

How China's Subsidies Threaten Advanced-Technology Industries

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Chinese Innovation Mercantilism's Impact on Global Innovation

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Industry by Industry: More Chinese Mercantilism, Less Global Innovation

ROBERT D. ATKINSON | MAY 2021

China's long-standing and rampant "innovation mercantilist" policies harm global innovation by taking market share and revenues from more-innovative foreign competitors, thereby diminishing the resources they can invest in research and development toward further innovation.

KEY TAKEAWAYS

- In most industries, Chinese firms operate far from the frontier of innovation. To the extent China's mercantilist policies erode market share and reduce revenue for innovation leaders, they also reduce investment in the next round of innovation.
- Most scholarly, econometric studies on the impact of China's economic policies on foreign research and development (R&D) and innovation find a negative relationship.
- ITIF compiled case studies of five industries: solar panels, high-speed rail, telecom equipment, semiconductors, biopharmaceutical products. In each case, our economic models suggested significant negative impact on global R&D and patenting.
- In the semiconductor industry alone, ITIF found that if Chinese firms had 80 percent less market share, there would be 5,000 more U.S. patents annually.
- If China were to reduce its unfair mercantilist policies, the pace of global innovation would increase. But in a classic win-lose dynamic, China shows no inclination to do so.
- Allied nations should pressure China to reduce its harmful policies and encourage the WTO to focus more on the innovation effects of trade distortions.
- To apply pressure, allies should limit market access for innovation-based goods and services that are supported by Chinese government and its mercantilist policies.
- Allies also should cooperate more on technology policy and establish stronger trade agreements to allow for the free flow of innovation-based goods.

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Moore's Law Under Attack: The Impact of China's Policies on Global Semiconductor Innovation

STEPHEN EZELL | FEBRUARY 2021

China's mercantilist strategy to grab market share in the global semiconductor industry is fueling the rise of inferior innovators at the expense of superior firms in the United States and other market-led economies. That siphons away resources that would otherwise be invested in the virtuous cycle of cutting-edge R&D that has driven semiconductor innovation for decades.

KEY TAKEAWAYS

- No industry has an innovation dynamic quite like the semiconductor industry, where "Moore's Law" has held for decades: The number of transistors on a microchip doubles about every two years, producing twice the processing power at half the cost.
- The pattern persists because the semiconductor industry vies with biopharmaceuticals to be the world's most R&D-intensive industry—a virtuous cycle that depends on one generation of innovation to finance investment in the next.
- To continue heavy investment in R&D and CapEx, semiconductor firms need access to large global markets where they can compete on fair terms to amortize and recoup their costs. When they face excess, non-market-based competition, innovation suffers.
- China's state-directed strategy to vault into a leadership position in the semiconductor industry distorts the global market with massive subsidization, IP theft, state-financed foreign firm acquisitions, and other mercantilist practices.
- Inferior innovators thus have a leg up—and the global semiconductor innovation curve is bending downward. In fact, ITIF estimates there would be 5,100 more U.S. patents in the industry annually if not for China's innovation mercantilist policies.
- To address the challenge Chinese innovation mercantilism poses to the semiconductor industry, the United States needs to work with like-minded nations while enhancing its own innovation capacity in the sector.

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The Impact of China's Production Surge on Innovation in the Global Solar Photovoltaics Industry

DAVID M. HART | OCTOBER 2020

China's subsidy-aided rise to dominance in PV manufacturing has driven prices way down, but at the cost of undermining promising alternative technological pathways. Policymakers should adopt measures to sustain greater diversity in PV and similar technologies.

KEY TAKEAWAYS

- Sustained innovation in solar photovoltaics (PV) is vital to achieve global climate goals. Experts differ on whether today's dominant PV technology can be improved to the extent required. The world needs more options; China's dominance limits them.
- China became the dominant global player in PV manufacturing during the 2010s with critical help from government subsidies.
- Excessive subsidy-powered competition from China decimated the industry in the rest of the world, eliminating many innovative companies.
- China's surge shifted the course of technological innovation: PV prices dropped, efficiency rose, and process innovation flourished. But R&D-intensity, patenting, and start-ups cratered.
- As the course of innovation shifted, alternative technological pathways that might have led to even lower prices and better performance were cut off.
- Policymakers should learn from this experience and adopt measures that would create and sustain technological diversity in PV and other climate-critical technologies, while working with allies to curb clean energy mercantilism.

