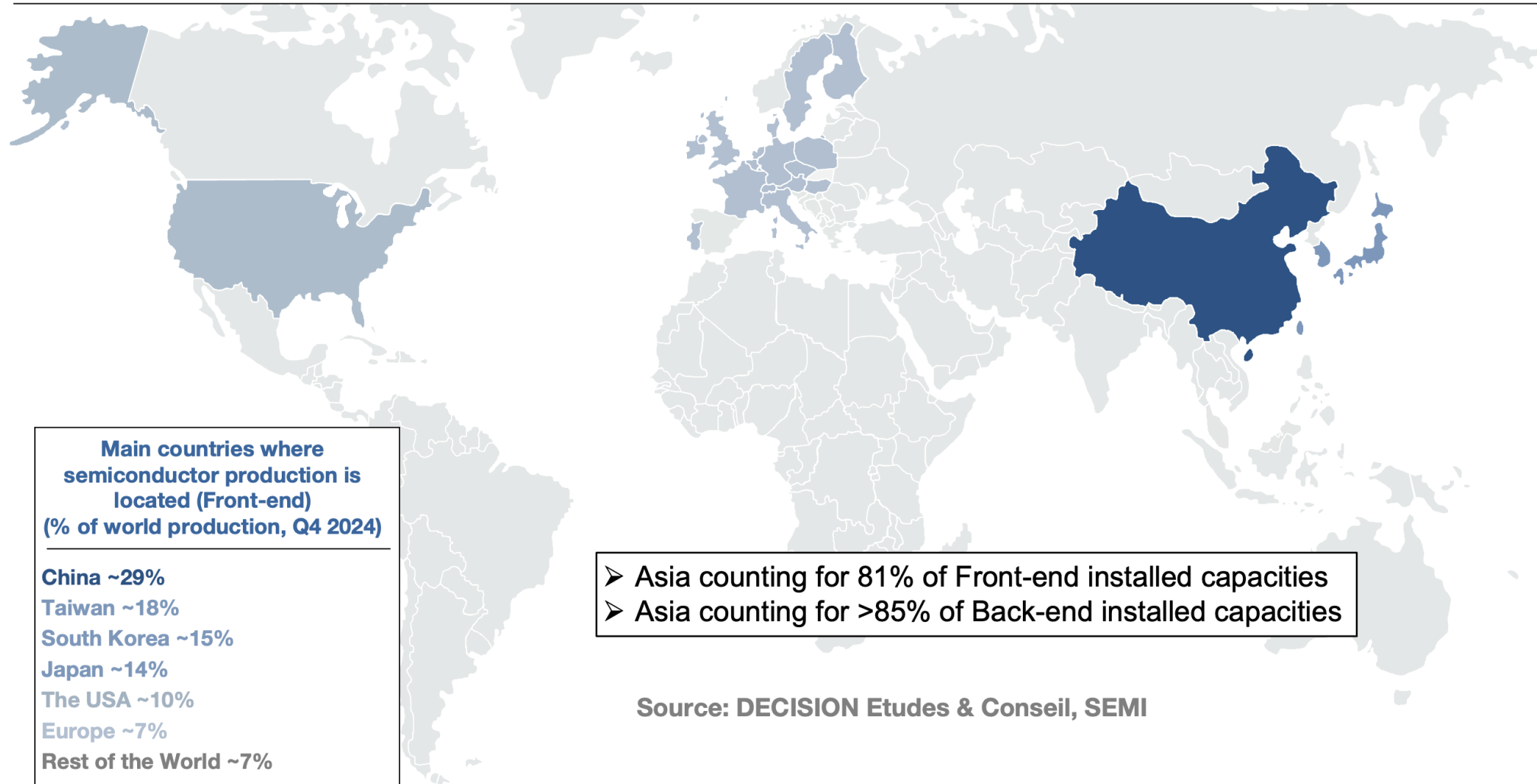
Project Number: 101092562
Project Acronym: ICOS
Project Title: International Cooperation On Semiconductors
Responsible: CEZAMAT WUT
Submission date: 30th June 2025

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1. **Global Competitive Landscape of Leading Semiconductor Nations**
2. 1990s - 2020s: Semiconductors at the Heart of the Geopolitical Shift
3. China's Rise and U.S. Industrial Policy Tools Aimed at Containment
4. Consequences on Trades, Companies and Third Countries
5. Recommendations for the EU

Semiconductor Manufacturing Installed Capacities, Q4 2024

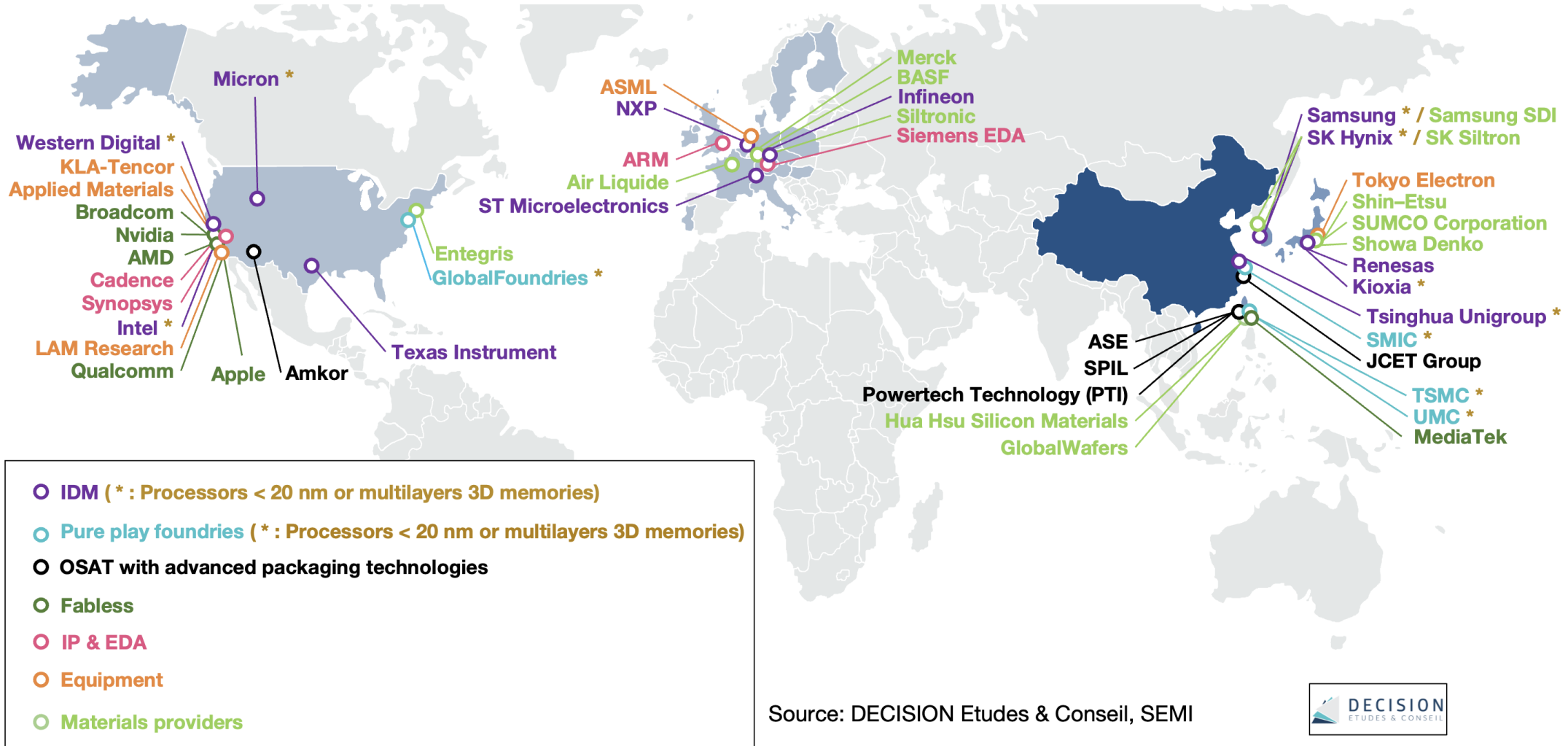


Global Competitive Landscape of Leading Semiconductor Nations

Considering the entire value chain, from materials to design and finished chips:

- The U.S. remains the historical leader, aiming for full-spectrum control of the value chain. However, while U.S. companies still hold by far the largest global market shares, China has already overtaken the U.S. in terms of workforce, fabs, and installed capacity across the value chain. In particular, the U.S. has developed a key strategic dependency on Taiwan for advanced semiconductor manufacturing—a strategic vulnerability, especially in the event of China’s reunification with Taiwan.
- China officially announced its ambition to achieve full control of the semiconductor value chain in 2015 through its Made in China 2025 plan. Since then, China has been growing dozens of companies across every segment of the value chain. Chinese companies have already overtaken EU and Japanese companies in terms of market shares. They are expected to overtake Korean and Taiwanese companies within the next five years. Beyond 2030, only U.S. companies are expected to retain higher market shares than Chinese firms.
- Taiwan and South Korea remain the leading manufacturing hubs for semiconductors. However, their new strategic priorities include advanced packaging and AI chip design.
- Japan and the EU are in similar positions: historical leaders of the value chain, with challenged positions but strong assets in IDMs, equipment, tools, and materials. They aim to preserve their strengths while investing in emerging technologies.

Global Semiconductor Landscape in 2024

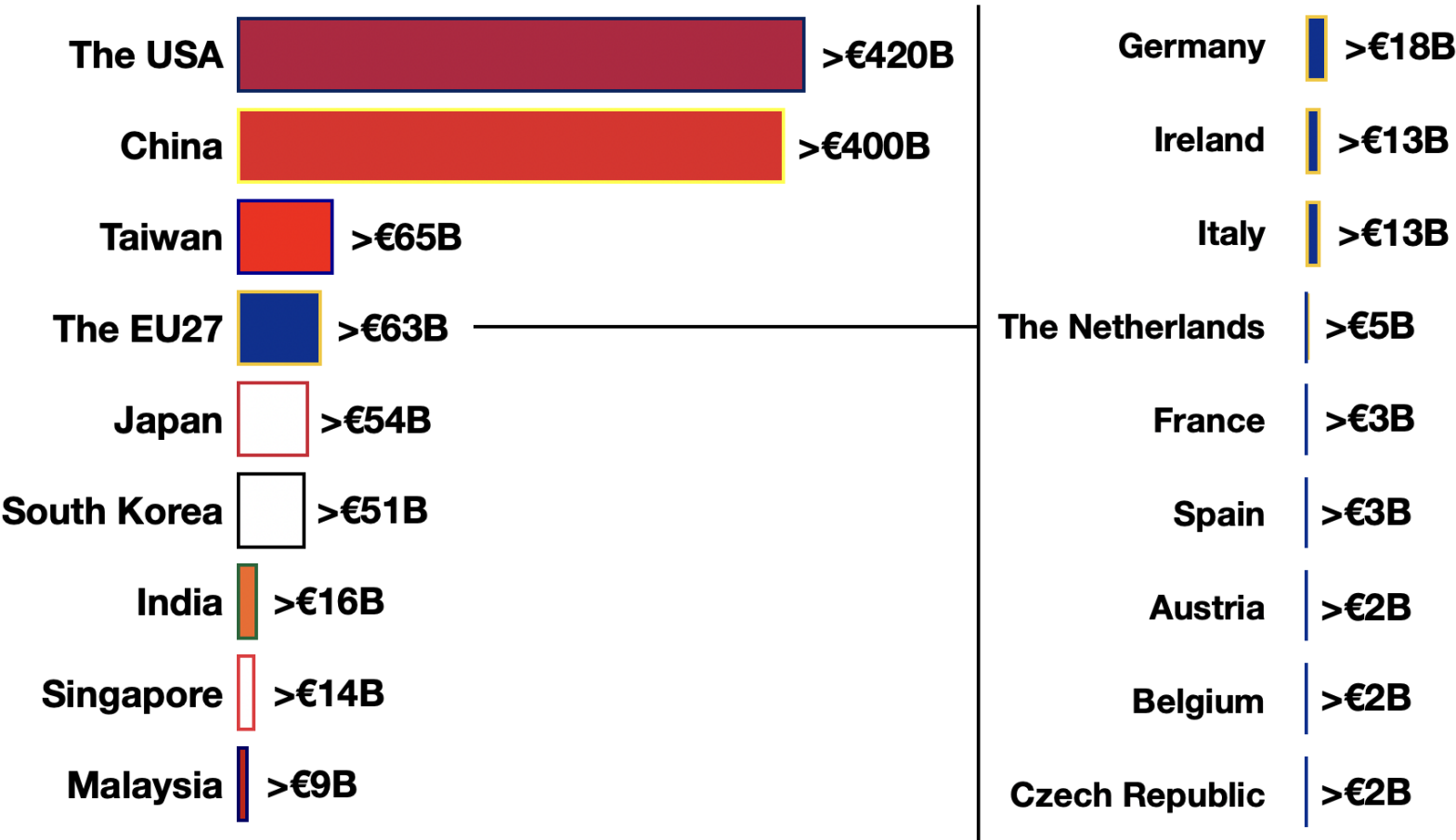


Source: DECISION Etudes & Conseil, SEMI

Status of investments

- China + Taiwan > The USA
- 3 groups of countries
 - The USA & China > 400
 - Taiwan, the EU27, Japan, South Korea [50;70]
 - Other countries (mostly Asian) [5;16]
- EU fragmented

Confirmed Ongoing Semiconductor Investments by Country/Region (Scope limited to projects exceeding €1 billion)



