



CHIPS and Science Act of 2022

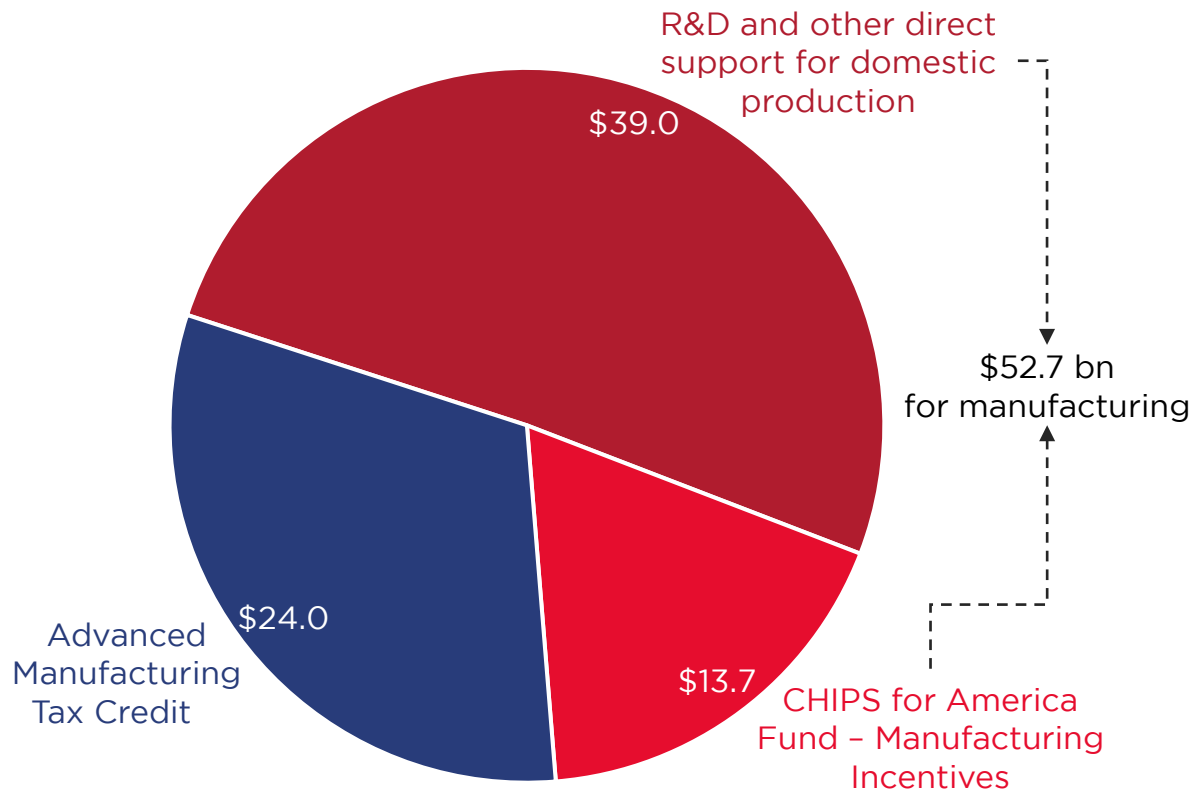
Analysis of Impacts

March 2024

CHIPS Act provides \$52.7 bn for domestic chip manufacturing

Plus tax credits for capital investment in domestic production

\$77 BN IN MANUFACTURING SPENDING AND TAX CREDITS \$ BN



MAIN POLICY OBJECTIVES

- Reduce risk of semiconductor supply chain shocks
- Improve America's economic competitiveness
- Protect semiconductors from international interference

SAMPLE OF KEY METRICS

- Increase in overall domestic chip production
- Grow domestic production for leading edge chips (e.g., for advanced computing and AI) from zero to 20% global market share by 2030
- Invest in workforce development according to NIST guidelines across construction, manufacturing, engineering, and R&D
- Nearshore critical components of the chip value chain, not limited to manufacturing

*The CHIPS Act also authorizes \$200 billion in STEM, R&D, Workforce and Economic Development spending