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Industrial Subsidies a Key Component of Chinese Strategy

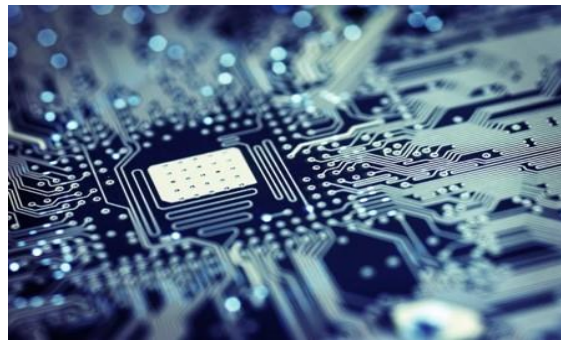
- Since China joined the WTO in 2001, subsidies have annually financed about 20 percent of China's manufacturing capacity.
- 95% of Chinese firms in tech industries received R&D subsidies in 2015, with those subsidies accounting for 22% of firms' R&D investments.



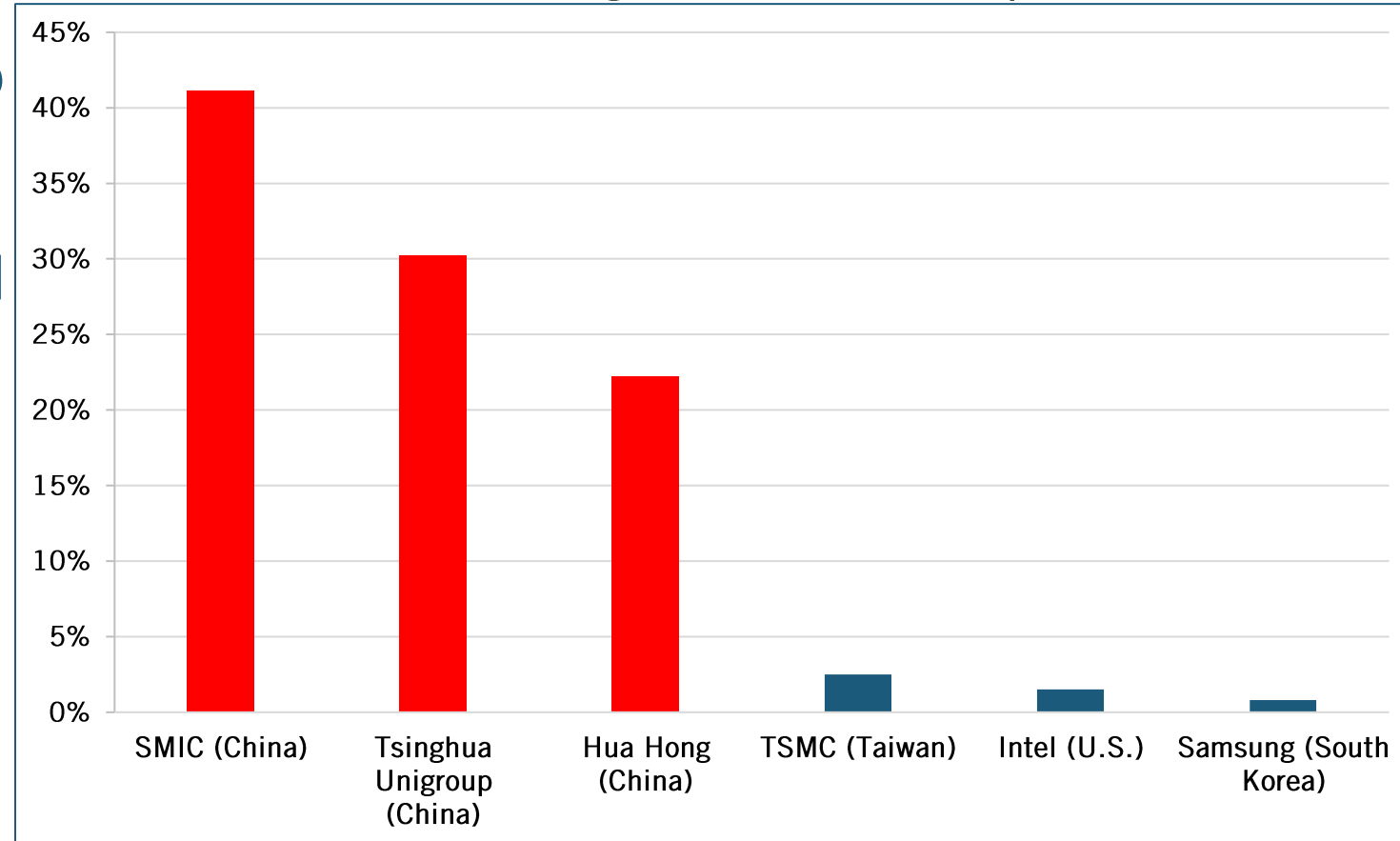
Source: Lily Fang et al., "Corruption, Government Subsidies, and Innovation: Evidence from China"; Jonas Nahm, Johns Hopkins SAIS

