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China's Chip Foundries Still Dependent on Foreign Tech Transfers

Although China's tech industries have made astounding progress in recent years, they have done so only with massive aid — in the form of transfers of technology and know-how — from the United States and other advanced non-communist countries. This is especially true with regard to computer chips. And all of China's industries are doomed to fall behind unless China's chip makers obtain the cutting-edge tools necessary to make newer and faster chips.



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The beating heart of our modern, electronically dependent society is the semiconductor, also known as the microchip. Semiconductors are produced in “foundries,” also called fabrication plants or “fabs.” Due to the enormous investment costs in building and maintaining a sophisticated chip foundry, many leading chip producers design their own chips but farm out the actual manufacturing to one or more of the relative handful of chip fabricators.

San Diego-based cellphone technology giant Qualcomm is a prime example of the “fabless” manufacturing model. Qualcomm designs chips for its own products, as well as other companies' products, but has them fabricated at chip foundries. In 2020, Qualcomm was number three on Investopedia's list of the “Ten Biggest Semiconductor Companies,” with \$24.7 billion in revenue. Its chips, which are used in cellphones, wi-fi routers, automobiles, laptops, tablets, watches, and other devices, are fabricated by Taiwan Semiconductor Manufacturing Company (TSMC) and China's Semiconductor Manufacturing International Corporation (SMIC).

Silicon Valley's Intel Corporation, which is the world's biggest chip producer (\$75.7 billion in revenue for 2020), fabricates its own semiconductors, as well as designing and manufacturing chips for other chip makers. Taiwan's TSMC, one of the world's largest foundries, is what is known as a “pure play” foundry, meaning it makes chips designed by fabless companies, but doesn't make any of its own chips that would compete with its customers. Unlike some other pure-play foundries, TSMC also provides in-house design services to design custom chips for its clients.

The big new kid on the foundry block is SMIC, headquartered in Shanghai, China. According to a report from Bank of America, roughly 80 percent or more of SMIC equipment comes from U.S. vendors. On



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June 23, 2015, SMIC executives and executives from Qualcomm and China's Huawei and Imec met for a signing ceremony in Beijing's Great Hall of the People to announce the formation of SMIC Advanced Technology Research & Development Corporation, a joint R&D center to work on building China's next generation of computer chips.

SMIC needs continued outside help. "Chips are generally evaluated in nanometers, traditionally the measure of the width of the gates in a chip's transistors; smaller gates enable faster operations that use less energy," Bloomberg reported in July. "SMIC says it can make 14nm chips, though its main business currently consists of producing 28nm chips and other mature technologies. By comparison, Taiwan Semiconductor Manufacturing Co. aims to ramp up mass production of 3nm chips in 2022, putting SMIC five to six years behind," the Bloomberg piece notes.

China desperately needs more transfusions of superior foreign technology to upgrade its "indigenous" chip foundries if it is to keep pace with the fast-developing semiconductor world. And while the CCP has pledged more than a trillion dollars to the effort, even that amount of cash doesn't guarantee success. In fact, in many ways it is counterproductive, inviting waste, corruption, and malinvestment.

As the Bloomberg piece cited above noted, "China's history with chipmaking shows that money can't solve all problems. Its chip effort, which started more than 20 years ago, has been marked by unfulfilled promises, stillborn projects, and government waste." And even though the CCP's state-owned-enterprises (SOEs) such as Huahon Group and SMIC have developed impressive fabrication plants, Bloomberg notes that "China hasn't produced a single chipmaker on the world-beating scale of the major rivals outside its borders."

The Bloomberg report notes further that "Some of the resulting failures have been spectacular. Take Hongxin Semiconductor Manufacturing Co., a \$20 billion chip project in central China's Wuhan, which the government backed. It promised to make 30,000 wafers monthly for 7nm chips, then collapsed in late 2020 before it had produced a single one."

President Trump's policies cutting off SMIC and China's other SOEs from easy access to U.S. chips and chip-fabricating machines have borne fruit. He coupled those policies with pressure on European, Japanese, and Taiwanese governments to have their foundries refrain from selling advanced manufacturing machines and processes to China. This has thrown a wrench into China's rush toward global military dominance. President Biden is now seeking to undo those impediments and reestablish the policies of the past four decades that have built Communist China into the global threat it has become.



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