EMERGING RESILIENCE IN THE SEMICONDUCTOR SUPPLY CHAIN
Fifth BCG x SIA report focuses on emerging resilience

5 THOUGHT LEADERSHIP REPORTS ON CRITICAL POLICY-RELATED ISSUES FOR THE SEMICONDUCTOR INDUSTRY

- **How Restrictions To Trade With China Could End US Leadership In Semiconductors**
  - March 2020

- **Government Incentives and US Competitiveness in Semiconductor Manufacturing**
  - September 2020

- **Growing Challenge of Semiconductor Design Leadership**
  - March 2021

- **Strengthening the Global Semiconductor Supply Chain in an Uncertain Era**
  - November 2022

- **Building Resilience in the Semiconductor Supply Chain**
  - May 2024
Global integration of the semiconductor supply chain has created significant value but has also led concentration risk

Government and private sector actions are building resilience, with $2.3T in fab investment expected by 2032, supported by the CHIPS Act and other programs

The entire supply chain, will be more geo-diverse by 2032, including major shifts in the US, Europe, and Asia

Fostering a strong talent pipeline is crucial, along with policies that maintain global connectedness
Over preceding decades, global integration generated significant value but also many significant concentration risks

**Value of Global Integration**

Benefits of specialization and global integration versus a fully self-sufficient value chain

- **$900-1,225B** of CapEx / R&D available for innovation
- **$45-125B** reduction in annual operating costs
- **25-40%** reduction in overall semiconductor prices

**Potential Impact on the Industry**

Corresponding risk / impact due to way in which global integration has manifested

- **50+ Chokepoints**

  - Chokepoints in the supply chain are steps where one region accounts for >65% of the global market share
  - Makes the industry susceptible to disruptions such as pandemics, natural disasters, or geopolitical conflicts

Sources: BCG analysis
Governments responding with incentives to develop more robust value chains

<table>
<thead>
<tr>
<th>Target</th>
<th>USA</th>
<th>Mainland China</th>
<th>EU</th>
<th>Japan</th>
<th>South Korea</th>
<th>Taiwan</th>
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<td>Achieve resiliency in semiconductor supply chain</td>
<td>Reach 70% self-sufficiency by 2025</td>
<td>Gain 20% global share by 2030</td>
<td>Earn $112B sales by 2030</td>
<td>Secure foothold in Logic, bolster fab leadership</td>
<td>Breakthrough 1 nm by 2030</td>
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| Key incentive amounts | $39B in grants | $142B in equity funds | $47B in grants | $17.5B in grants | $55B in tax incentives | $16B in tax incentives |

| Key initiatives | 25% investment tax credit | Big Fund I, II, III and local funds | Grants and loans under EU Chips Act | National fiscal funding | Tax incentives under K-Chips Act | Financial subsidies under the Chip Innovation Program |
| | Grants under the CHIPS Act | State-owned enterprise leaders | Tax credits | Leading-Edge Semiconductor Technology Center | Private-public education programs | Industry-academia co-op, tax credits |
| | State-level support | National science fund | State aid allowances | | |

| Impact | New fab & ATP investments since 2020 | 26 | –30$ | 8 | 4 | 3 | 7 |

1. $39B for manufacturing; $14B for R&D and workforce development 2. Important Projects of Common European Interest (IPCEI) 3. Comprises fab and ATP projects that have been announced, started, or completed since 2020 4. 25% tax credit pledging to give back $2.25B per annum over 7 years. 5. May undercount the total number of sites in China.

Sources: Gartner; SIA; Press releases; Company disclosures; Government websites; BCG analysis
Net impact is major shifts in flows of CapEx globally...

Future flows of CapEx from company HQ region to destination region, 2024-2032F

1. Others includes Israel, Malaysia, Singapore, India and the rest of the world

Sources: SEMI; BCG Analysis
...leading to corresponding shifts in wafer fab capacity by region...

1. Discretes, analog, and optoelectronics & sensors; 2. Others includes Malaysia, Singapore, India, and the rest of the world
Note: Looked at fabs with over 5K wspm and 8+ inch wafer size; excluded R&D fabs
Source: Department of Commerce; SEMI; BCG Analysis
...as well as in other stages of the value chain such as ATP

2022-2032F global ATP capacity

Rest of world ATP capacity, 2022-2032F (as % of total capacity)

1. Other countries include Indonesia, Canada, Brazil, Costa Rica, India, Israel, and Morocco

Note: Includes both OSAT and IDM facilities

Source: US Department of State; The White House; SEMI; IHS; BCG analysis
... Requires targeted policies that:

- **Foster talent at all levels**, from cutting-edge research to technicians on the factory floor and welders on construction sites, through effective partnering with educational institutions, workforce training, and industry-tailored migration policies.

- **Provide sustained support** to address remaining supply chain vulnerabilities, anticipate the expiration of current incentive programs, and “stay the course” through business cycles.

- **Help new markets develop** the right conditions to attract semiconductor investment, including targeted and sustained use of incentives, workforce training, infrastructure buildout, and improvements in the regulatory environment.

- **Maintain trade** and diversifying end markets by enacting trade measures that are well-defined, consistently applied, and aligned across likeminded partners, and negotiating effective trade agreements in the face of geopolitical uncertainty.
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