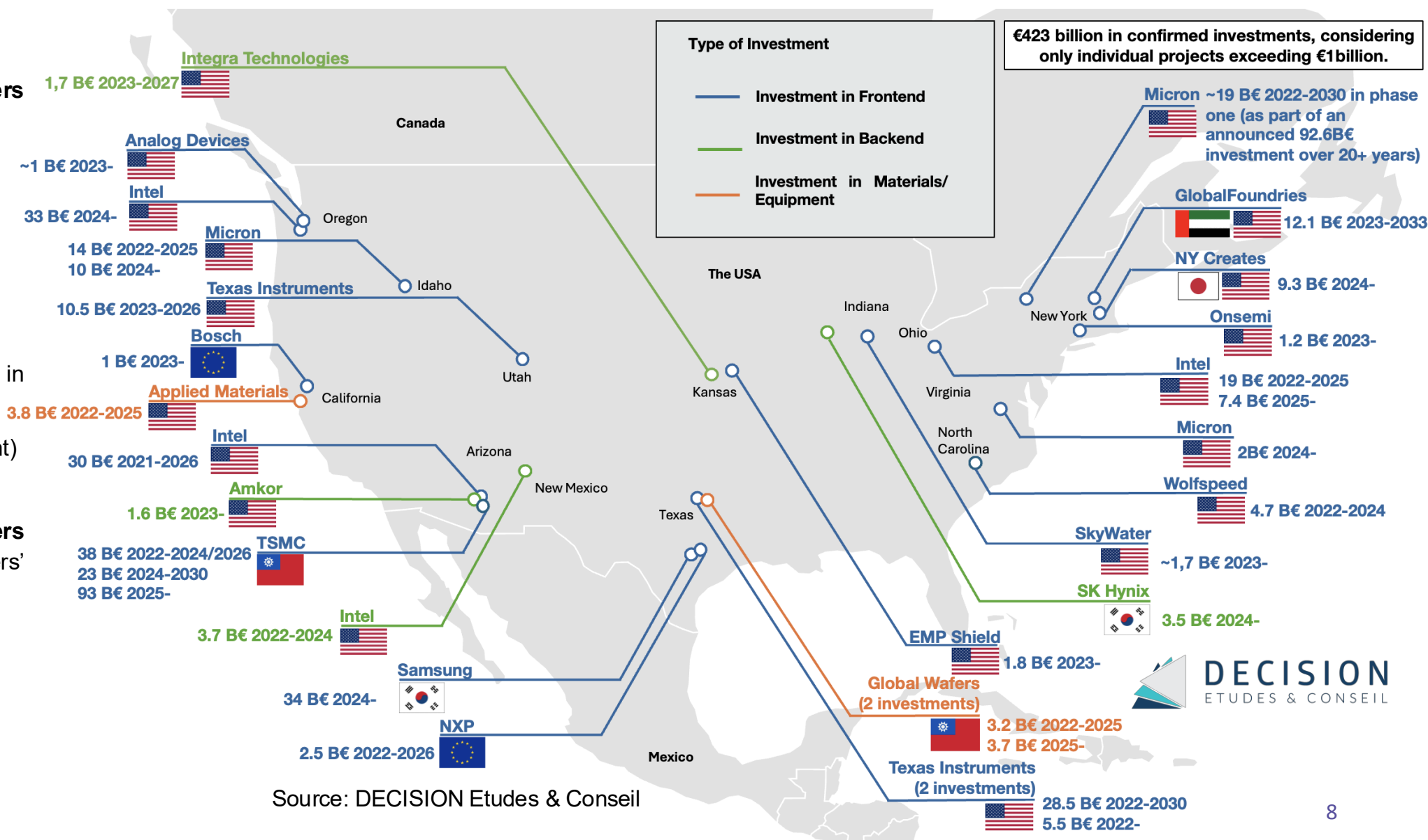
Investment from global leaders in advanced processing

- **TSMC:** €154B
- **Intel:** €89B
- **Samsung:** €34B

Nvidia

- Up to \$500 billion investment in U.S. 2026-2030 3.8
- (April 14, 2025, announcement)

US Dependency in Raw Wafers addressed through Global Wafers' Investment.



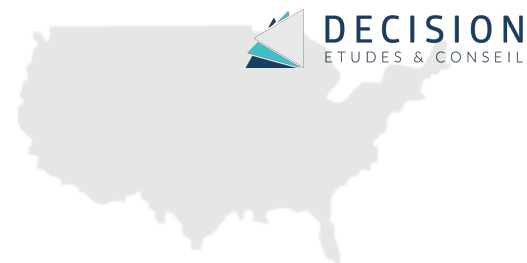
The US and China: The Only Two Countries Aiming to Master the Entire Semiconductor Value Chain

Main US strengths

- Design
 - AMD
 - BROADCOM
 - Cadence
 - NVIDIA
 - Qualcomm
 - SYNOPSYS
- Equipment
 - Lam RESEARCH
 - APPLIED MATERIALS
 - KLA Tencor

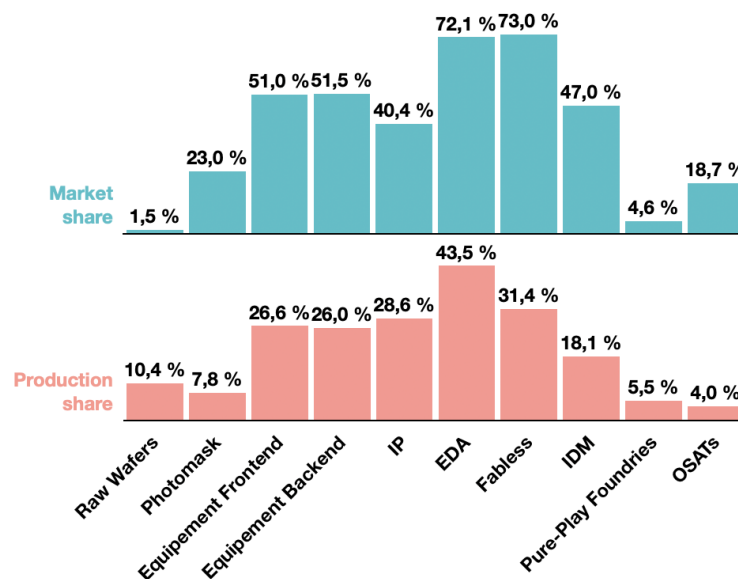
Main Chinese strengths

- Manufacturing
 - SMIC
 - 紫光集团 TSINGHUA UNIGROUP
- Packaging, Assembly, Test
 - JCET
 - TF 通富微电
 - HUA TIAN



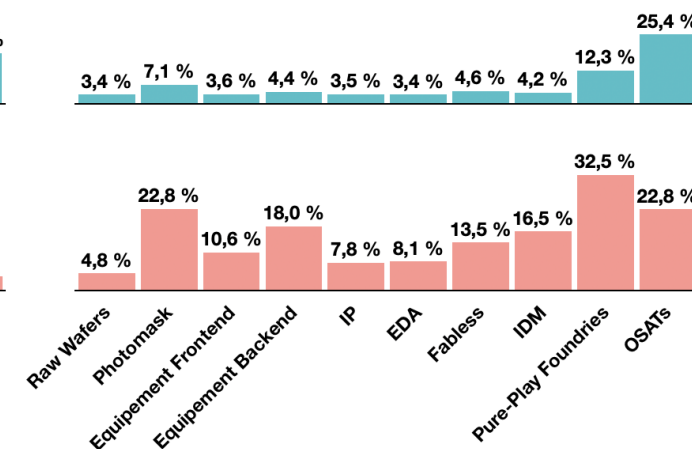
The US

44% Market share
19% Production



China

7% Market share
18% Production



Taiwan and South Korea: The Two Leading Countries in Semiconductor Manufacturing

Main Taiwanese strengths

- Advanced processors manufacturing



- Packaging



- Design

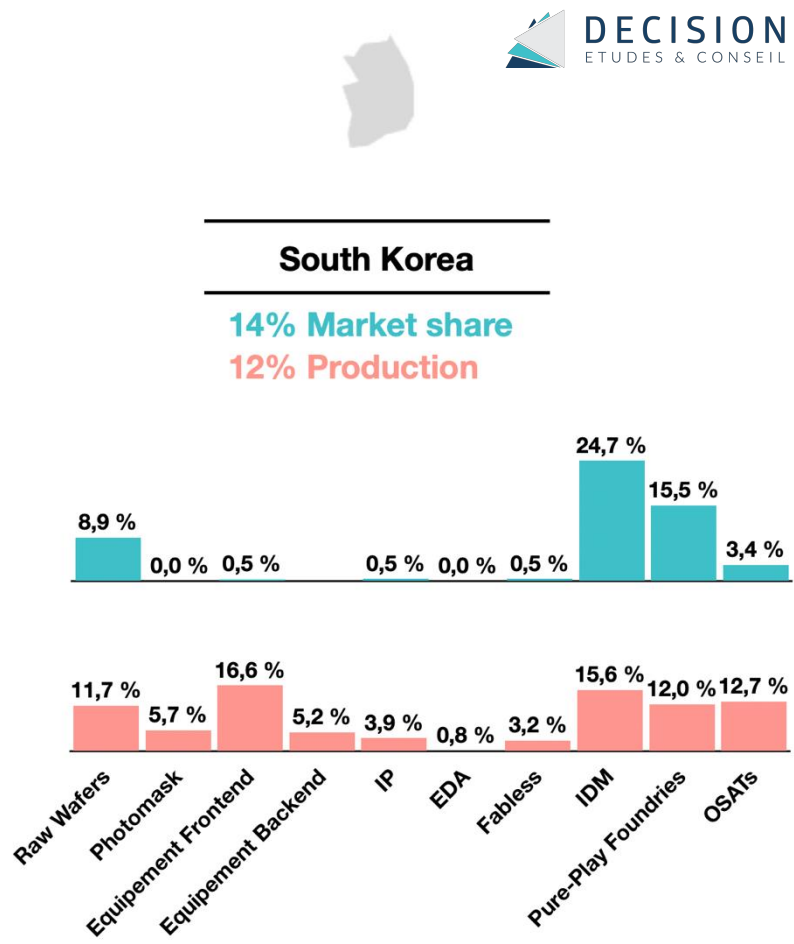
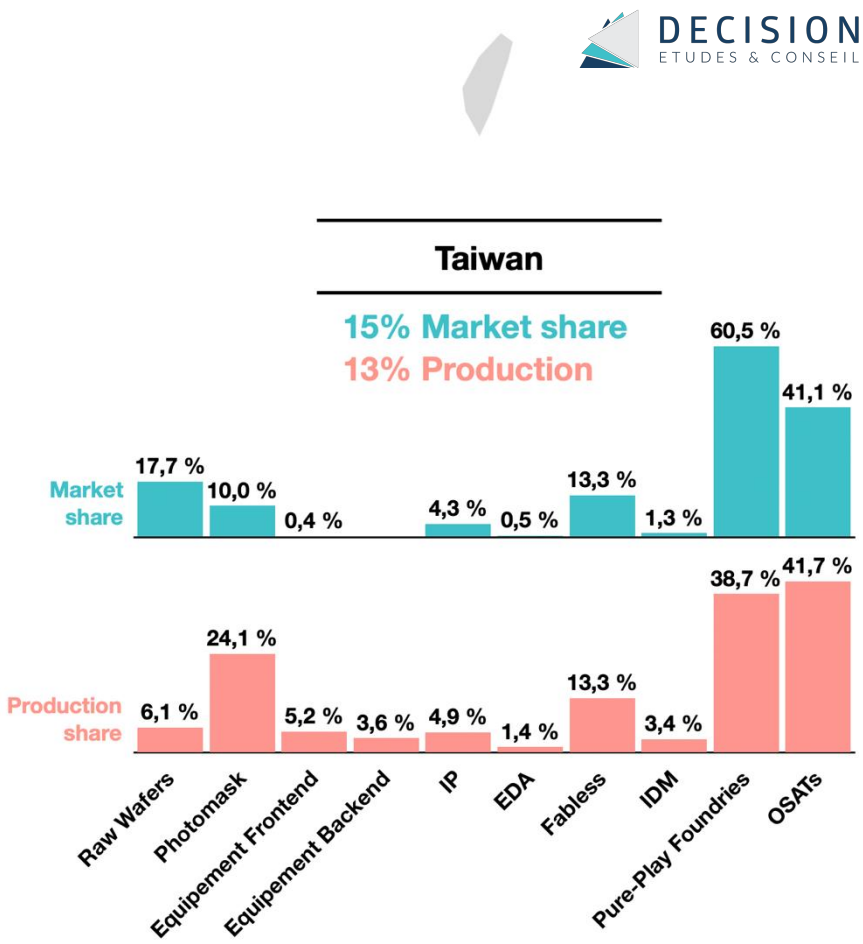


