



EMERGING RESILIENCE IN THE SEMICONDUCTOR SUPPLY CHAIN

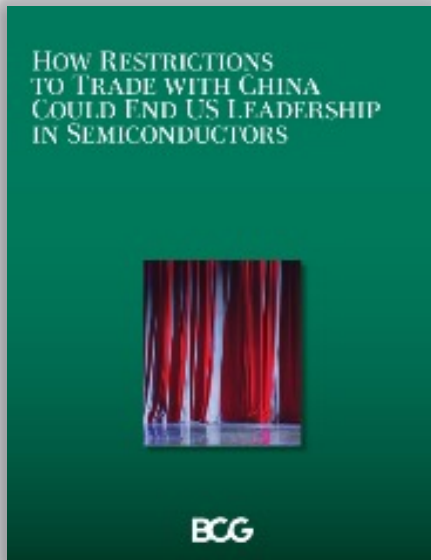
Briefing deck

JUNE 2024

Fifth BCG x SIA report focuses on emerging resilience



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



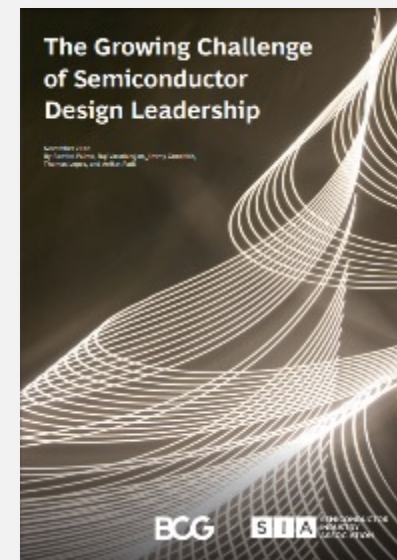
March 2020



September 2020



March 2021



November 2022



May 2024

Key findings from our report

- 1 Global integration of the semiconductor supply chain has created significant value but has also led concentration risk
- 2 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
- 3 The entire supply chain, will be more geo-diverse by 2032, including major shifts in the US, Europe, and Asia
- 4 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

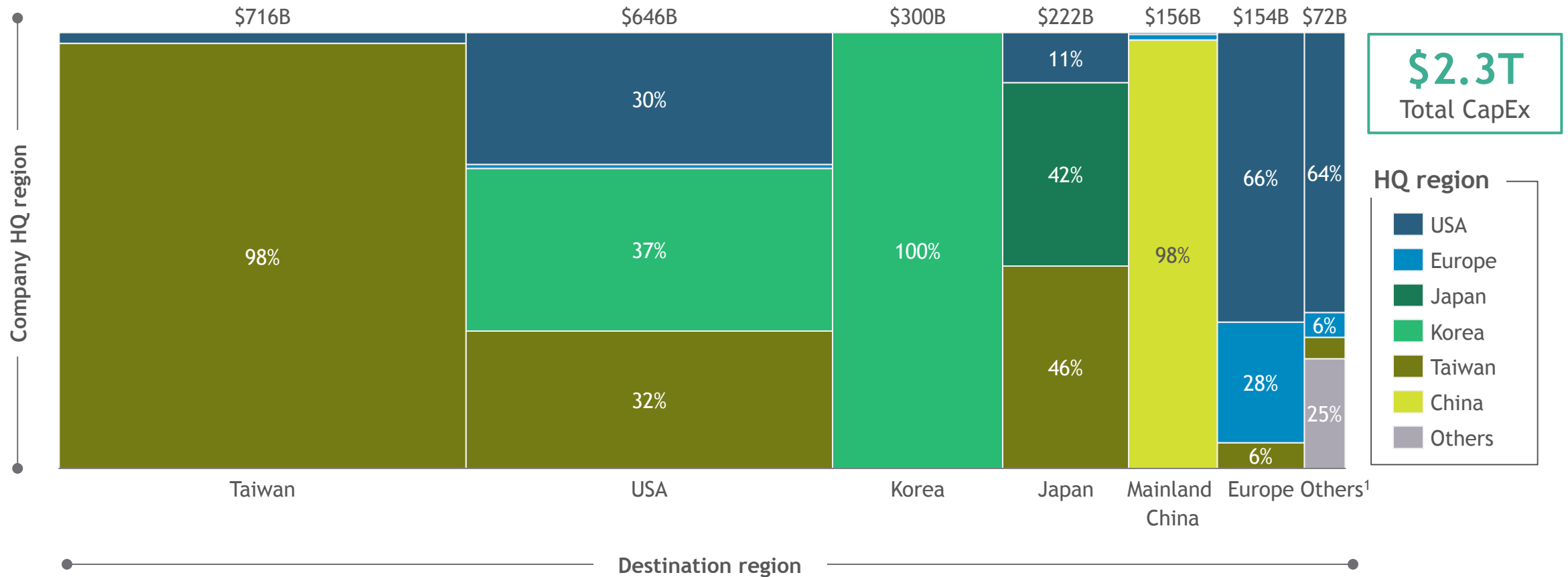
Governments responding with incentives to develop more robust value chains