Source: CHIPS and Science Act of 2022, Onyx

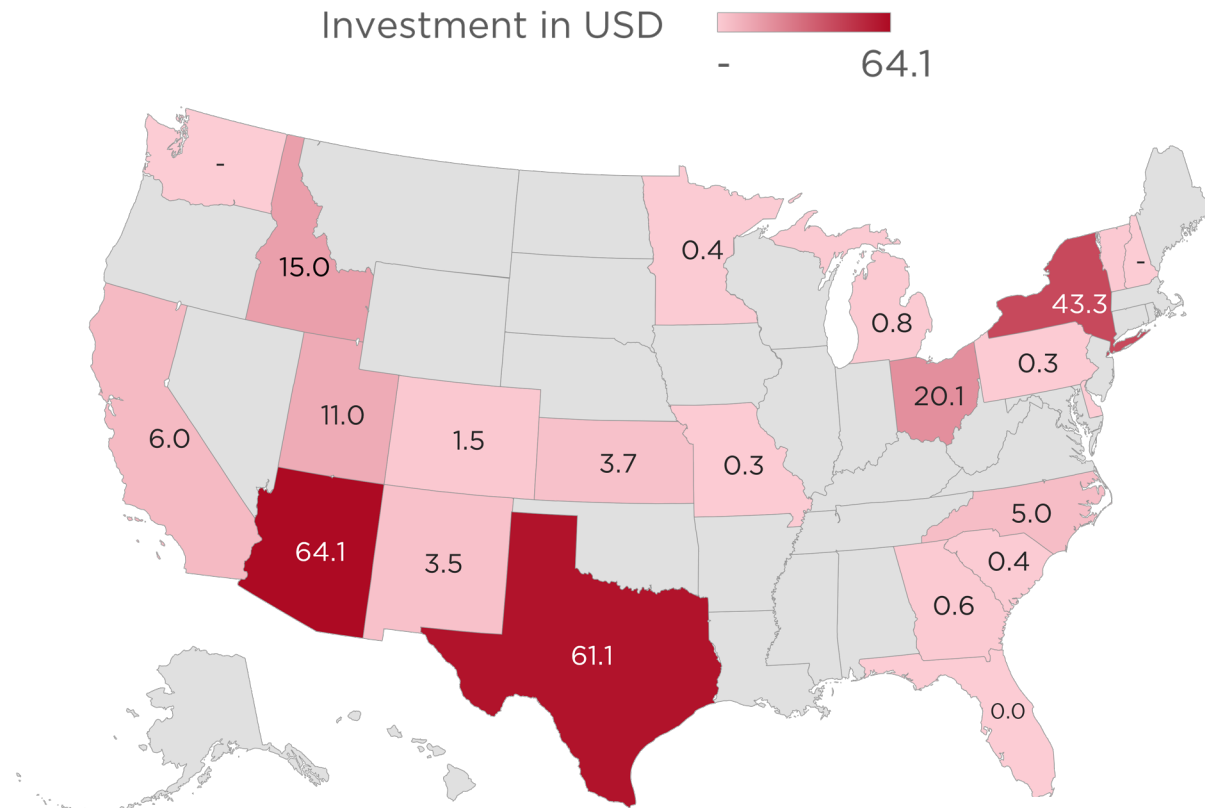
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The private sector has announced >\$250Bn in projects