Main Korean strengths

- Advanced processors



- Memories

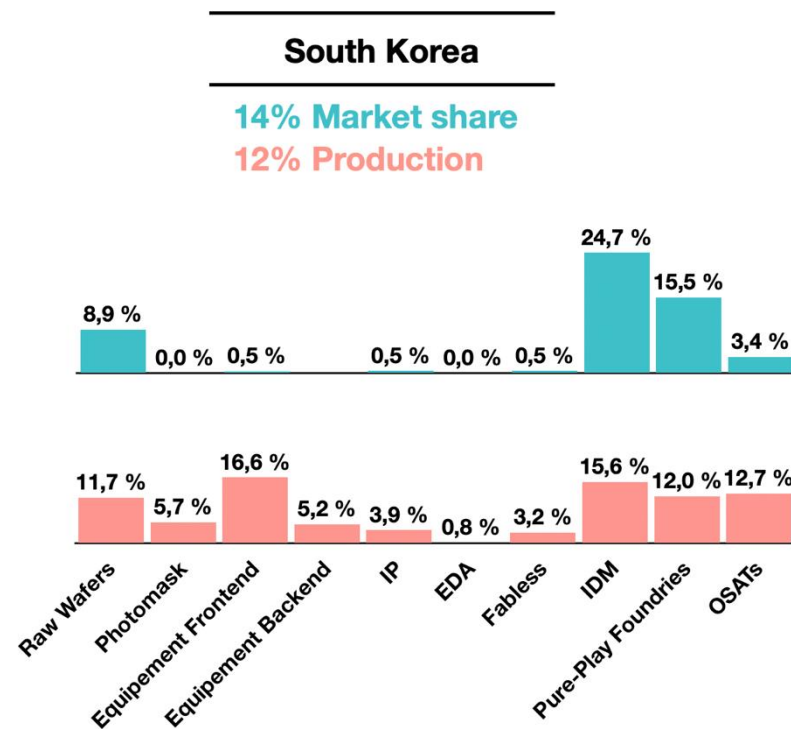
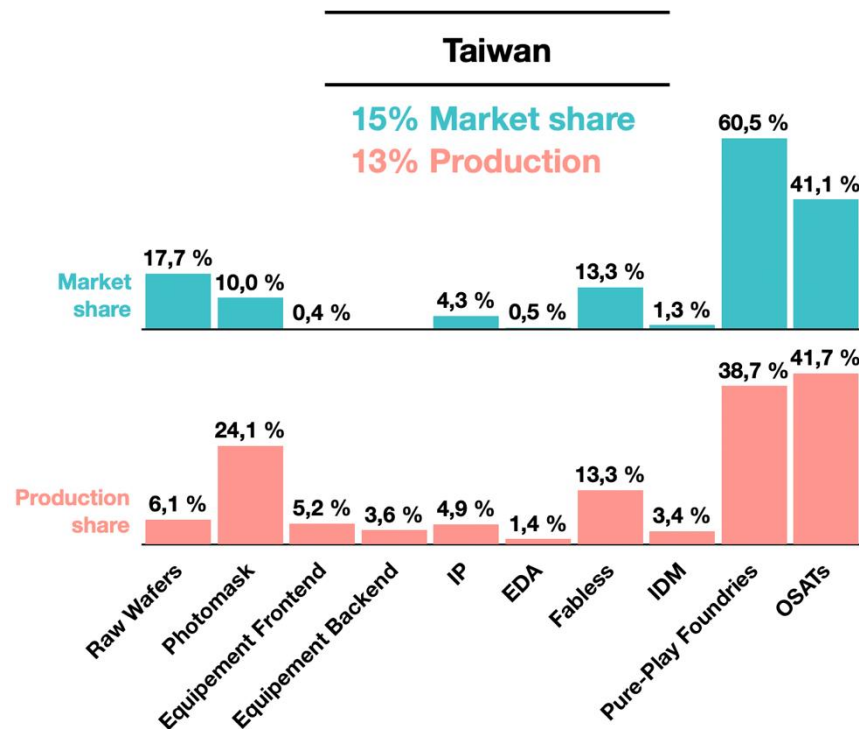


Taiwan and South Korea: The Two Leading Countries in Semiconductor Manufacturing

Structured strategies to build on two key trends

- Advanced packaging
- AI chips

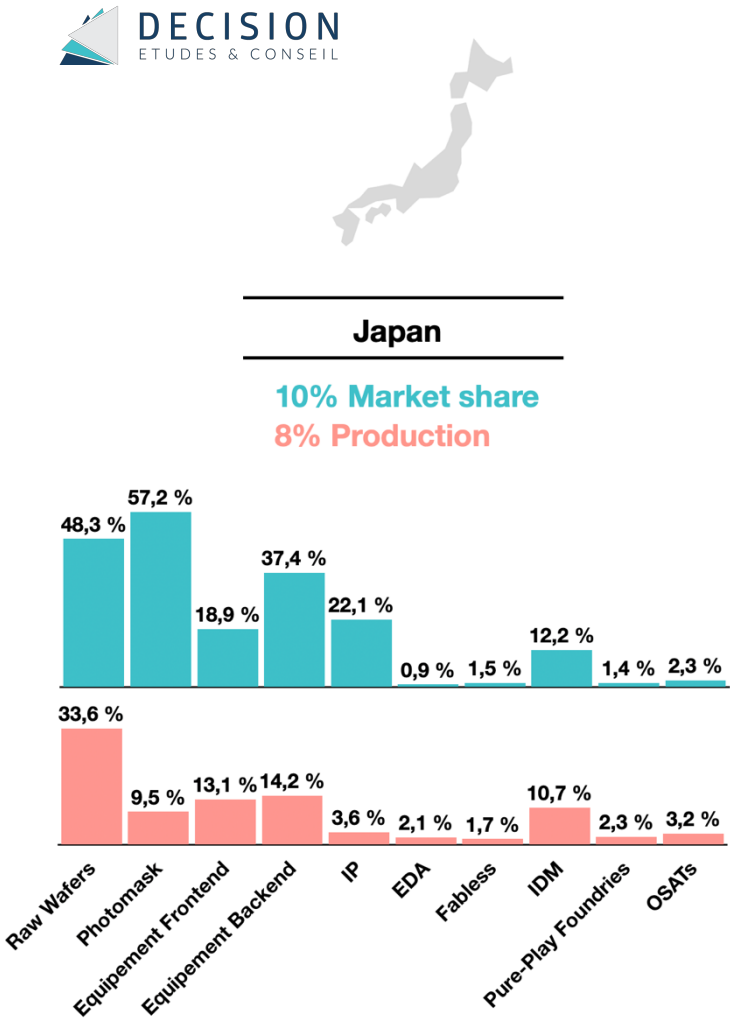
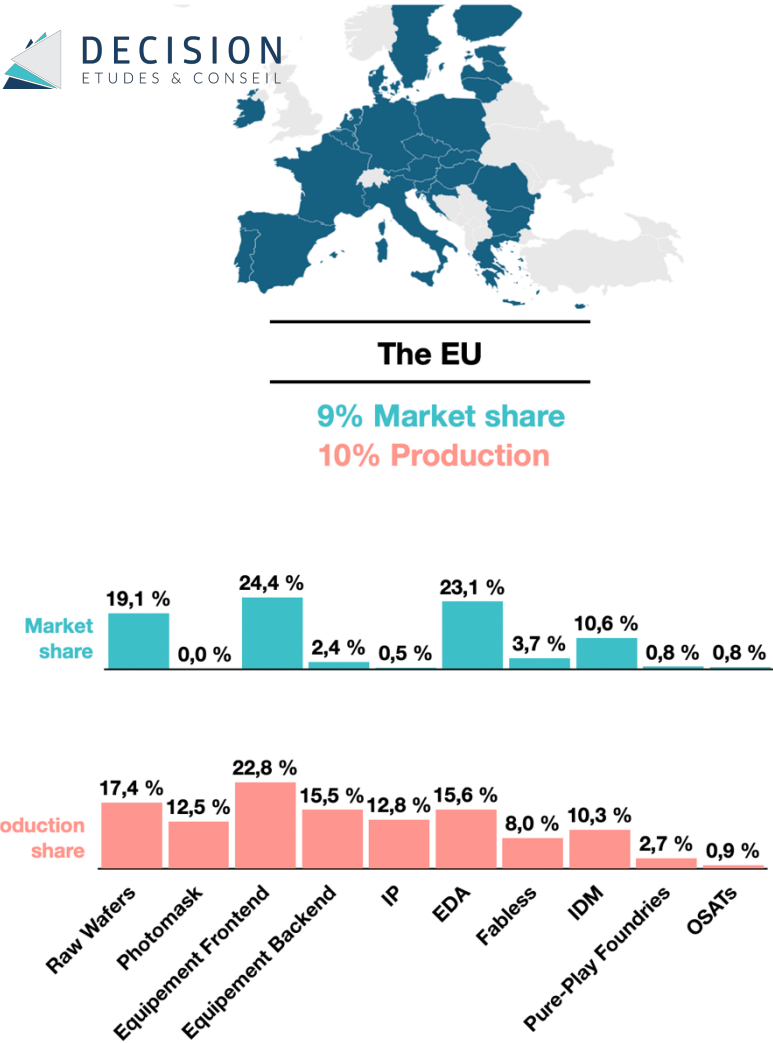
...to capture the growing Datacenter market for Cloud & AI



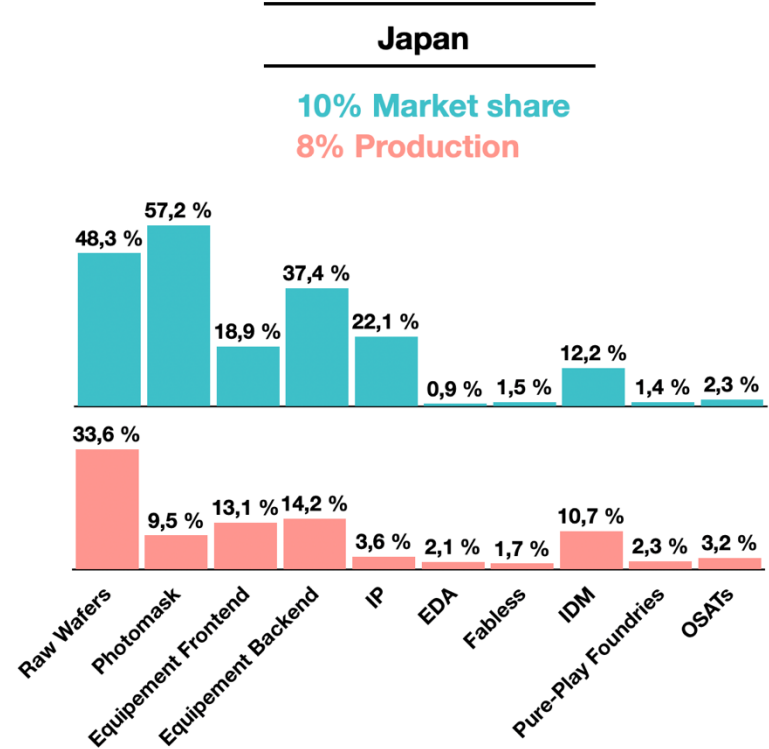
The EU27 and Japan: Historical strengths in IDMs, Equipment, Materials & Tools

Main EU strengths

- R&D
 - imec
 - Fraunhofer
 - cea
 - leti
- Specific products for embedded apps
 - ST
 - Infineon
 - NXP
- Equipment
 - ASML
 - ASM
 - exyte
- Materials
 - Air Liquide
 - Atlas Copco
 - MERCK



- The most comprehensive ecosystem after the US and China.
- Was about to be the first ecosystem in the 1990s.
- A comprehensive strategy to
 - Secure sovereign advanced manufacturing (Rapidus)
 - Attract global leaders (JASM/TSMC)
 - Compete in memory technologies: Kioxia, Western Digital, Micron



Southeast Asia: Rising Semiconductor Ecosystems

India

- Strong growth prospects
- Strong design workforce
- Rising packaging capacities

