# Semiconductors, China, Taiwan, and the U.S. Policy Debate:

## Intersecting Technological, Economic Security, and Geopolitical Realities

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# Semiconductors as a Strategic Industry

- Semiconductors/integrated circuits/microchips are the most complex “tools” ever devised by humankind
- Functions in a unique global “ecosystem”
- The ”brains” of our electronic future
- “Coin of the realm” in national technological power
- Requires enormous capital investment and a large and well-trained workforce

# Semiconductors and the New U.S.-China-Taiwan Nexus

- U.S-Taiwan partnership key to the geopolitical balance, peace and stability in Asia
- Taiwan Semiconductor Manufacturing Company (TMSL) the exclusive contractor for U.S. Companies' Chip designs
- China's Dependence on Taiwan for 70 percent of its semiconductor needs
- Taiwan's domination of global semiconductor fabrication reinforces its traditional geostrategic status
- No longer about Taiwan itself, but the peace, stability, and U.S.-led Asia-Pacific order

# U.S. Debate on China-Taiwan Is Stove-Piped

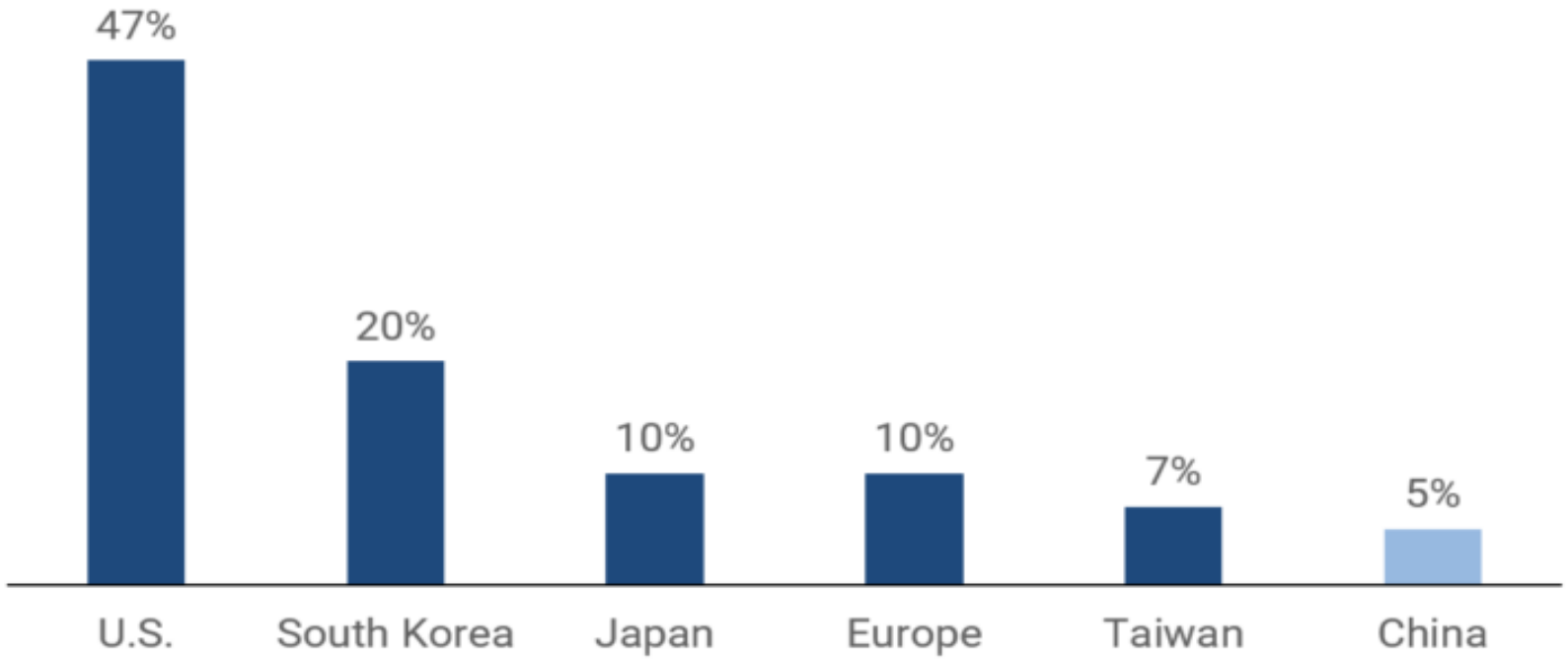
- Washington foreign & security policy community debates no-longer relevant "strategic ambiguity" vs. "strategic clarity"
- Military services focused on war-fighting posture, new weapons procurement, and PLAAF and PLAN modernization and capabilities—DoD's "pacing challenge"
- DoD concerned that there is no domestic foundry that can produce leading-edge chips tailored to unique weapons system requirements
- Intel and rest of industry, Congress, lobbing for USG, state, and municipal operating subsidies
- All oblivious to or ignoring the "inconvenient truth" of Taiwan's "Silicon Shield"