	USA	Mainland China	EU	Japan	South Korea	Taiwan	
Guidance	Target	Achieve resiliency in semiconductor supply chain	Reach 70% self-sufficiency by 2025	Gain 20% global share by 2030	Earn \$112B sales by 2030	Secure foothold in Logic , bolster fab leadership	Breakthrough 1 nm by 2030
	Guiding policy	CHIPS and Science Act, 100-Day Supply Chain Review	National IC Outline, 14th Five Year Plan	Digital Compass 2030	Strategy for Semis and the Digital Industry	K-Belt Semiconductor Strategy	Angstrom Semiconductor Initiative, Moonshot program
Measures	Key incentive amounts	\$39B in grants ¹	\$142B in equity funds	\$47B in grants	\$17.5B in grants	\$55B in tax incentives	\$16B in tax incentives ⁴
	Key initiatives	25% investment tax credit Grants under the CHIPS Act State-level support	Big Fund I, II, III and local funds State-owned enterprise leaders National science fund	Grants and loans under EU Chips Act Tax credits State aid allowances ²	National fiscal funding Leading-Edge Semiconductor Technology Center	Tax incentives under K-Chips Act Private-public education programs	Financial subsidies under the Chip Innovation Program Industry-academia co-op, tax credits
Impact	New fab & ATP investments since 2020³	26	~30 ⁵	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