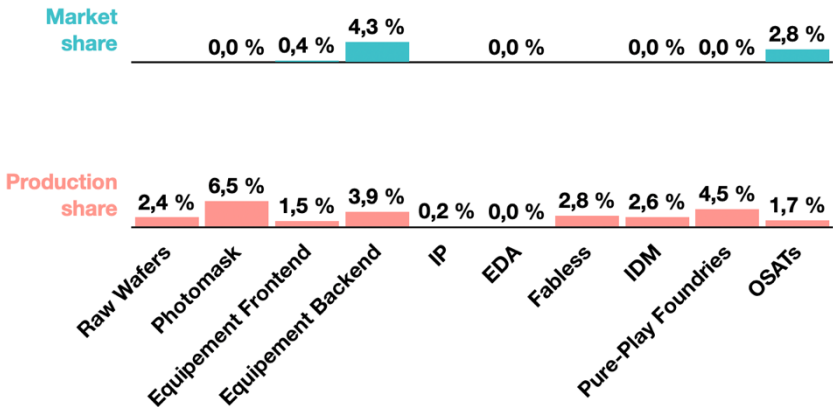
South-east Asia dynamics

- Malaysia
- Vietnam
- Philippines
- Thailand
- Indonesia



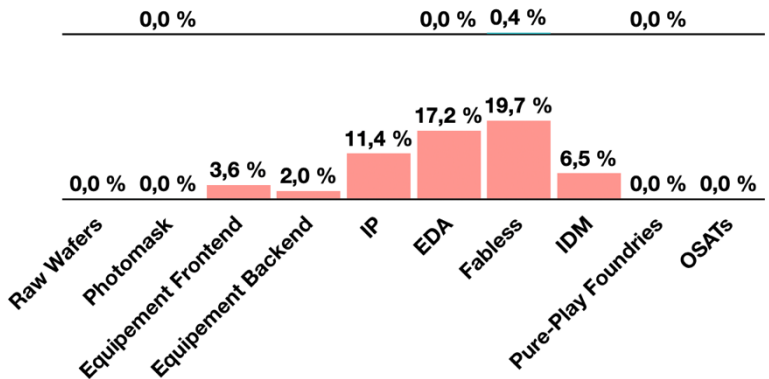
Singapore

0.3% Market share
2.7% Production



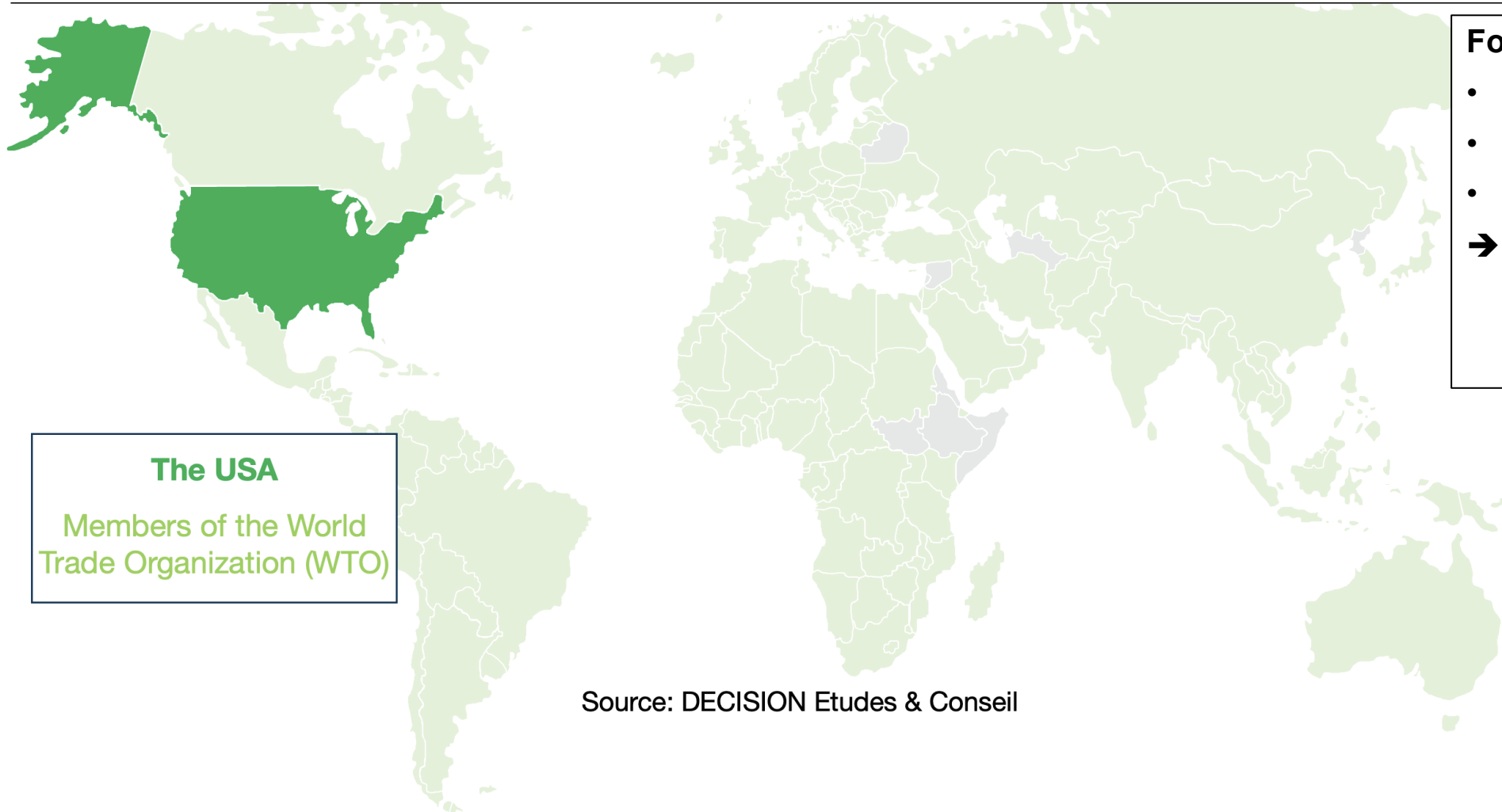
India

0.1% Market share
7.4% Production



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27 years of globalization in a unipolar World (1991-2018)



For 30 years

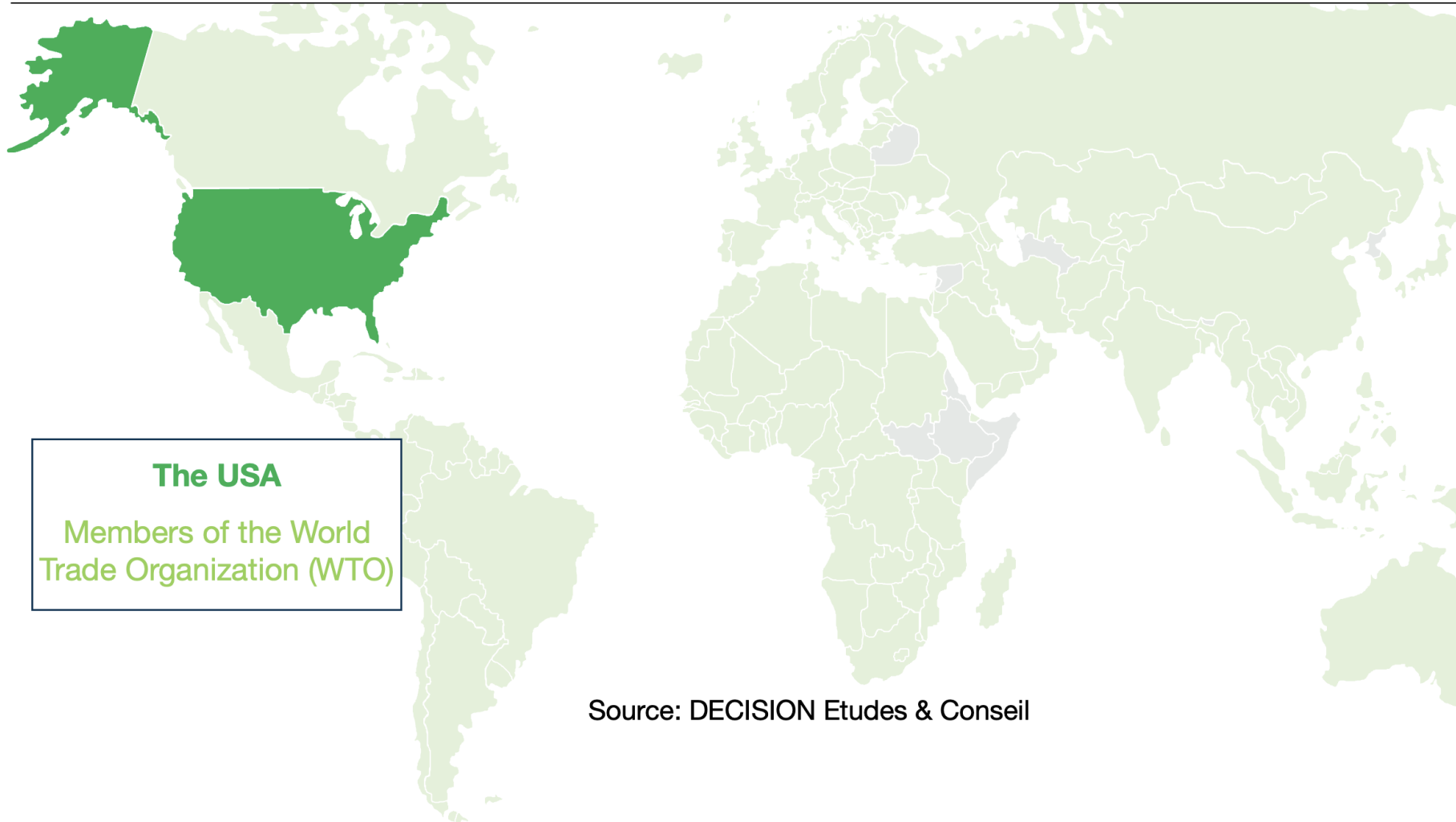
- No geopolitical constraints
 - No sanctions
 - Lower tariffs (WTO)
- ➔ Leading to a single value chain
-the most globalized- illustrated
by chokepoints: ASML and
TSMC.

The USA

Members of the World
Trade Organization (WTO)

Source: DECISION Etudes & Conseil

27 years of globalization in a unipolar World (1991-2018)



Source: DECISION Etudes & Conseil

From 2018 onwards, the geopolitical landscape shifted for two reasons:

1. The concentration of semiconductor manufacturing capacity in China & Taiwan

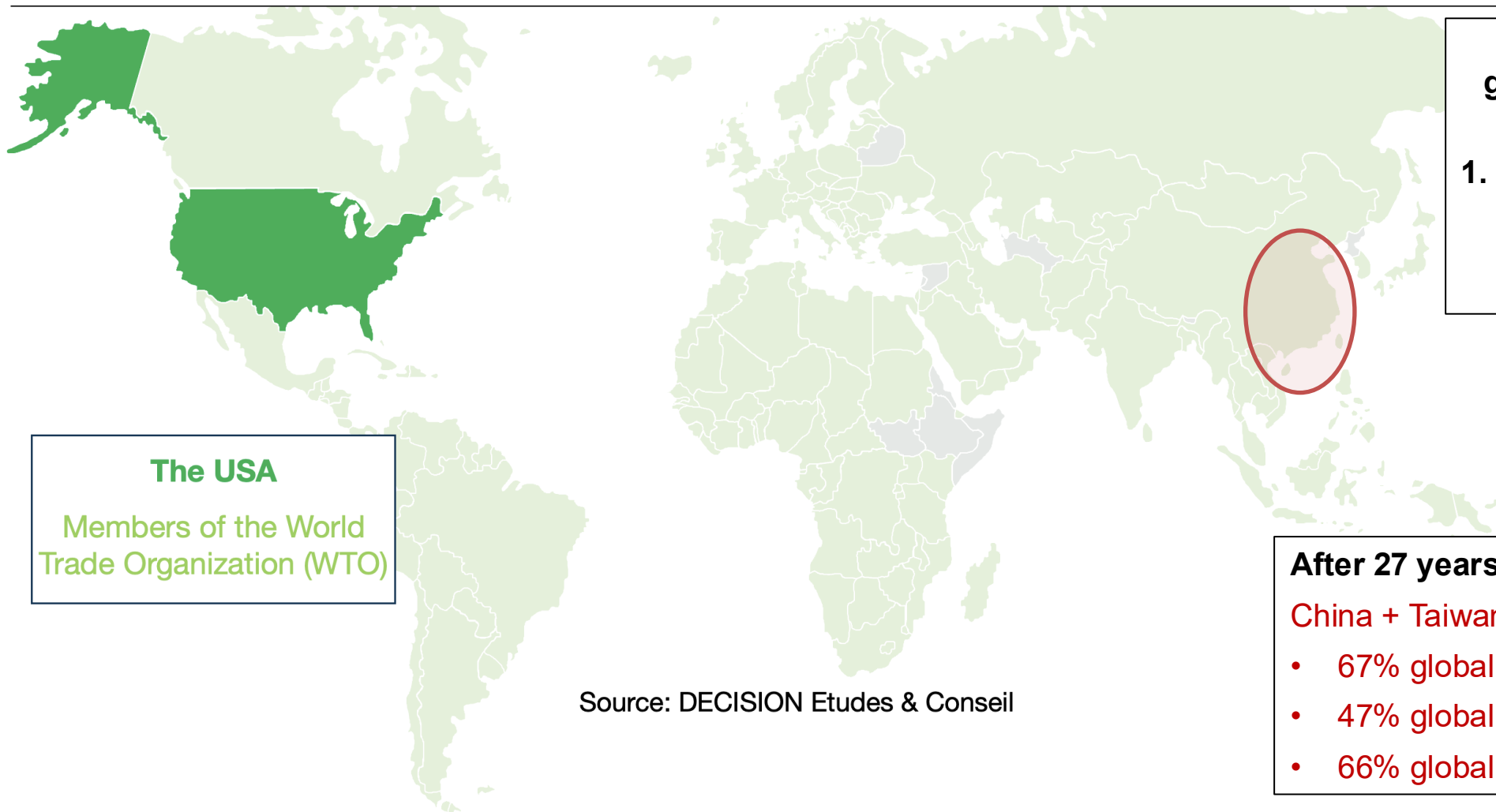
In the event of reunification, this would represent a vital strategic dependency for the US, as electronics, robotics, cloud, AI and defence rely on semiconductors.

2. The rise of multipolarity

Manufacturing, growth and wealth progressively shifted from the West to emerging nations: BRICs, Asia...

Challenging the position of the US as the global power

27 years of globalization in a unipolar World (1991-2018)



From 2018 onwards, the geopolitical landscape shifted for two reasons:

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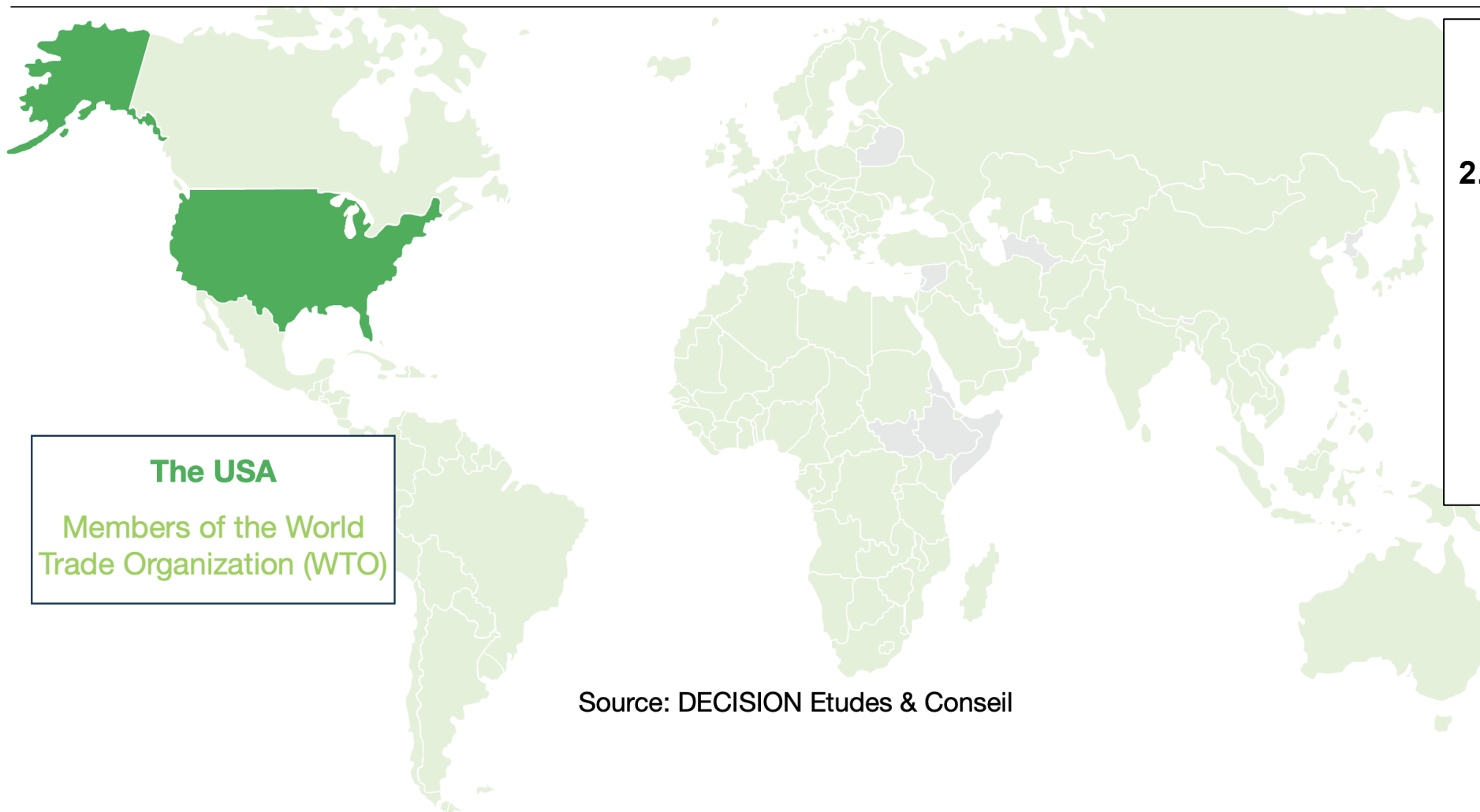
Source: DECISION Etudes & Conseil