Many projects are dependent on CHIPS Act funds

SEMICONDUCTOR MANUFACTURING INVESTMENTS

MAY 2020 TO FEBRUARY 2024, \$ BILLIONS



TOP 10 PROJECTS BY VALUE

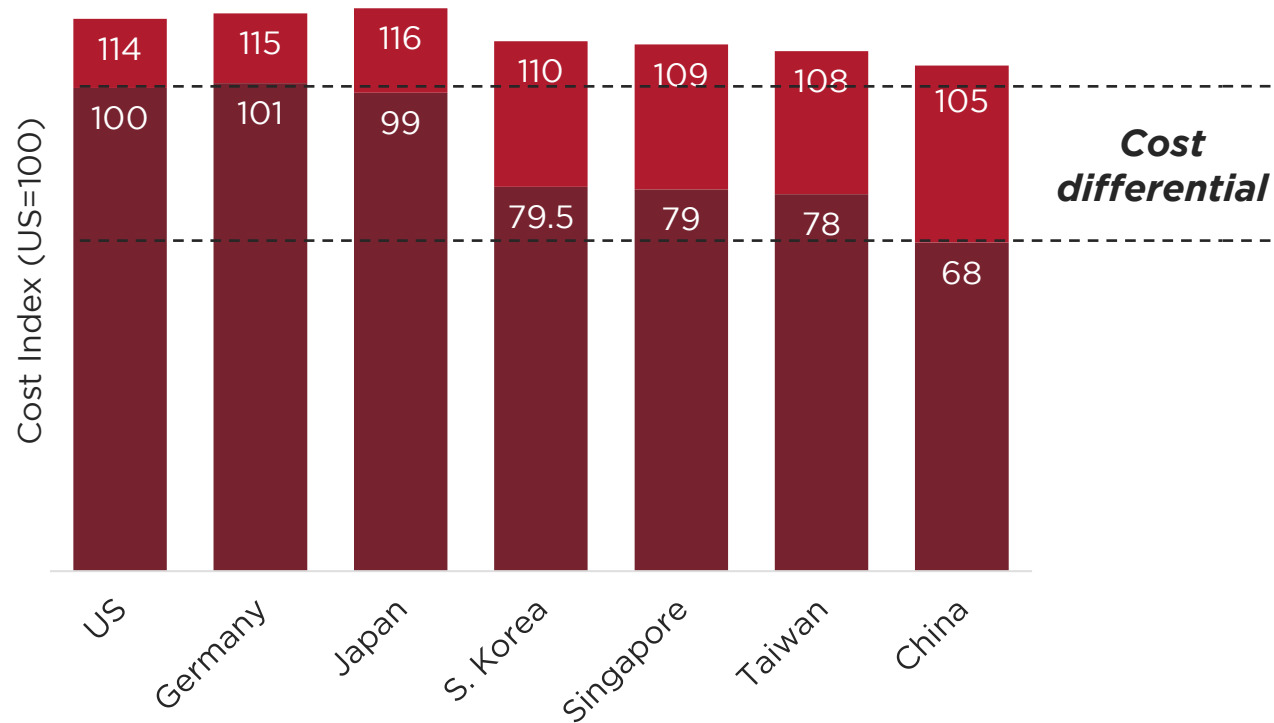
COMPANY	VALUE	STATE
TSMC	\$40.0	AZ
Texas Instruments	\$30.0	TX
Intel	\$20.0	AZ
Micron	\$20.0	NY
Intel	\$20.0	OH
Samsung Electronics	\$17.3	TX
Micron	\$15.0	ID
SK Hynix	\$15.0	IN
Global Foundries	\$11.5	NY
Texas Instruments	\$11.0	UT