# Taiwan's Geostrategic Importance


# Semiconductors: Mutual Dependence of the U.S. and China on Taiwan: But with important differences

- U.S. – depends on TCMC for fabricating 92 percent of leading-edge chips *designed* by Nvidia, AMC, Intel, Apple etc.
- China -- largest importer of integrated circuits--$350 billion in 2020--to support world's largest electronics assembly industry
- China still relatively a minor factor in the global semiconductor ecosystem
- China fabricates only 6-10 percent of its own needs
- Depends on Taiwan to fabricate 70 percent of total needs—the 'silicon shield"

# 2020 Global Sales Market Share

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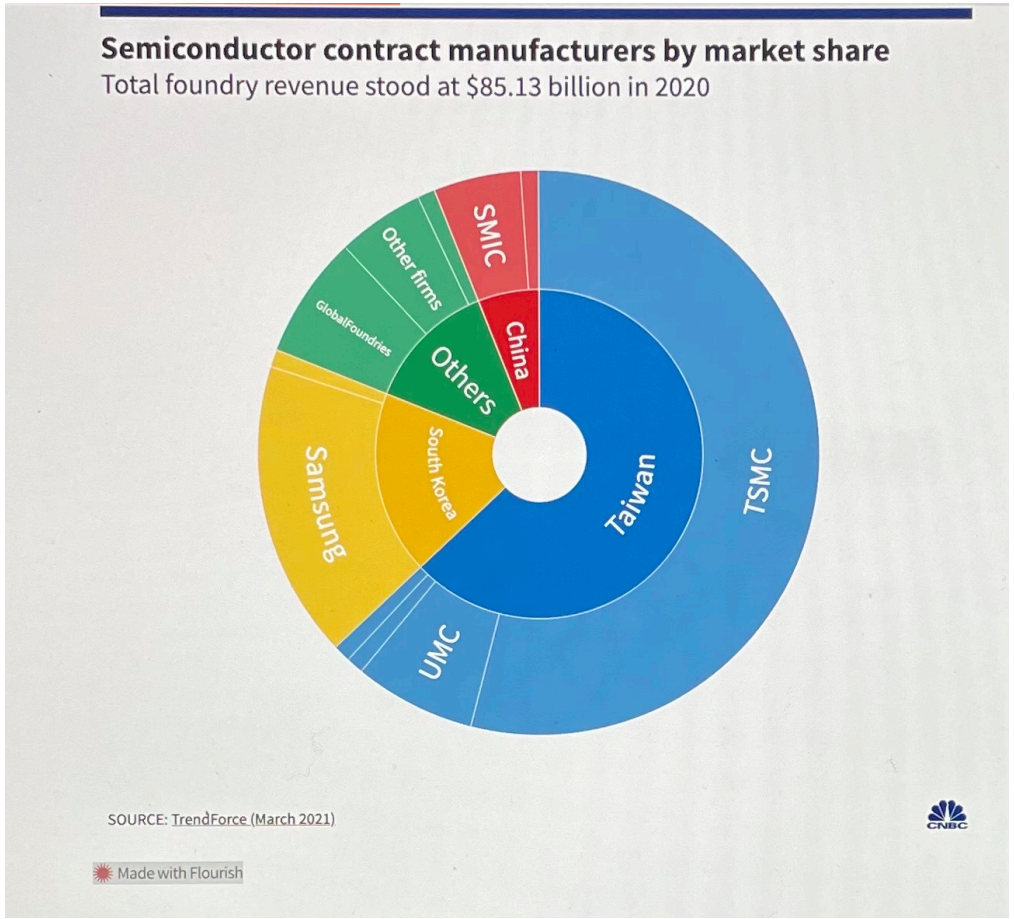
# Taiwan’s strategic sway in a highly differentiated semiconductor ecosystem