After 27 years of a single global value chain

China + Taiwan (2024) =

- 67% global back-end capacities
- 47% global front-end capacities
- 66% global front-end capacities <6nm

27 years of globalization in a unipolar World (1991-2018)



From 2018 onwards, the geopolitical landscape shifted for two reasons:

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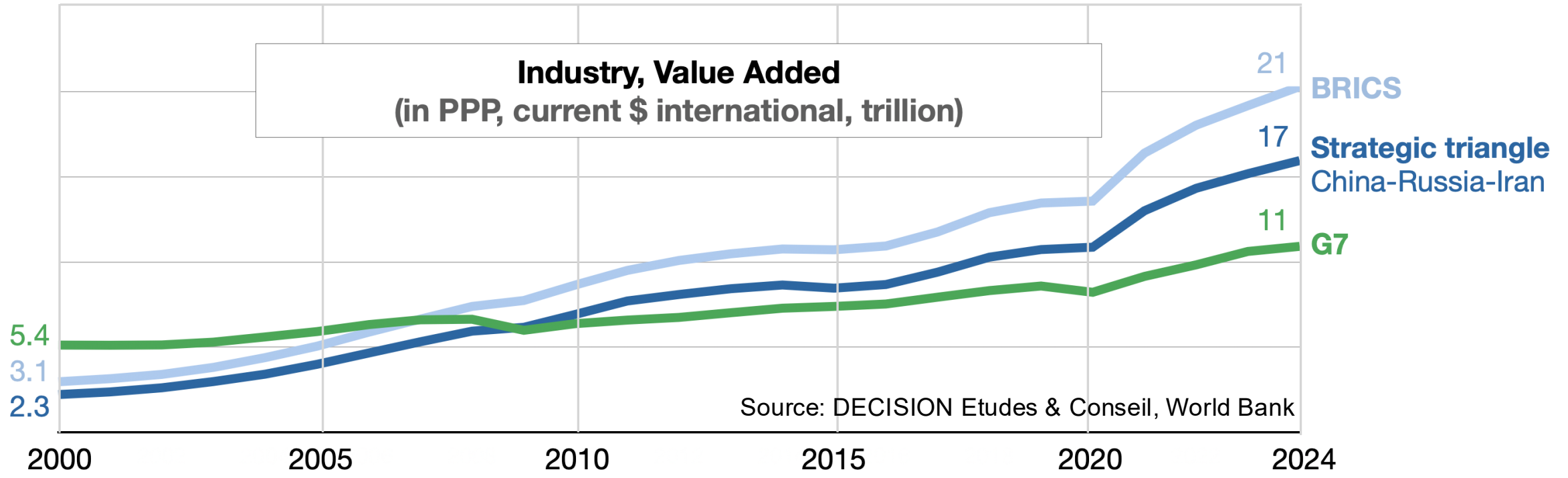
Manufacturing, growth and wealth progressively shifted from the West to emerging nations: BRICs, Asia...

Challenging the position of the US as the global power

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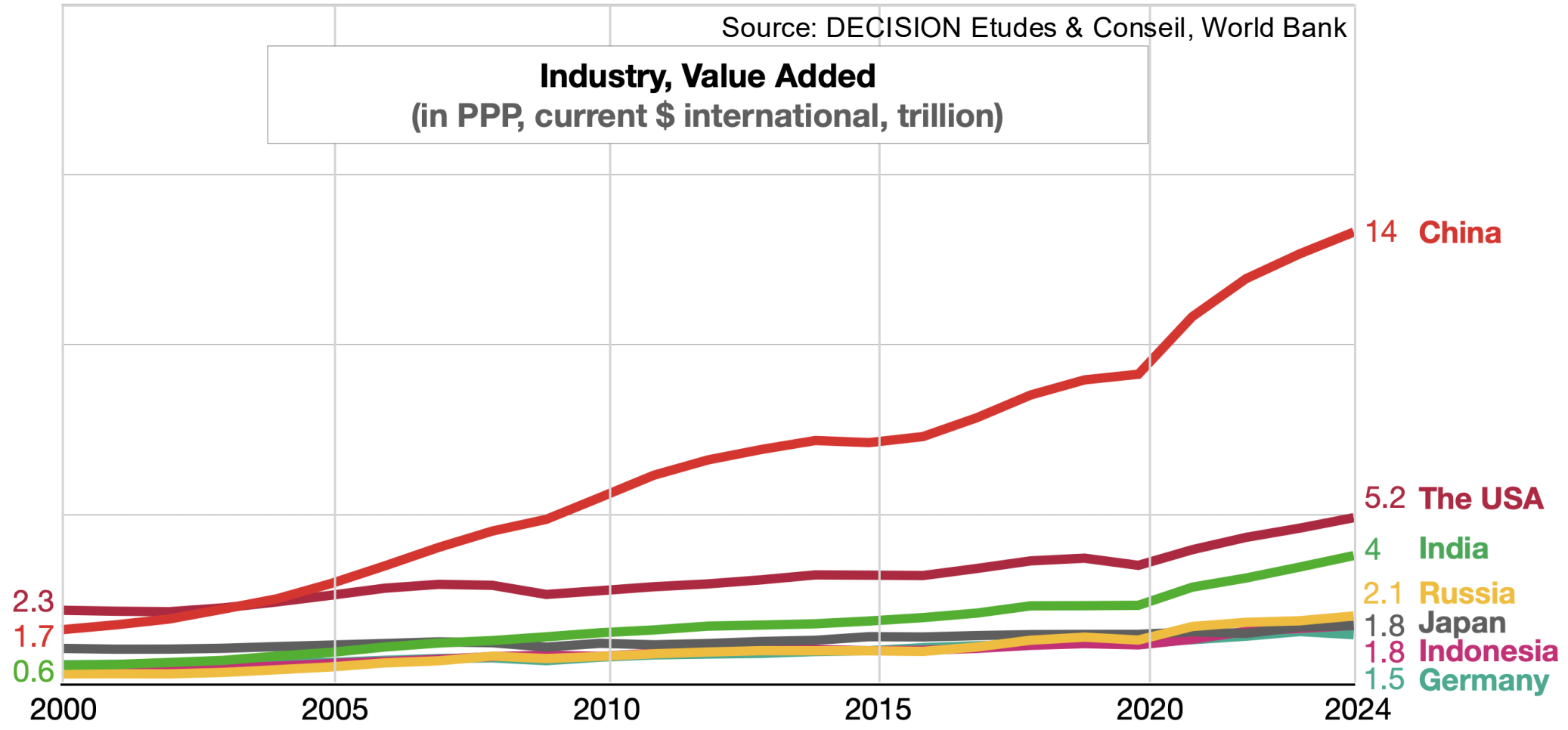
Source: DECISION Etudes & Conseil

The Road to Multipolarity (2000-2024)



The Road to Multipolarity (2000-2024)

- Same shift towards multipolarity...
- But seen from the perspective of nations rather than potential alliances
- Closer the current U.S. administration's nation-centric worldview



The three US post-unipolar world strategies

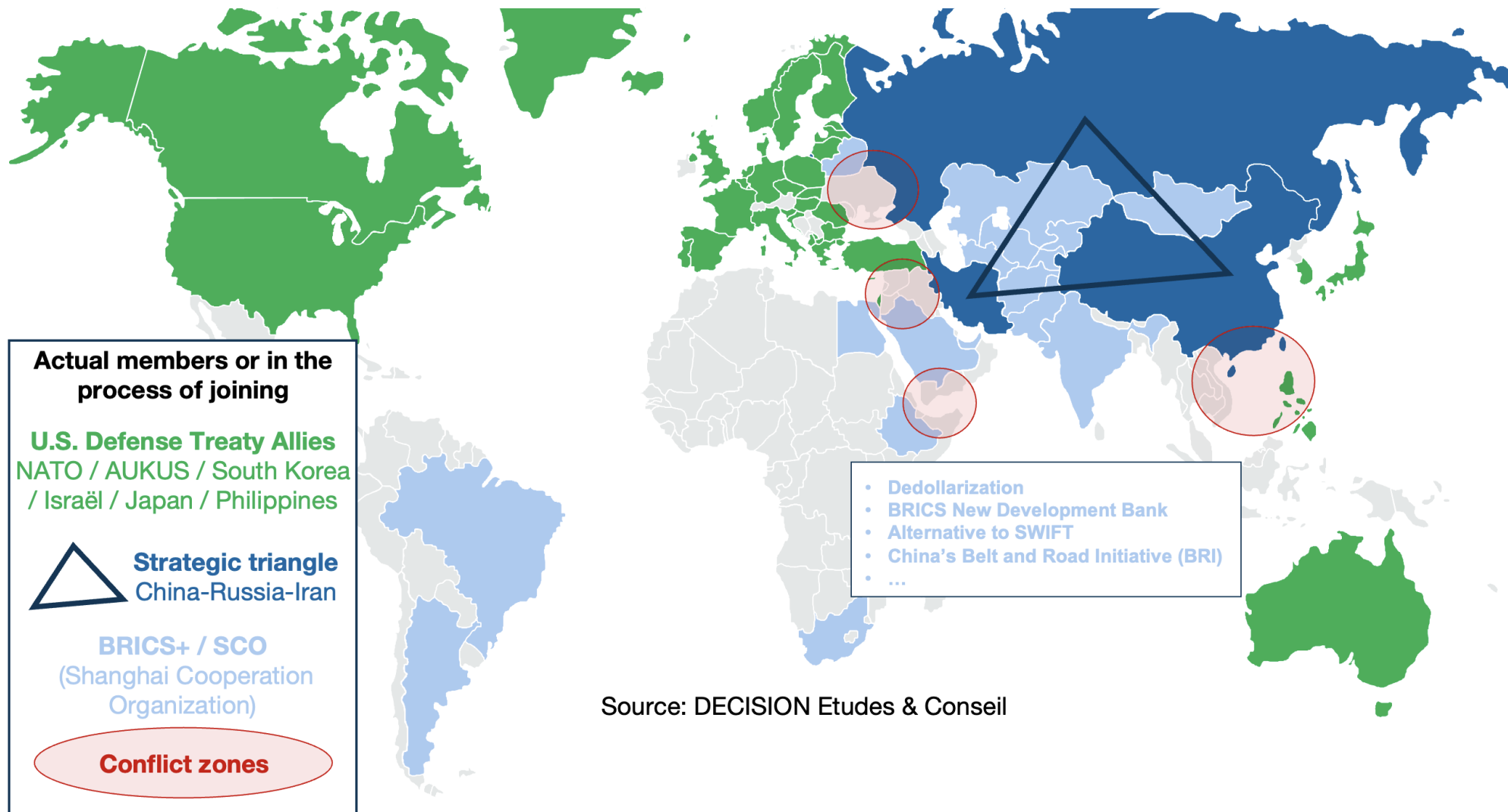
Since 2018, geopolitics, sanctions and tariffs have played an increasing role in reshaping the semiconductor value chain.