The CHIPS Act aims to level the playing field

US capex and opex are structurally higher than most markets

2020 ESTIMATED FAB TOTAL COST COMPARISON BEFORE AND AFTER GOVERNMENT INCENTIVES

■ Cost After Incentives ■ Cost Before Incentives



GOVERNMENT INCENTIVES ARE THE TOP REASON FOR FAB COST DIFFERENTIALS

Percentage range* of total cost difference between US and other countries

Government incentives: 40% to 70%

Labor and utility costs: 15% to 40%

Capex: 15% to 20%

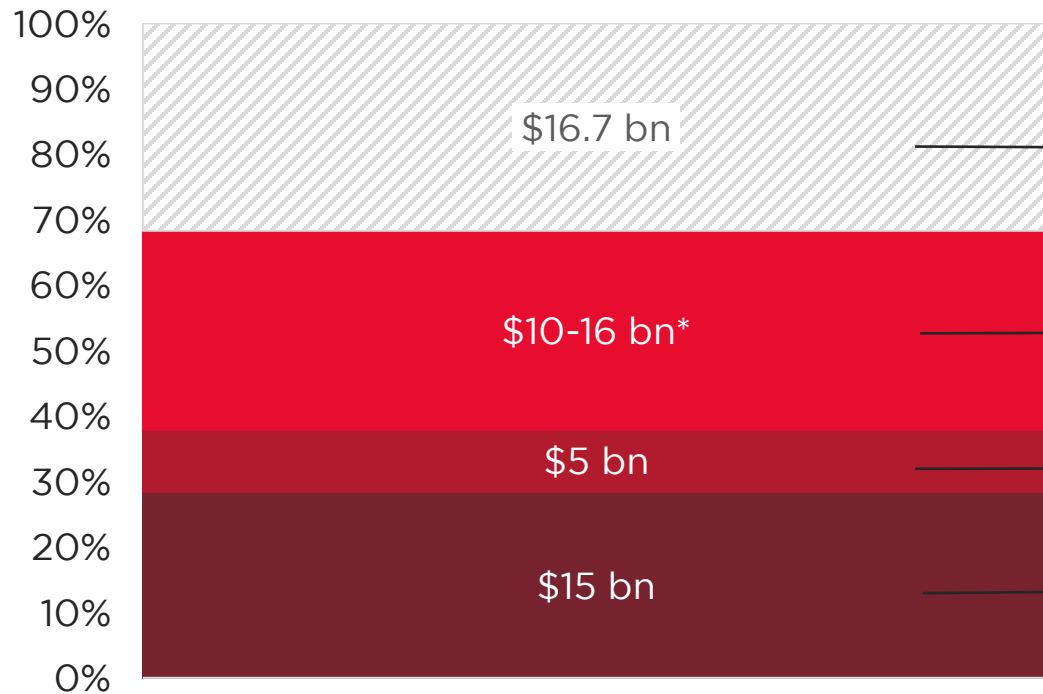
**Ranges dependent on the comparison country and type of chips produced*

CHIPS funding has received significant private sector interest

2024 beginning to see major funding announcements, more to come

CHIPS ACT AWARDS FOR MANUFACTURING TOT \$ BN and % OF TOTAL MANUFACTURING FUNDING

- Awarded
- Pending
- Forecast: Rest of 2024
- ▨ 2025+



CURRENT AND EXPECTED PROJECTS TO TOTAL \$52.7 BILLION

- Dept of Commerce currently considering 600+ applications
- USG engaged in negotiations with applicants, targeting ~8 more grant awards for the rest of 2024
- Samsung: \$6 billion including a \$5bn grant
- GlobalFoundries: \$1.5 billion
- TSMC: \$5 billion
- Intel: \$8.5 bn grant (\$20bn total support)

We expect approx. 70% of funds to be awarded by the end of 2024

*Assumes \$1-2 billion average grant award

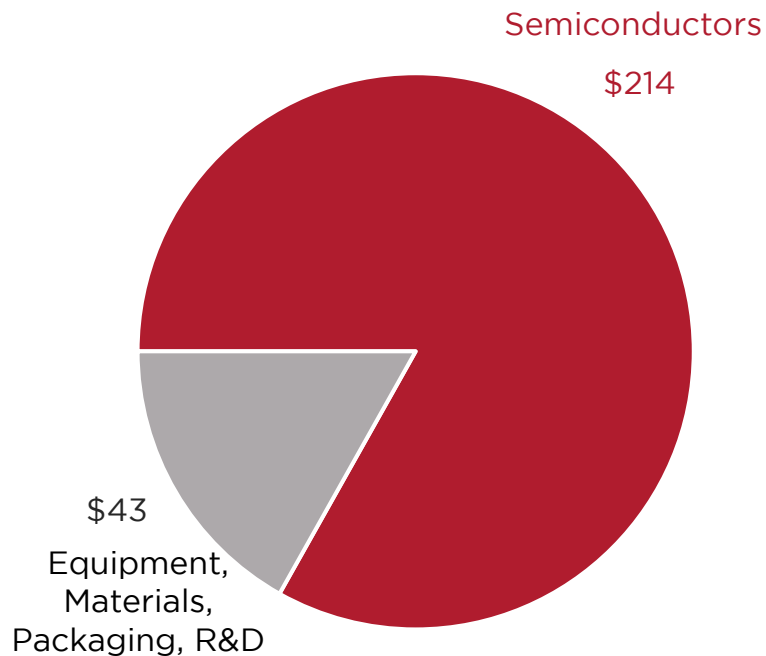
Source: Reuters, US Department of Commerce, Onyx

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US investment equates to 7-11 million wafers per year by 2030