Chinese Subsidies to the Semiconductor Industry

- National IC Plan: \$170 billion to develop a Chinese closed-loop semiconductor ecosystem.
- OECD: “86% of identified global semiconductor subsidies from 2014-2018 to Chinese firms.”



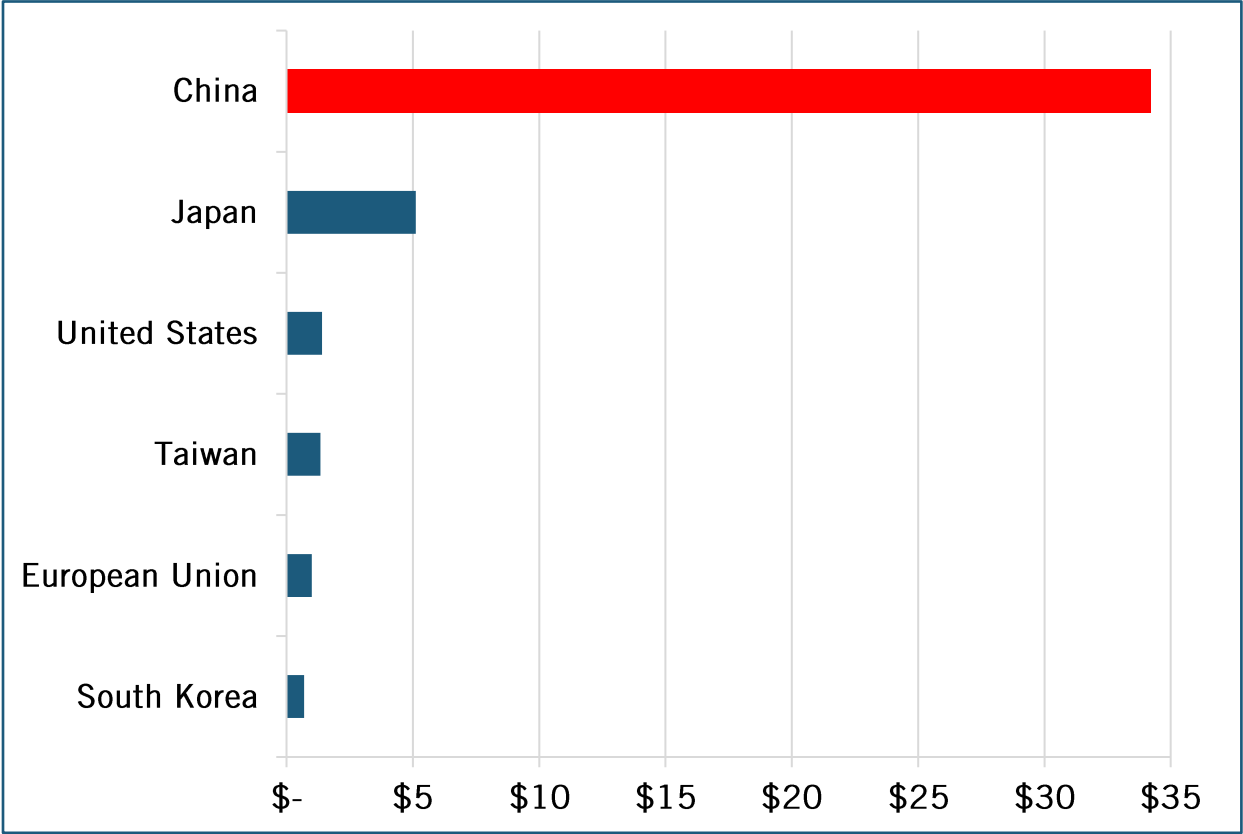
State Subsidies as a Percentage of Revenue for Chip Fabs, 2014-2018