Since 2018, three phases can be distinguished, reflecting shifts in US strategic policy and their impact on international relations:

1. (2018-2024) - Towards a bloc-based international order “The West versus the Rest”
2. (2025) – Attempts to economically coerce China and decouple Russia from China
3. (Nov 2025 -) – Donroe Doctrine: coercive sphere-of-influence strategy

(2018-2024) – US policy: Towards a bloc-based international order “The West versus the Rest”

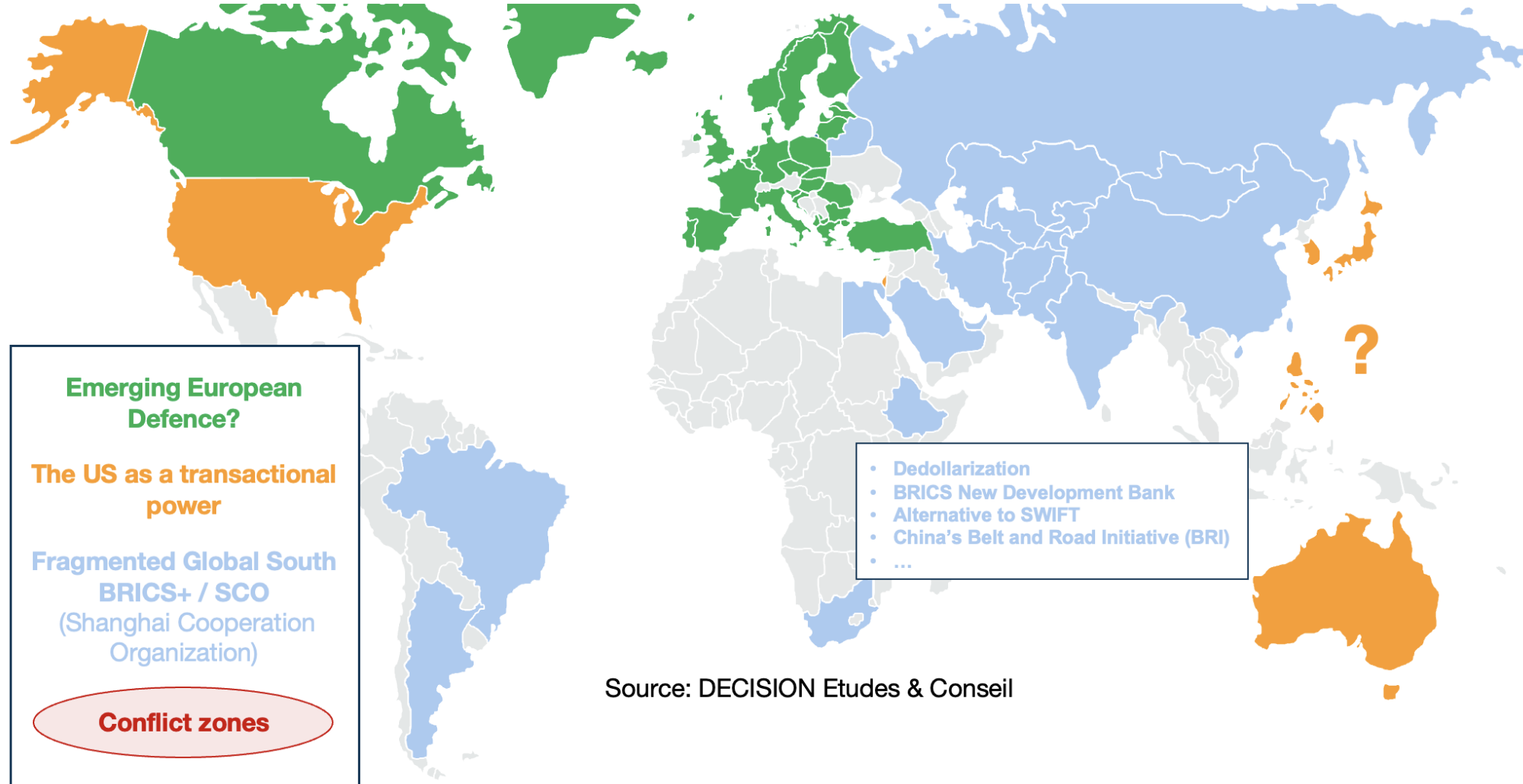
- Reinforcement of NATO under U.S. leadership
- Deepening of the Western defense alliance around the U.S.
- Deepening ties between Russia, China, and Iran...
- Prelude to a potential Eastern bloc?



Source: DECISION Etudes & Conseil

Trump 2 (2025) – US policy: A transactional power

- U.S. prioritizing nations over alliances
- U.S. pursuing bilateral deals, country by country
- Questioning the West as a unified alliance



Source: DECISION Etudes & Conseil

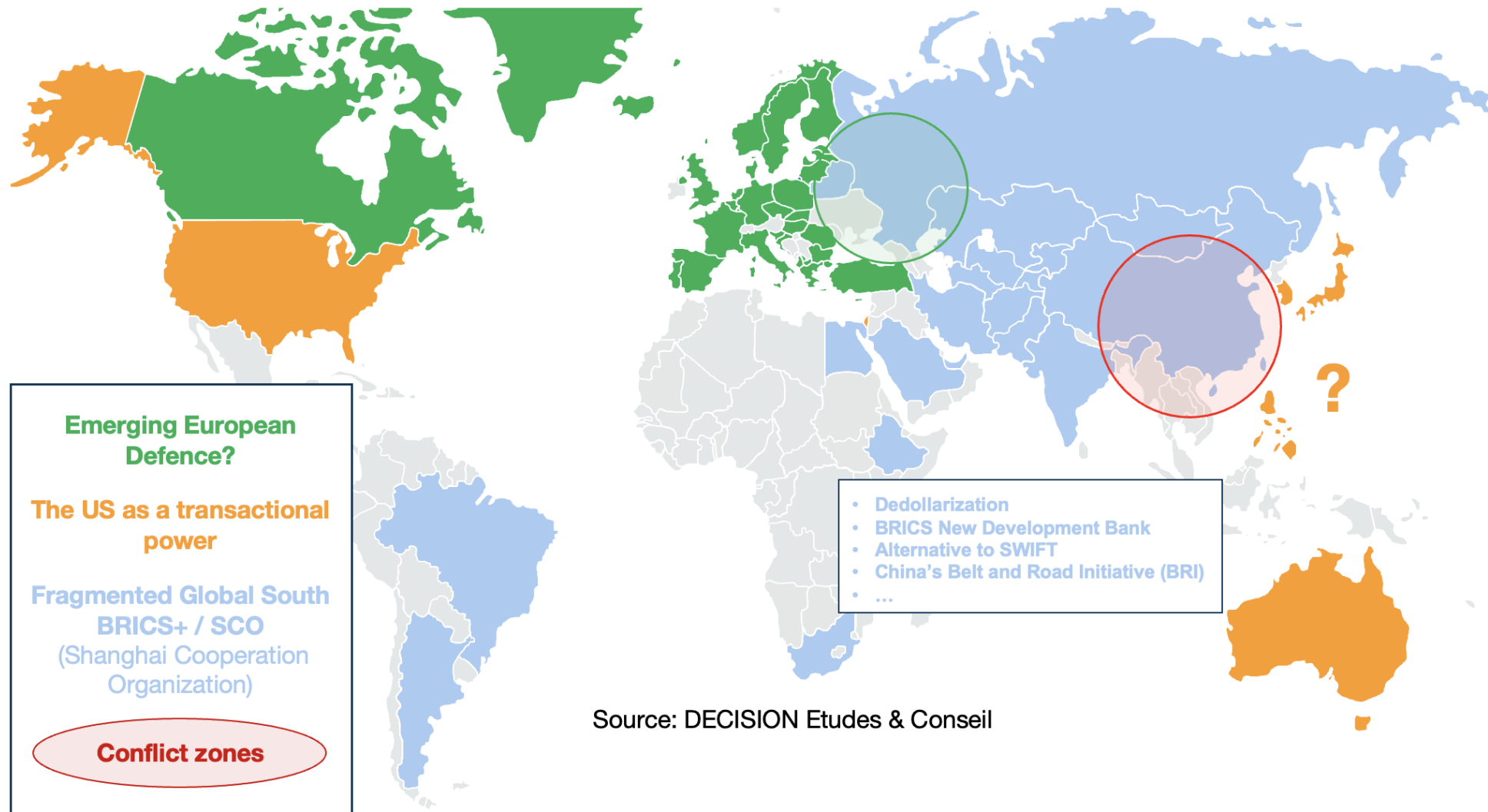
2025 – US policy: Attempts to economically coerce China and decouple Russia from China

The two U.S. priorities in 2025

1. Economically coerce China (sanctions & tariffs)
2. End the war in Ukraine and decouple Russia from China

This strategy proved unfruitful:

1. Twice (in May and November), the U.S. had to step back following negotiations with China. A sign that the U.S. is no longer able to dictate its rules to China?
2. The war in Ukraine is still ongoing

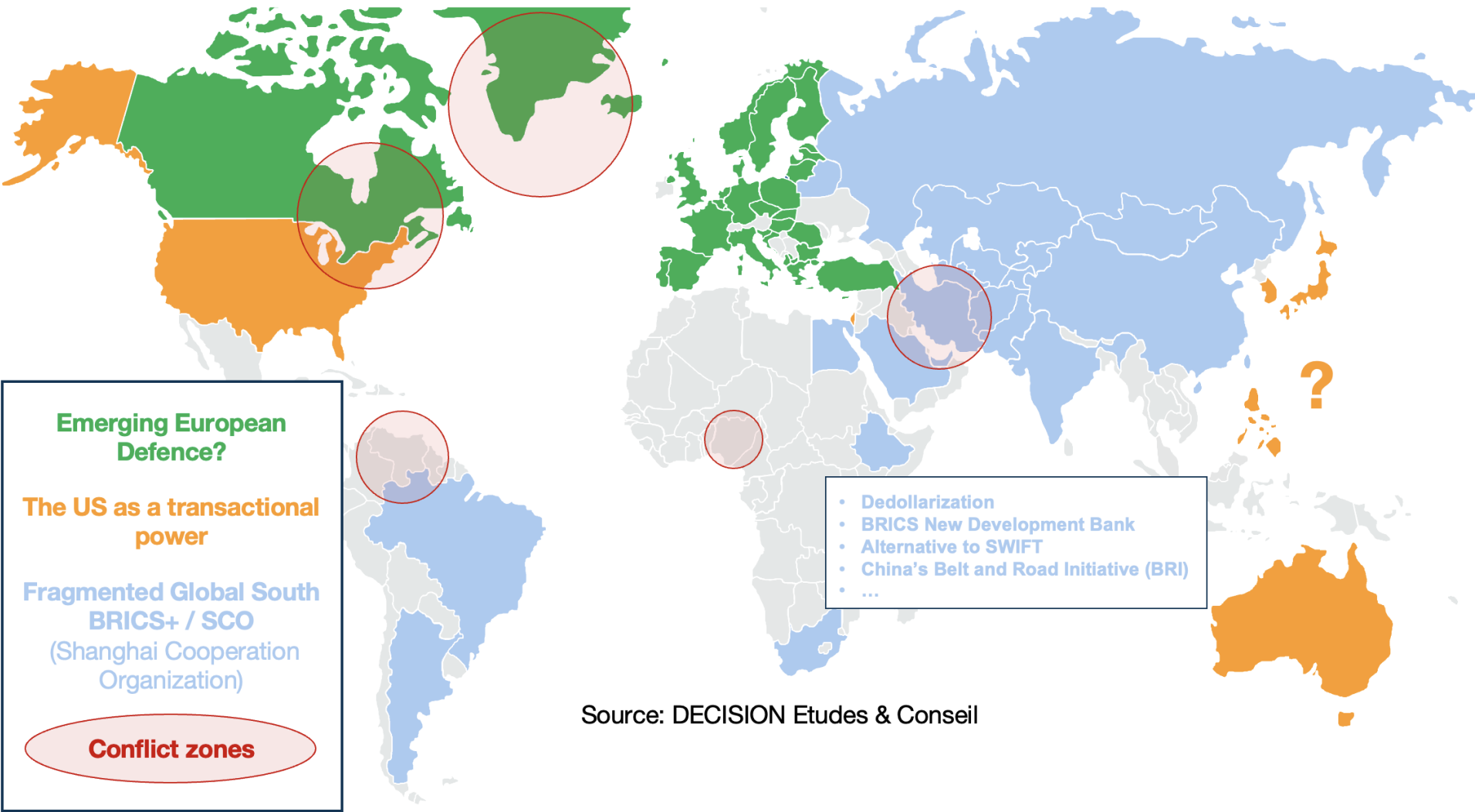


Source: DECISION Etudes & Conseil

Since Nov 2025 – US policy: Donroe Doctrine: coercive sphere-of-influence logic

U.S. National Security Strategy (Nov. 2025)

- **Monroe Doctrine revival:**
Logic of coercion from the U.S. on their perceived sphere-of-influence.
- “We (the US) want to ensure that the Western Hemisphere remains (...) reasonably stable and well-governed (...) free of hostile foreign incursion or ownership of key assets, and that supports critical supply chains”
- U.S. escalation on Venezuela, Greenland, Iran, Nigeria, Panama, Canada...
- Europe, Anglosphere

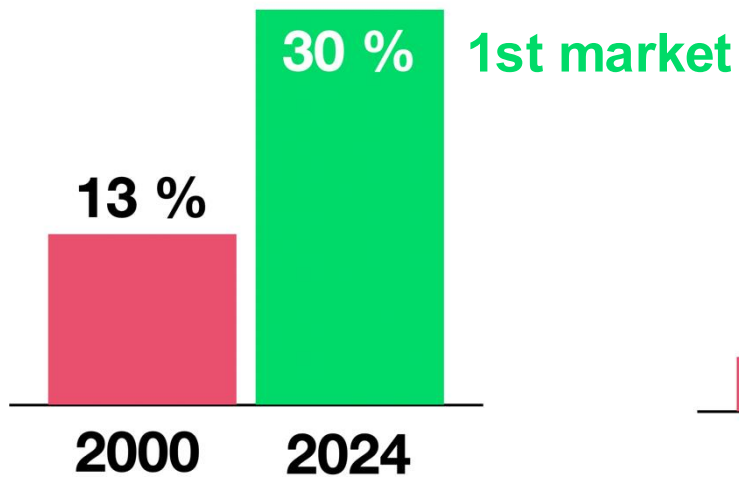


Economic landscape analysis

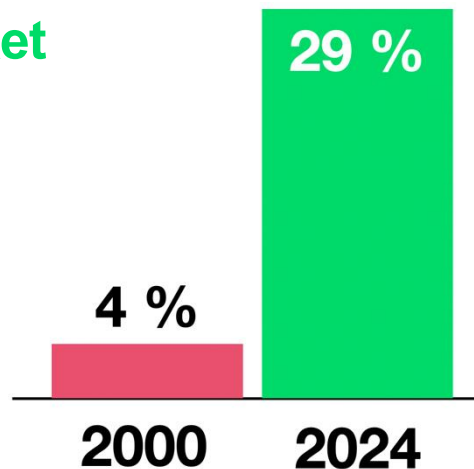
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In **2015**, China published its plan “**Made in China 2025**” where it officially announce for the first time its willingness to master the complete value chain of semiconductor.