# Source of China's Laggard Status

- Santa Clara Valley nicknamed "Silicon Valley" in 1972 when China was in the throes of Mao's "Cultural Revolution"
- Deng Xiaoping's opening to foreign investment in SEZs led to over-dependence (Legal and illegal) on commercializing foreign technology based on (then) low wages, cheap land and large-scale infrastructure
- Inadequate investment in pure science and technology research
- Dominant role of inefficient SOEs and massive political corruption
- Reforms that accompanied WTO undone by the 2000 global financial crisis and need for massive stimulus to maintain acceptable growth
- Bigger reversal under Xi Jinping beginning in 2012

# Biden Administration Belatedly Forging an All-of-Gov. Approach to China & and Supply Chain Vulnerability

- Greatly expanded Trump administration export controls blacklisting of Chinese companies and civilian/military research institutions
- New controls on Chinese-US dual citizens working for Chinese companies on leading-edge tech, AI, nuclear & weapons systems
- Pressure on allies to support U.S. export controls
- The $52 billion “Chips” act “specifically to support revitalizing U.S. chip production and reducing supply chain risk”
- Support to TSMC and Samsung for building foundries in AZ & TX

# Issues and Questions about Re-shoring/Onshoring?

- Focus is on leading-edge chips, but what about supply chain needs for many millions of “mature” chips for vehicles and appliances?
- The impact of likely recession and sharp drop in semiconductor demand?
- Can Intel deliver on its new foundry/process model?
- Political support for long-term USG, state, & local subsidies and tax breaks?
- Can TSCM foundries in AZ gain DoD designation as domestic producer?
- Will TSCM and Samsung actually produce their most advanced chips here?

# Many Issues and Risks Related to Export Controls

- Sharp decline in semiconductor sales due falling post-COVID demand and the continuing supply chain issues for “mature” chips
- Qualcomm, Nvidia, LAM, & other U.S. companies are losing sales of chips to China—effect of export controls overstated?
- Qualcomm has gotten authority to export near-advanced 4G chips
- In many cases advanced U.S.-designed chips are not replaceable despite “Made in China 2025” and “Dual Circulation” policies
- Obstacles to enforcing export-controlled chips and machinery may arise or complicate relations with allies and security partners
- Ultimately, leading-edge chips less important than the export of chip-making tools from the Netherlands (ASML) and Japan

# Main U.S. challenge arises from freezing China out of advanced semiconductors and the tools to make them

- Some export control slippage likely for leading-edge chips but China barred from buying essential Dutch extreme ultraviolet (EUV) photolithography machines
- An attack on Taiwan to capture its EUV and HUV machines not only would touch off a major war but is technologically impossible and impractical because of the “choke points” for essential foreign inputs
- Permanent sanctions would not prevent Chinese military modernization but would earn Chinese enmity and deny Xi his “Chinese dream” of technological parity across the board by 2049
- Hopefully, someone in the administration is working on this!

# THANK YOU!