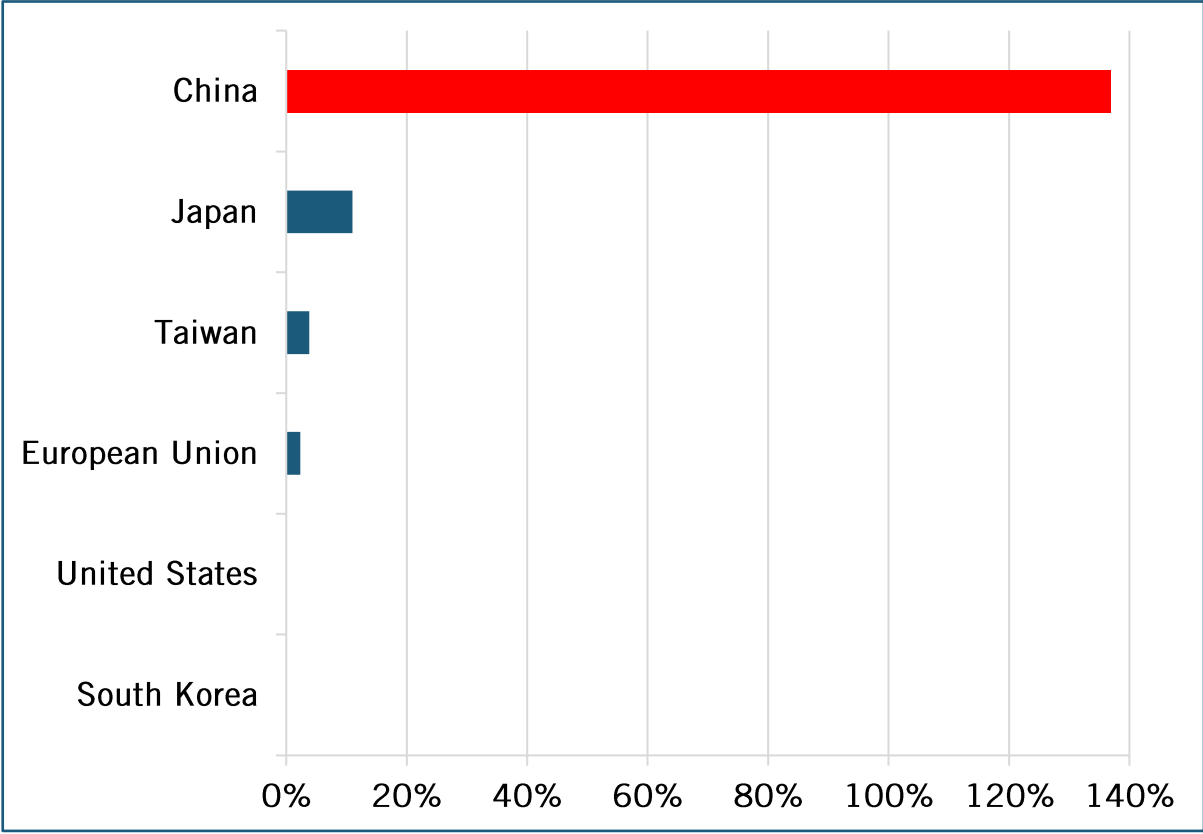
Source: OECD, “Measuring Distortions in International Markets: The Semiconductor Value Chain”

Chinese Subsidies to the Semiconductor Industry

Estimated Value of Total Semiconductor Sector Funding Assistance, (US\$, Billions) in 2019