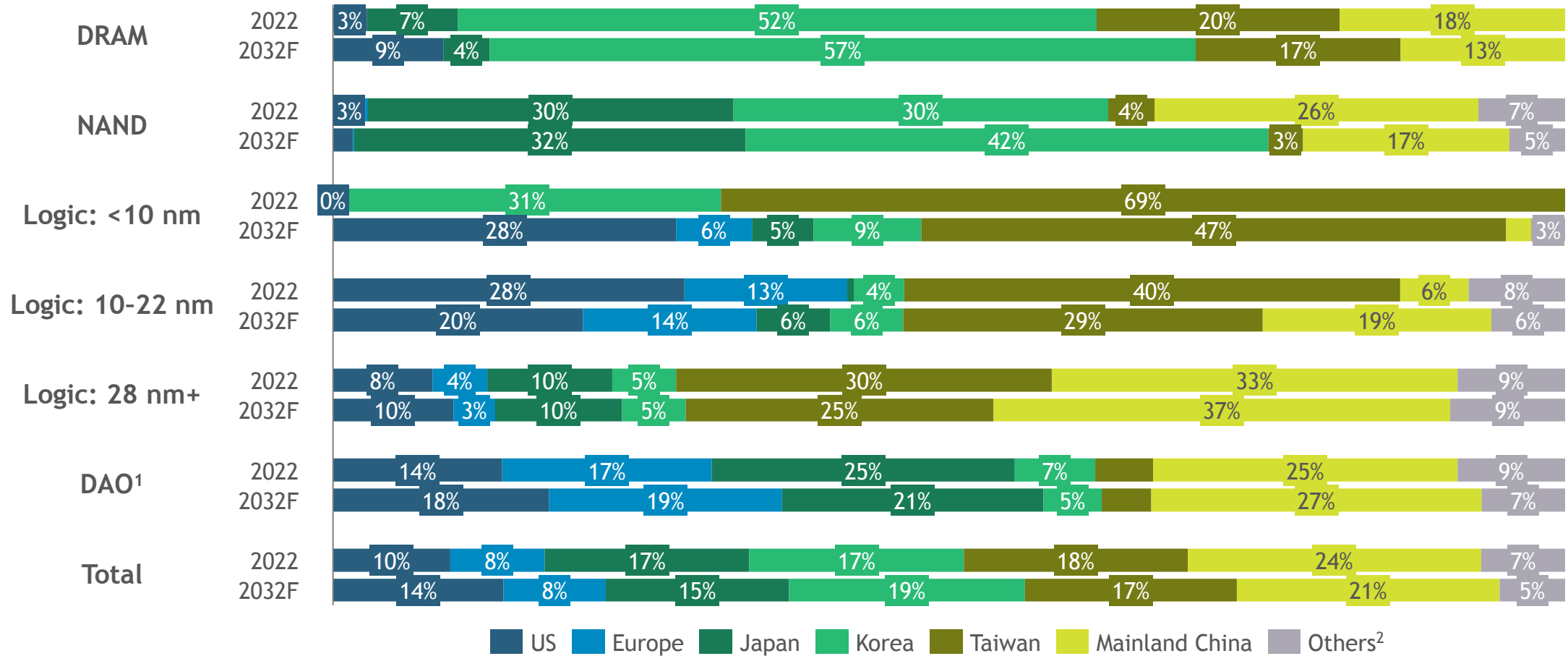
Net impact is major shifts in flows of CapEx globally...

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...

