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# China's New Semiconductor Policies: Issues for Congress

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# Introduction

Since August 2020, the government of the People's Republic of China (PRC or China) has issued several new related policy measures to boost the development of its semiconductor and software industries. In August 2020, China's State Council issued the *Notice on Several Policies to Promote the High-quality Development of the Integrated Circuit Industry and Software Industry in the New Era*, which provides a broad framework.[1] In March 2021, the Chinese government issued several implementing measures that include criteria companies must meet to qualify for government preferences, as well as tax and tariff provisions (See **Table 1** and **Appendix**). The Chinese government is expected to issue lists with more details about specific companies, projects, technologies, raw materials, and components that are to be encouraged by the state.

China's new policies encourage U.S. and foreign semiconductor companies—including those from Taiwan, Hong Kong, and Macau—to transfer certain technology, intellectual property (IP), talent, and research and development (R&D) to operations in China. These policies target capabilities across the semiconductor value chain, including integrated circuit (IC) design, fabrication, equipment, software design and tools, packaging and testing, and materials. These policies offer preferential terms over the next ten years—including tax, tariff, financing, and IP protection—for firms willing to establish capabilities, including production facilities, in China. These policies require companies to transfer certain IP—including a specific number of invention patents, depending on the subsector—to ownership by a China-based business that is legally separate from its corporate parent, potentially giving the Chinese government greater control over certain technologies, including through the use of China's new export control law.[2]

A semiconductor (also known simply as an integrated circuit, a microelectronic chip, or a computer chip) is a tiny electronic device (based primarily on silicon or germanium) composed of billions of components that store, move, and process data. Semiconductors are a uniquely important enabling technology. They are fundamental to nearly all modern industrial and national security activities, and they are essential building blocks of other emerging technologies, such as artificial intelligence, autonomous systems, 5G communications, and quantum computing. For more than six decades, consistent growth in semiconductor capabilities and performance and concurrent cost reductions have boosted U.S. economic output and productivity and enabled new products, services, and industries.[3]

Many Members of Congress and U.S. policymakers are concerned that China's state-led semiconductor policies, if successful, could lead to the loss of U.S. technological leadership and significantly shift global semiconductor production and related design and research capabilities to China. Chinese semiconductor competencies could support a range of technology advancements,

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[1] China's State Council *Notice of Several Policies to Promote the High Quality Development of the Integrated Circuit (IC) and Software Industries in the New Era*, Guofa [2020] No. 8, August 2020, available in Chinese at http://www.gov.cn/zhengce/content/2020-08/04/content_5532370.htm.

[2] China's State Council *Notice of Several Policies to Promote the High Quality Development of the Integrated Circuit (IC) and Software Industries in the New Era*, Guofa [2020] No. 8, August 2020, paragraph numbers 26 and 38, available in Chinese at http://www.gov.cn/zhengce/content/2020-08/04/content_5532370.htm; *Notification of the Relevant Requirements for the Development of Lists of Projects and Software Companies, Development and Reform High Technology [2021] No. 413* (Annex 1 and Annex 3), issued by the National Development and Reform Commission, MIIT, Ministry of Finance, General Administration of Customs, and General Administration of Taxation on March 29, 2021. See CRS Insight IN11524, *China Issues New Export Control Law and Related Policies*, by Karen M. Sutter.

[3] CRS Report R46581, *Semiconductors: U.S. Industry, Global Competition, and Federal Policy*, by Michaela D. Platzer, John F. Sargent Jr., and Karen M. Sutter



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including military applications. Although some countries, including the United States, support their domestic semiconductor industry, the scope and scale of China's state-led efforts are unprecedented when considering the amount of state funding involved, the Chinese government's ambitions to lead across the entire semiconductor value chain, the targeting of U.S. and foreign capabilities, and the particular methods that China is using, which appear to challenge current global rules and norms.[4]

# U.S.-China Phase One Trade Deal Commitments

These new measures build on China's existing state-led semiconductor initiatives by providing new specific technology requirements tied to preferential market treatment and economic benefits.[5] In establishing a direct quid pro quo link between technology transfer and qualifications for particular government incentives, China appears to be pursuing trade practices—that previously were detailed in USTR's Section 301 report from March 2018—of concern to the U.S. government and many in Congress.[6] Specifically, China's new semiconductor policies may violate provisions in the January 2020, U.S.-China Phase One Trade Deal, particularly in Chapter 2 of the agreement that addressed some aspects of China's technology transfer policies and practices.[7] Among related commitments, in Article 2.3 of the agreement, China agreed it would not require or pressure firms to transfer technology in relation to investment transactions, or as a condition for parties to receive or continue to receive any advantages conferred by China.[8] In late March 2021, China's planning agency, the National Development and Reform Commission, issued further guidance on the new policies; the guidance clarifies that the Chinese government will require the relevant patents and IP mandated under its measures to be owned by a legally distinct and independent business in China, and cannot be simultaneously owned or controlled outside of China.[9] According to these policies, patents and related IP submitted to the Chinese government for review will require government authorization, which creates an opening for the Chinese government to determine and require the specific know-how that companies must transfer to China to meet the policy requirements.