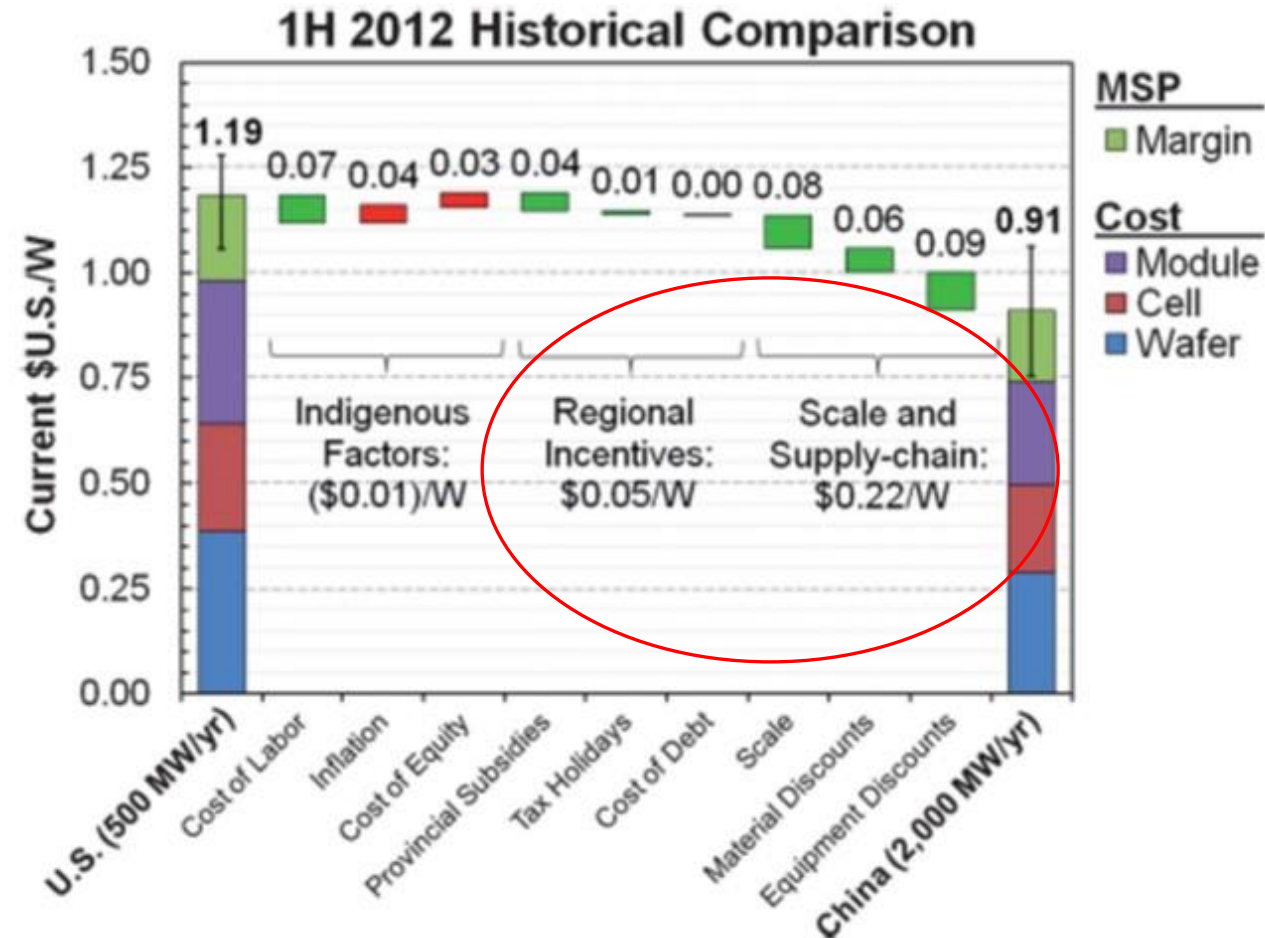
Estimated Value of Total Semiconductor Sector Funding Assistance as a Percentage of Global Sales



Source: Peter Cowhey, "Expanding the Analysis of Subsidies and Semiconductors," World Semiconductor Congress, 2019

Solar PV Cost Differences and Chinese Subsidies

- \$42 billion in subsidies for solar PVs from 2010 to 2012 alone.
- Cost of making a solar panel (per MW) \$0.28 higher in the U.S. than in China, with direct subsidies 1/6th the gap.
- However, scale and supply chain effects, which account for 80% of the difference, are a direct effect of the subsidies.
- Effect: “Some 200 to 300 U.S. solar start-up companies out of business.”