Equivalent to gaining 5% to 7% of global market share

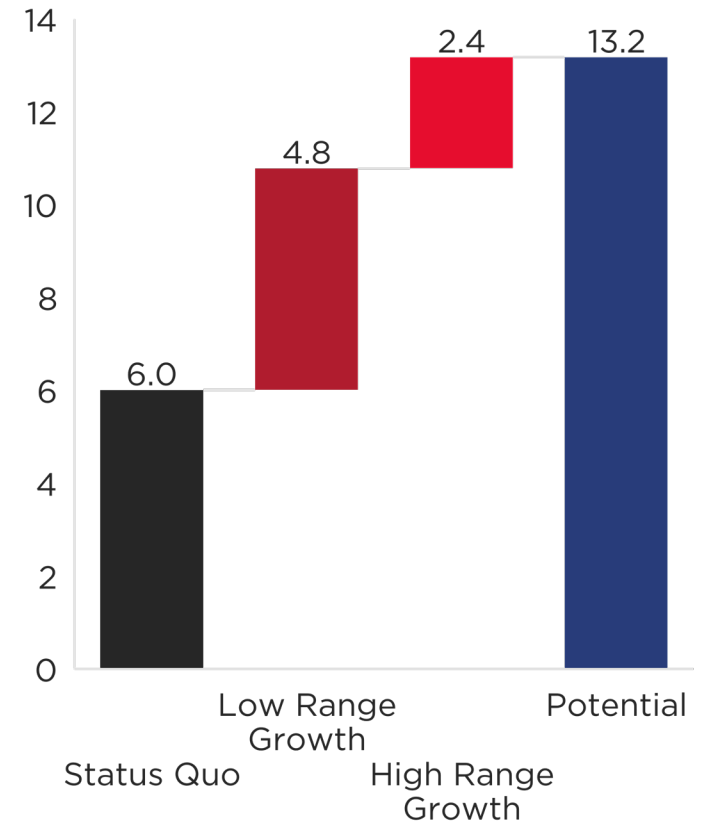
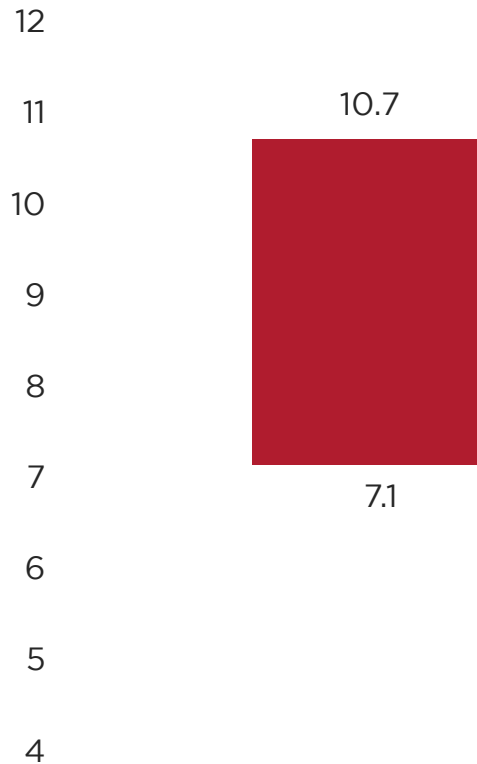
INVESTMENT IN US SEMICONDUCTOR SECTOR
\$ BN