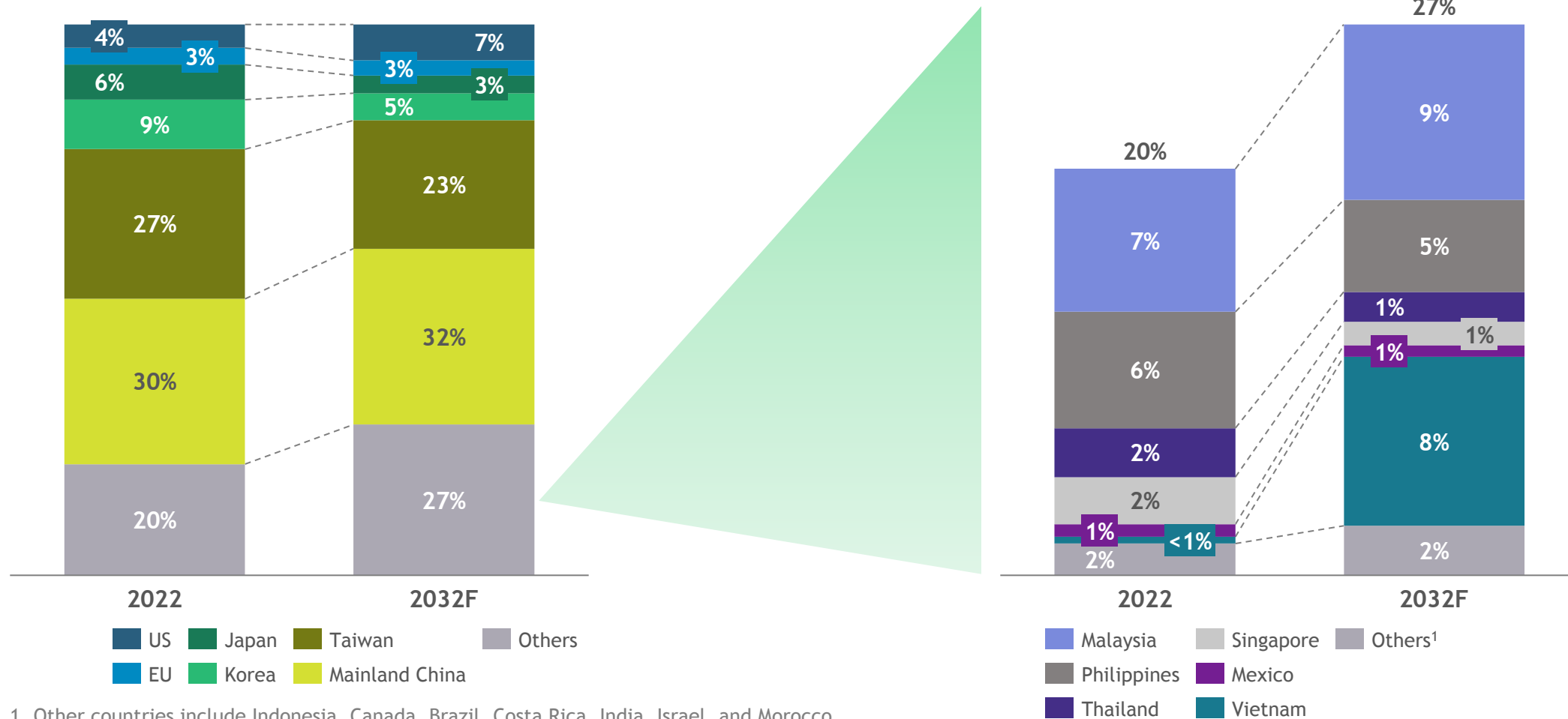


1. Discretes, analog, and optoelectronics & sensors; 2. Others includes Malaysia, Singapore, India, and the rest of the world
 Note: Looked at fabs with over 5K+ wspm and 8+ inch wafer size; excluded R&D fabs
 Source: Department of Commerce; SEMI; BCG Analysis

...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

CONTINUING TO
STRENGTHEN
THE GLOBAL
SEMICONDUCTOR
SUPPLY CHAIN FOR
THE NEXT DECADES
OF INNOVATION...

... **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

Disclaimer

The services and materials provided by Boston Consulting Group (BCG) are subject to BCG's Standard Terms (a copy of which is available upon request) or such other agreement as may have been previously executed by BCG. BCG does not provide legal, accounting, or tax advice. The Client is responsible for obtaining independent advice concerning these matters. This advice may affect the guidance given by BCG. Further, BCG has made no undertaking to update these materials after the date hereof, notwithstanding that such information may become outdated or inaccurate.

The materials contained in this presentation are designed for the sole use by the board of directors or senior management of the Client and solely for the limited purposes described in the presentation. The materials shall not be copied or given to any person or entity other than the Client ("Third Party") without the prior written consent of BCG. These materials serve only as the focus for discussion; they are incomplete without the accompanying oral commentary and may not be relied on as a stand-alone document. Further, Third Parties may not, and it is unreasonable for any Third Party to, rely on these materials for any purpose whatsoever. To the fullest extent permitted by law (and except to the extent otherwise agreed in a signed writing by BCG), BCG shall have no liability whatsoever to any Third Party, and any Third Party hereby waives any rights and claims it may have at any time against BCG with regard to the services, this presentation, or other materials, including the accuracy or completeness thereof. Receipt and review of this document shall be deemed agreement with and consideration for the foregoing.

BCG does not provide fairness opinions or valuations of market transactions, and these materials should not be relied on or construed as such. Further, the financial evaluations, projected market and financial information, and conclusions contained in these materials are based upon standard valuation methodologies, are not definitive forecasts, and are not guaranteed by BCG. BCG has used public and/or confidential data and assumptions provided to BCG by the Client. BCG has not independently verified the data and assumptions used in these analyses. Changes in the underlying data or operating assumptions will clearly impact the analyses and conclusions.



BOSTON
CONSULTING
GROUP



SEMICONDUCTOR
INDUSTRY
ASSOCIATION

bcg.com