Source: U.S. National Renewable Energy Laboratory, Dominik Kümmerle and Dr. Christian Schmidkonz, “China’s Strategic Trade Policy”

CRRC's Main Weapon: Cheap (State-Backed) Financing

- State-supported financing:
 - Funnels hundreds of billions of direct and indirect subsidies.
E.g., CRRC debt surged seven-fold from \$70 billion in 2005 to over \$558 billion in 2017.
 - Allows abnormally low bids overseas: 20-30 percent below competitors.
E.g., CRRC's bid for a commuter rail contract in Pennsylvania was \$47 million less than the next competitor (Hyundai Rotem).
- Quote from Hyundai Rotem, w/ factory in Philadelphia.
 - “I cannot grasp how they are able to do it at that cost.”



Source: ITIF, “Heading Off Track: The Impact of China’s Mercantilist Policies on Global High-Speed Rail Innovation”

Subsidies Across Other Chinese Industries

- Huawei: \$75 billion in state support over 25 years; \$100 billion line of export credit.
- Billions for shipbuilders “decreased cost of production in Chinese shipyards 13-20% from 2006 to 2012.”
- Chinese government provided \$52 billion in subsidies to steel producers from 2001 to 2006 alone.
- From 2015 to 2019, Chinese long-term export credit financing 90% that of all G7 nations combined.



Source: ITIF, “False Promises II: The Continuing Gap Between China’s WTO Commitments and Its Practices”

Harms Caused By Aggressive Industrial Subsidization

- Distorts market economics: Innovators depend on profits from one generation of innovation to finance investment in the next.
- When inferior technologies prevail, especially through excessive subsidization, it locks the global economy in lower levels of technological innovation.
- Inhibits market-based competition not just on the technological features/value of a product, but also on more environmentally friendly production systems.

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Design for Location? The Impact of Manufacturing Offshore on Technology Competitiveness in the Optoelectronics Industry

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This paper presents a case study of the impact of manufacturing offshore on technology competitiveness in the optoelectronics industry. It looks, in particular, at a critical design / facility location decision being faced by optoelectronic component manufacturers. The paper uses a combination of simulation modeling and empirical data to demonstrate the economic constraints facing these firms. The results show that production location changes the relative economics of the two competing designs – one emerging, one prevailing – which are perfect substitutes for each other on the telecom market. Specifically, if optoelectronic component firms shift production from the U.S. to countries in developing East Asia, the emerging designs that were developed in the U.S. no longer pay. Production characteristics are different abroad, and the prevailing design can be more cost-effective in developing country production environments. The emerging designs, however, have performance characteristics, which may be valuable in the long term to the larger computing market and to pushing forward Moore's Law. The paper concludes by exploring the dilemma this creates for the optoelectronic component manufacturers, and recommending a framework based on which the results may be generalized to other industries.

Key words: international, product development, design for manufacturing

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1 Introduction: A Dilemma for Optoelectronic Component Manufacturers

Today only 28% of manufacturing value (MVA) added occurs within the U.S. (UNIDO, 2007). While this figure steadily declines, the percentage of MVA in South and East Asia continues to grow (2007).¹ Despite this continuing shift in the distribution of manufacturing activity, there is surprisingly little empirical literature quantifying global differences in operation parameters, and the implications of these differences for product strategy and technology choice. Nor are all firms moving manufacturing offshore alike. Whereas traditional literature suggested that firms would at first produce in the North, close to the

¹ China's annual growth in manufacturing value added rose to 10.5% between 2000-2005, compared to growth of 1.5% in North America during the same period (UNIDO, 2007. *International Yearbook of Industrial Statistics*. Cheltenham, UK, Edward Elgar.

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Source: Erica Fuchs, Carnegie Mellon U. "Design for Location? The Impact of Manufacturing Offshore Technology Competitiveness in the Optoelectronics Industry"

Recommendations for Policymakers

- Clarify the definition of “public body,” extending it to include state-influenced activities of entities such as state-owned enterprises or private firms.
- Improve transparency: Insist upon timely and complete notification of subsidies.
- Establish a presumption of prejudice toward subsidies not timely notified.
- Obligate the subsidizing country to prove that a given subsidy does not inflict harm on others.
- Broaden the categories of specifically prohibited subsidies at the WTO.

Thank You!

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