NEW US WAFER CAPACITY BY 2030

MILLIONS OF WAFERS PER YEAR

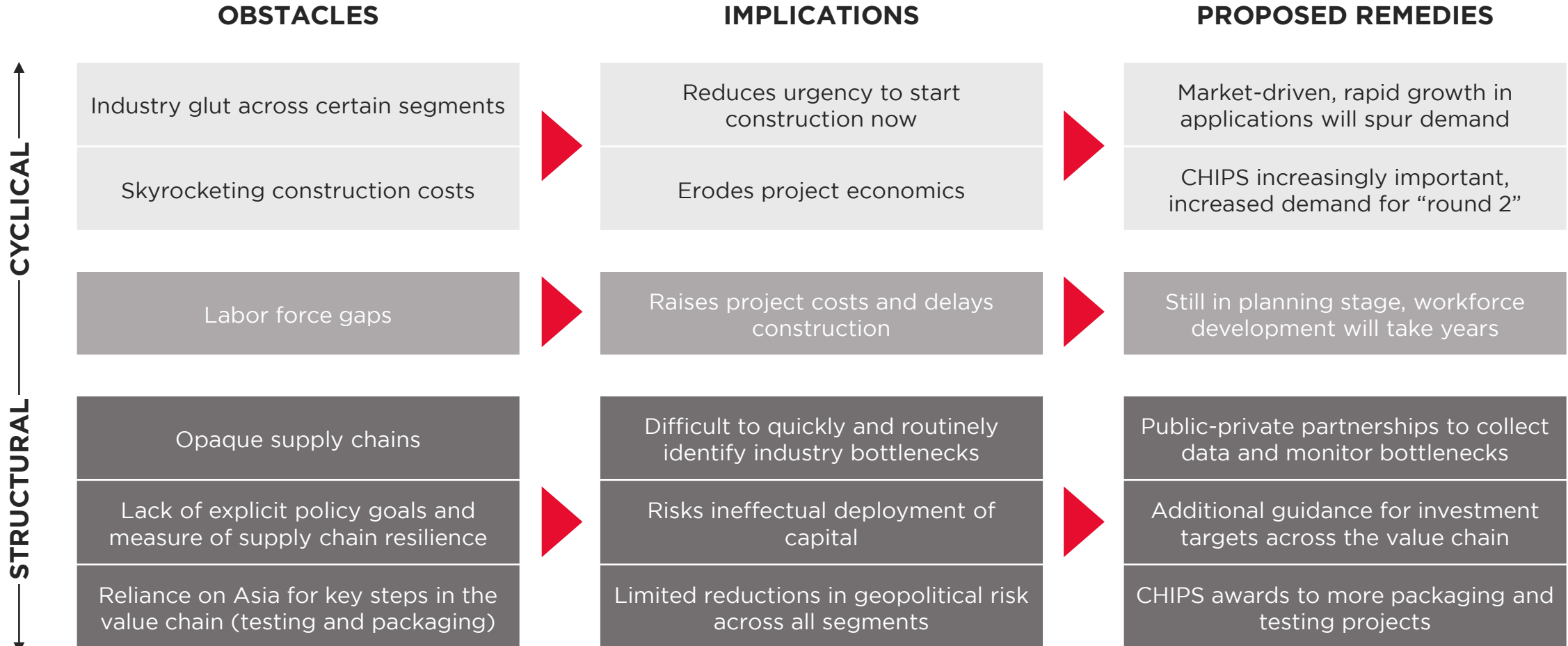
% OF TOTAL GLOBAL CAPACITY



Source: Semiconductor Industry Association, SEMI, Onyx
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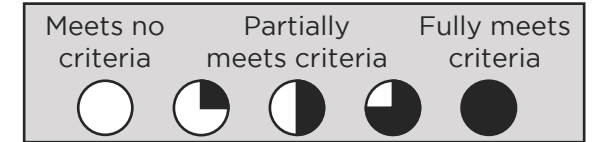
Major obstacles to meeting policy objectives

CHIPS criticized for being a spending package without a clear strategy



Outlook: CHIPS will be moderately successful

But will likely require further funding to maintain effectiveness



CHIPS POLICY ANALYSIS - ABILITY TO MEET CRITERIA BY 2030

POLICY OBJECTIVE	SCORE	EVALUATION
Reduce risk of semiconductor supply chain shocks		<ul style="list-style-type: none"> CHIPS will expand US chip production, but US will gain limited market share as other global players are making similar investments US production will contribute to an industry glut, reducing supply chain risks in the near-term Slower/limited investments across the entire value chain will force US chip manufacturers to ship to Asia for testing and packaging and then to China for assembly into some final products
Improve America's economic competitiveness		<ul style="list-style-type: none"> New fabs bring significant new jobs, but ramp-up of labor force availability will take time despite strong local availability of training programs US faces a chronic shortage of STEM workers; CHIPS funding unlikely to fully resolve this long-standing challenge R&D funding is most at-risk piece of the legislation - Congress has chronically under-funded STEM R&D in recent budgets
Protect semiconductors from international interference		<ul style="list-style-type: none"> Expanded domestic production will result in a greater availability of trustworthy chips, but significant Chinese investment in key raw materials mean developing a fully risk-free supply chain is extremely difficult Allied nations (Netherlands, Japan) with companies that control key bottlenecks have so far been aligned with US restrictions intended to hinder Chinese tech development

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