**Semiconductor market
China % World**



**Installed capacity of
semiconductor (Front-end)
China % World**



**Across the entire semiconductor
value chain in 2022**



**1st ecosystem: Workforce,
fabs, installed capacities**

Sources: DECISION Etudes & Conseil, WSTS, SEMI

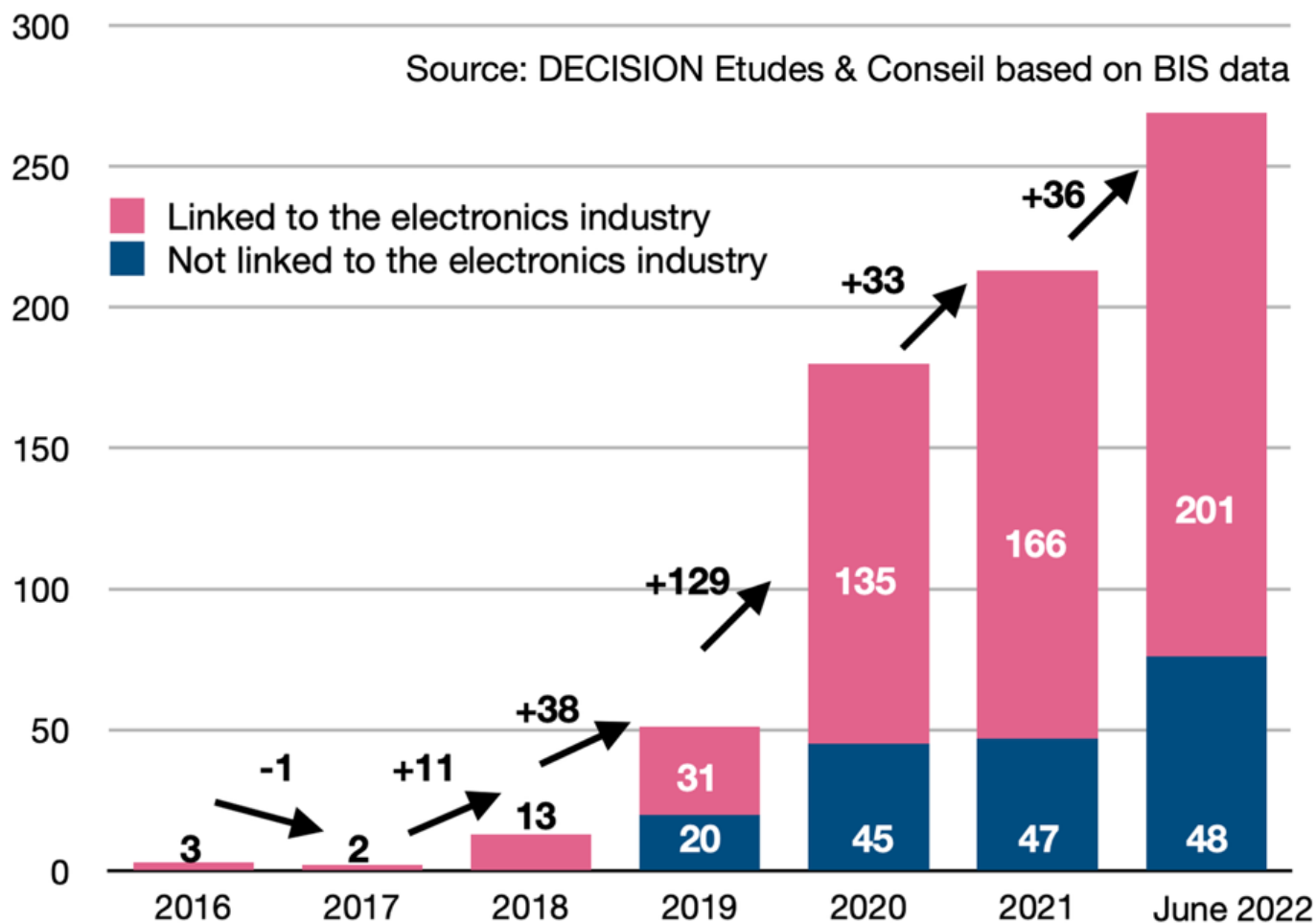
US policy tools to contain China's rise

US industrial policy tools to contain China's rise

- **FCPA (Foreign Corrupt Practices Act) (2008↑)**: The use of foreign corrupt practices to weaken key non-US companies and eventually purchase them.
- **Export bans - BIS Entity list (2016 ↑)** : Entities and products placed under extra-territorial embargo.
- **FIRRMA (Foreign Investment Risk Review Modernization Act) / CFIUS (2018)** to monitor and control foreign investments, including in semiconductors: Qualcomm, Aixtron, Lattice Semiconductor, Siltronic, Western Digital, Lumileds...
- **FDPR (Foreign Direct Product Rules) (2020)**: Expands U.S. export controls to foreign-made products if they use U.S. technology, software, or equipment (example: TSMC restricted from selling advanced chips to China).
- **Inflation Reduction Act (IRA) (2022)**. \$369B by 2031 public funding, requiring domestic content ranging from 40% to 100% for different components and sectors to qualify for full subsidies and tax incentives.
- **Export control measures expansion (CCL, EAR, MEU) (2022 ↑)**
- **Tariff of up to +30% on all Chinese imports (2025-)**
- **“Affiliates Rule” – BIS or MEU lists 50% ownership rule (29 September 2025)**
 - Nexperia crisis
- **Suspension of the Affiliates Rule (10 November 2025)** One-year suspension of the rule as part of a temporary U.S.–China trade arrangement; potential reactivation in November 2026.

The US FDPR especially affects EU companies in their ability to serve Chinese' market

Example: Summary of Chinese entities subject to U.S. export restrictions (de facto embargoes)



Sum of new Chinese companies or Research Institutions placed under extraterritorial embargo by the USD administration since 2016

➤ Increasing every year

1. Prevent China from achieving full control over the semiconductor value chain

- China is on track to become the world's leading power
- The United States seeks to preserve leverage over China by maintaining chokepoints across the semiconductor value chain.

2. Maintain technological leadership vis-à-vis China in key strategic technologies

- Smartphones
- Telecom Infrastructure
- High Performance Computing (HPC)
- Advanced semiconductors (processors, memories)
- Artificial Intelligence

3. Reduce Taiwan's "Silicon Shield" to make a Chinese reunification strategically acceptable

Underlying US policy goal: Maintain technological leadership vis-à-vis China in key strategic technologies

- **Prevent Huawei from overtaking Apple as the global leader in the smartphone market**
 - 2016-2021
 - **Achieved (2021)** – Huawei exit the global smartphone market while Apple remains number one
- **Prevent China from taking a leadership position in telecom infrastructure**
 - Sanctions against Huawei and other Chinese in 5G
 - Investment in US 6G ecosystems built around New Space actors and hyperscalers
 - **Achieved** – Currently China tries to keep up the innovation pace in New Space
- **Slow down China's development of HPC capabilities, including military applications**
 - Sanctions against Sugon and other Chinese HPC actors
 - **Ongoing**
- **Slow down China's capabilities in the design and manufacturing of advanced semiconductors**
 - **Ongoing: China (with SMIC & SMEE) tries to fill a gap of 5 to 10 years compared to TSMC & ASML**
 - Side effect: Redirection of Chinese investment towards mainstream chips -> increased competition with EU players

Underlying US policy goal: Reduce Taiwan's "Silicon Shield" to make a Chinese reunification strategically acceptable

Toward China's reunification agenda

- China's position since 1949: it will "not renounce the use of force" to achieve reunification with Taiwan
- 1971: the United Nations replaced Taiwan with Beijing as China's only representative
- China is narrowing its military gap with the US every year, largely to increase its leverage on the Taiwan issue.
- China seeks reunification while avoiding an open confrontation with the US, as it relies on global trade to sustain growth

US strategic response: Reducing Taiwan's "Silicon Shield" to make a Chinese reunification strategically acceptable

- 70% of TSMC's sales go to North American clients in 2025 -> Tariffs are an efficient tool
- "Our objective is to bring 40% of Taiwan's semiconductor supply chain and production to the United States," U.S. Commerce Secretary Howard Lutnick, CNBC, January 2026
- ➔ Taiwan's "Silicon Shield" should remain in place at least until 2035, as major investment in Taiwan continues
- ➔ A race against time: the US is trying to speed up reshoring



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Economic landscape analysis

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Status of trade in semiconductor in this changing environment

- **Global trade** flattening since 2024
- **Semiconductor trade** flattening since 2024
 - **US-China trade** declining since 2018
 - **EU-China trade** growing above the average since 2015
 - **Trade via other Asian countries** growing above the average since 2020
- **+€10B EU trade balance along the semiconductor value-chain**
 - **-€10B for semiconductor products**
 - **+€20B for equipment & tools**
- **Main EU trading partners** (accounting for 70% of EU semiconductor trade)
 1. China
 2. The USA
 3. Taiwan
 4. Malaysia (strong EU back-end manufacturing base)
 5. South Korea
 6. Japan

The Road Ahead - Regionalization and Progressive Decoupling of the Semiconductor Value Chain

- **Export control, export bans, tariffs...**
- Since 2015-2020, companies start implementing **local-for-local manufacturing strategies**
 - At least for the U.S. and Chinese markets
 - Sometimes for each country
- **From Just-in-Time production to**
Teams dedicated to supply chain analysis & management (BOM)
 - Multi-sourcing strategies
 - Strategic inventories
 - Long-term supply agreements

More costly but ensuring supply chain resilience

The Road Ahead - Regionalization and Progressive Decoupling of the Semiconductor Value Chain

- **Towards at least 2 value-chains (US versus Chinese)**
 - In both cases, south-east Asia and India are the main beneficiary of these diversification strategies (Malaysia, Philippines, Vietnam, Thailand, Indonesia).
 - **Several countries adopt strategies to be less reliant on both the US and China**
 - Japan
 - South Korea Strategy on AI chips 2024-2029
 - India
- > Should the EU adopt similar strategies, in cooperation with these countries?

The U.S. shifting away from alliance-centric strategies: An opportunity for Europe to deepen cooperation with third countries?



- In 2025, senior officials have publicly stressed the need for Japan to strengthen autonomous defense and industrial capabilities in response to growing unpredictability in U.S. policy
- Historic shift toward sovereign defense capabilities (*new National Security Strategy & military spending*)

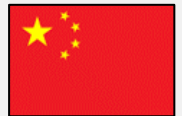


2025 legislation and national strategies (*K-Semiconductor Strategy, National Strategic Technology Nurturing Act*)

- Framing export controls and extraterritorial regulations as strategic vulnerabilities
- Prompting a turn toward industrial and technological self-reliance



- Since 2025, unprecedented U.S. rhetoric challenging Canadian sovereignty
- “On Arctic sovereignty, we stand firmly with Greenland and Denmark and fully support their unique right to determine Greenland’s future. Our commitment to Article 5 [NATO] is unwavering” Prime Minister Mark Carney, January 20, 2026



- For years, Chinese authorities have regularly and publicly expressed a willingness to strengthen cooperation with the European Union in the semiconductor sector.
- Should the EU consider launching a structured EU–China dialogue on semiconductors to (1) better understand China’s industrial development, (2) avoid missing potential opportunities, and (3) ensure that any cooperation initiatives proposed by Chinese players are framed in a way that safeguards the EU’s economic security?

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The EU's main dependencies

• Main dependencies



- Equipment & tools  
- EDA  
- Advanced processors   
- Mainstream chips
(>6.5B€ EU27 sales 2024)    

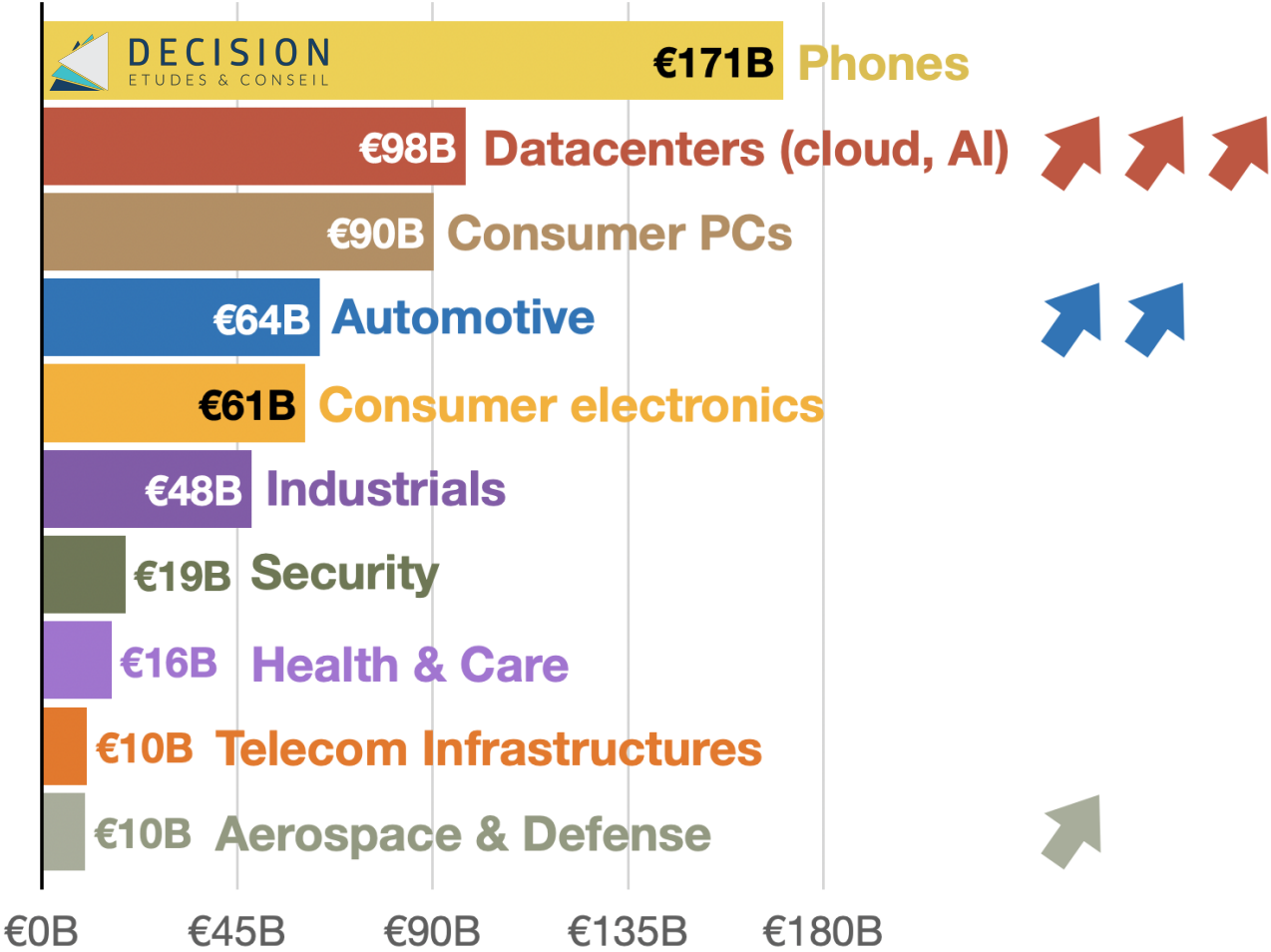
• Main dependencies



- Optoelectronics (Diodes, LEDs)
- Rare earths
- Gallium, Germanium
- PCB
- Mainstream chips (risk)

Main market drivers

- 1. **Datacenters**
- 2. **Automotive**
- 3. **Aerospace & Defense**

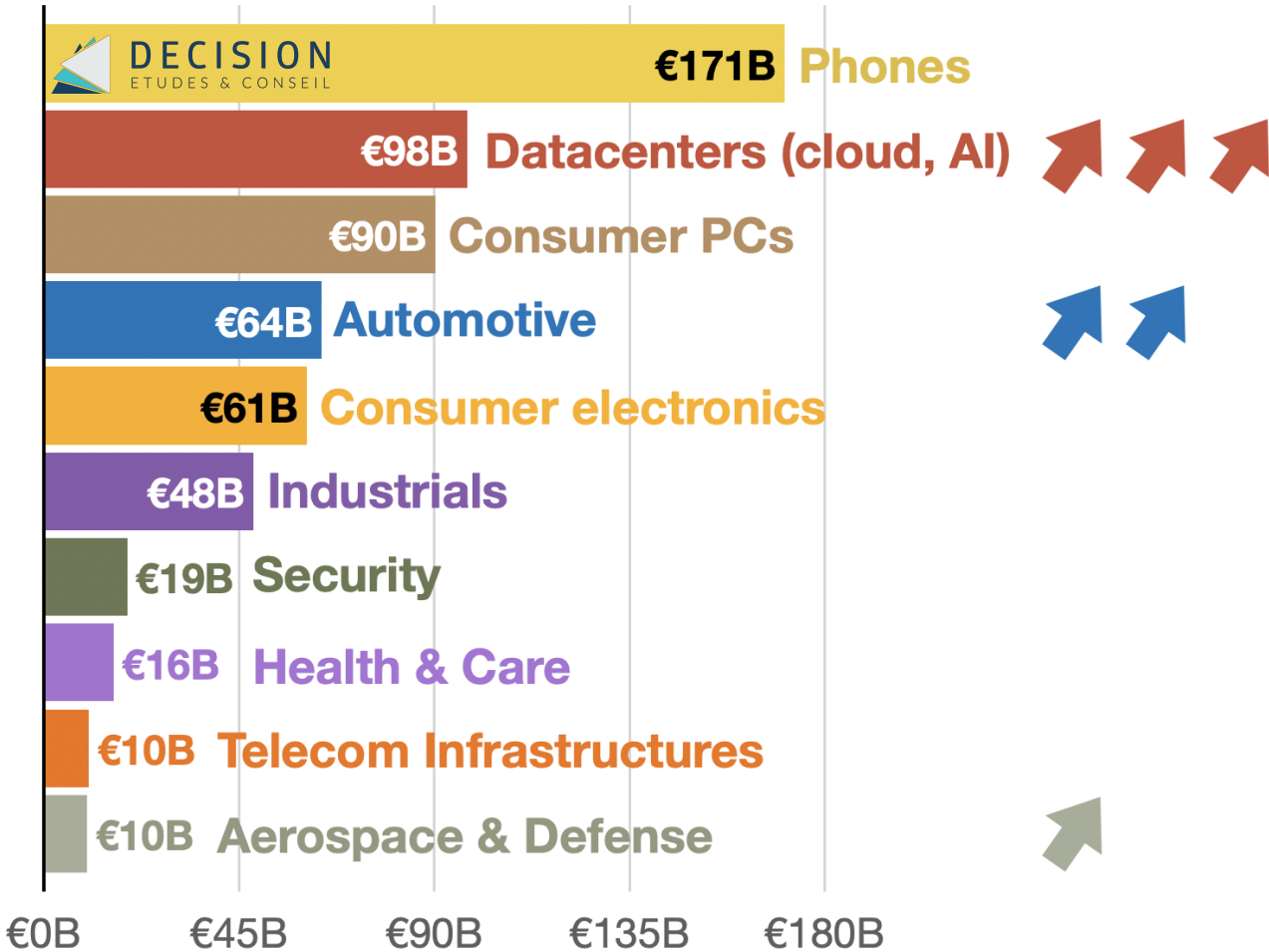


Challenges for the EU

1. **Datacenters** - Europe limited to specific subcomponents:
 - Power management
 - Connectivity & networking support
 - Security ICs
 - Sensors & monitoring

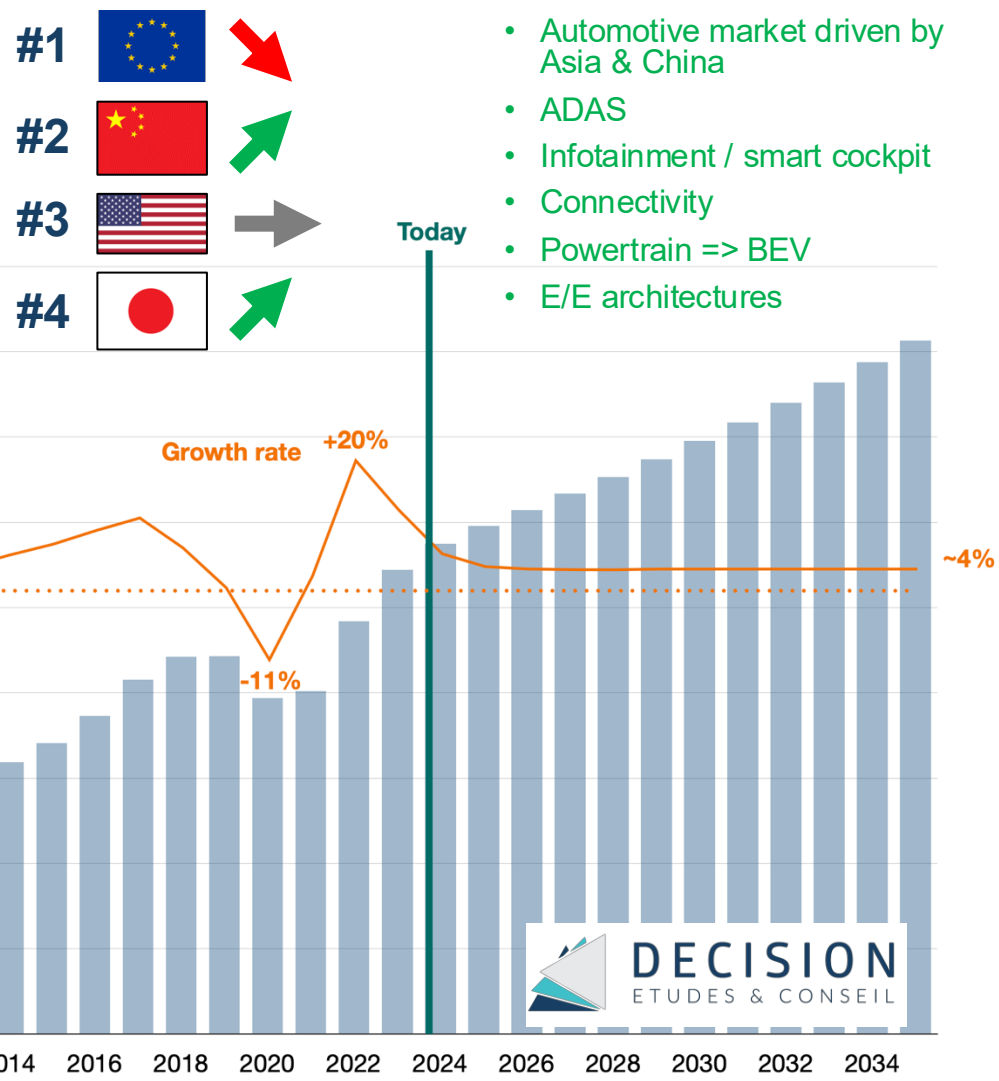
-> Risk of missing out on most of the value creation: advanced processors and HBM.

-> Risk of being locked into a subcontractor role within a US-Taiwan-dominated ecosystem.
2. **Automotive** - Difficulties of the European automotive industry
3. **Aerospace & Defense** is structurally a niche semiconductor market

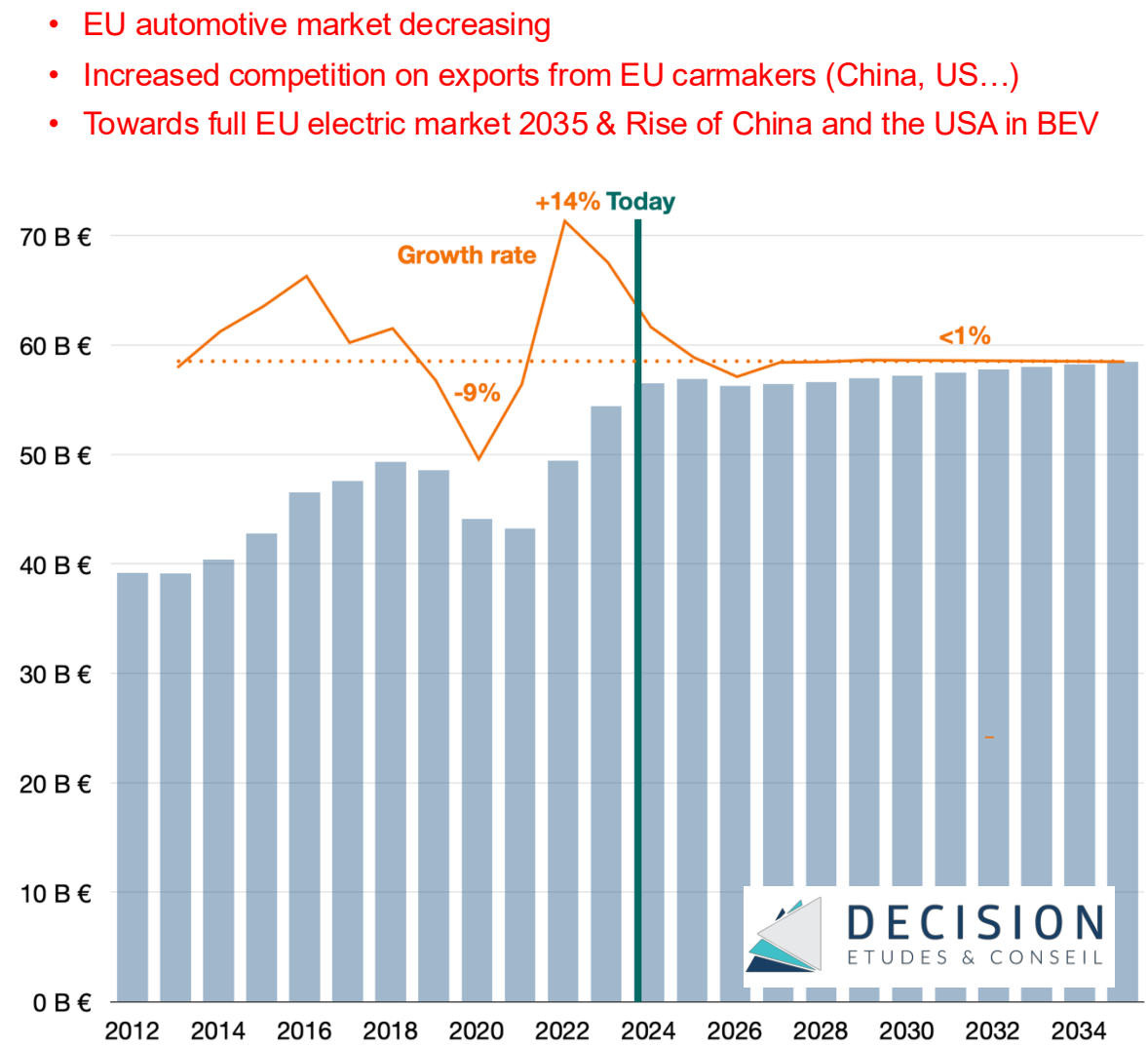


The European automotive electronics ecosystem: Global opportunities, local challenges

World production



Production in the EU27



➤ **Diversify the EU semiconductor value chain beyond the US and China**

- Main countries weaponizing trades of semiconductors
- Both countries have -or are building- full-chain capabilities, creating inherently asymmetric dependencies for partners

➤ **Key partner countries for diversification**

- Japan
- Republic of Korea
- India
- Southeast Asia: Vietnam, Thailand, Singapore, Indonesia
 - ❖ In 2025, Indonesia has the world's sixth-largest industrial sector, growing at an impressive pace. The country is expected to develop a domestic chip ecosystem in the coming years.
- Canada
- Brazil...

To learn more about the chip ecosystem, please refer to the
ICOS reports on which this presentation is based



Economic analysis of the EU and International semiconductor ecosystem

Project Number: 101092562
Project Acronym: ICOS
Project Title: International Cooperation On Semiconductors
Responsible: DECISION Etudes & Conseil
Due date: 31 December 2023
Submission date: 12 December 2023

 icos-semiconductors.eu



Monitoring semiconductor value chains: Implications for International Cooperation

Project Number: 101092562
Project Acronym: ICOS
Project Title: International Cooperation On Semiconductors
Responsible: CEZAMAT WUT
Submission date: 30th June 2025

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ICOS Final Event – Results & Recommendations on
International Cooperation on Semiconductors for
European Economic Resilience