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[4] OECD, Trade and Agricultural Directorate, Trade Committee, "Measuring Distortions in International Markets: The Semiconductor Value Chain," November 21, 2019. See CRS Report R46581, *Semiconductors: U.S. Industry, Global Competition, and Federal Policy*, by Michaela D. Platzer, John F. Sargent Jr., and Karen M. Sutter.

[5] See CRS Report R46581, *Semiconductors: U.S. Industry, Global Competition, and Federal Policy*, by Michaela D. Platzer, John F. Sargent Jr., and Karen M. Sutter.

[6] Pursuant to Section 301 of the Trade Act of 1974 (19 USC §§2411-2420), USTR concluded that China's policies and practices related to forced technology transfer requirements, cyber-enabled theft of U.S. intellectual property and trade secrets, discriminatory and nonmarket licensing practices, and state-funded strategic acquisition of U.S. assets were unreasonable or discriminatory. See "Findings of the Investigation Into China's Acts, Policies, and Practices Related to Technology Transfer, Intellectual Property, and Innovation Under Section 301 of the Trade Act of 1974," Office of the United States Trade Representative, March 22, 2018, https://ustr.gov/sites/default/files/Section%20301%20FINAL.PDF.

[7] See CRS Insight IN11208, *U.S. Signs Phase One Trade Deal with China*, by Karen M. Sutter.

[8] "Economic and Trade Agreement Between the Government of the United States of America and the Government of the People's Republic of China," January 15, 2020, https://ustr.gov/sites/default/files/files/agreements/phase%20one%20agreement/Economic_And_Trade_Agreement_Between_The_United_States_And_China_Text.pdf.

[9] "Answers to Relevant Questions About the 'Notice on the Requirements for Creating a List of Integrated Circuit Companies or Projects and Software Companies that Enjoy Preferential Tax Policies," High Technology Division, National Development and Reform Commission, March 31, 2021, https://www.ndrc.gov.cn/xxgk/jd/jd/202103/t20210331_1271319.html.



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**Table 1. Summary of Criteria for Semiconductor and Software Companies to Qualify for Government Preferences**

| Category | Requirements (Ranges reflect different criteria by subsector) |
|---|---|
| **Business Incorporation** | • Legally registered in China (excluding Hong Kong, Macau, and Taiwan).<br>• Has an independent or separate legal personality in China. |
| **Industrial Policies** | • Complies with China's national industrial policies. |
| **Talent** | • At least 30-50% of employees have a college degree.<br>• R&D personnel account for 15-50% of employees (15-20% for IC production firms; 50% for design and software firms). |
| **Research and Development (R&D)** | • Annual R&D expenses are at least 2-6 % of total income.<br>• For packaging and testing, total R&D expenses equals the amount of total sales in the final tax settlement year. |
| **Intellectual Property (IP)** | • Has independent IP rights for core IC-related technology.<br>• Registers at least 5 to 10 authorized patents in China related to R&D, design, or manufacturing. (5 patents for IC materials and packaging and testing firms; 10 patents for semiconductor equipment firms). |
| **Business Environment** | • Has applicable business premises, software and hardware facilities, uses legal or legitimate Electronic Design Automation (EDA) and other software and hardware tools, and meets other basic conditions.<br>• Does not have any major corruption, safety, quality, or environmental issues in the year of final settlement.<br>• Violations are recorded on China's national credit information sharing platform. |
| **Investment, Sales and Income** | • Annual sales in the targeted subsector are at least 30-60% of total income.<br>• Annual income is at least $1.5 million to $7.6 million.<br>• For IC production, fixed-asset investment is $15.3 million to $1.2 billion depending on the production line.<br>• Specific production capacity targets for each IC line. |

**Source:** CRS with information from *Conditions for Integrated Circuit Design, Equipment, Materials, Packaging, and Testing Companies Encouraged by the State*, draft measures for comment issued by the Ministry of Industry and Information Technology (MIIT) on February 4, 2021; and *Notification of the Relevant Requirements for the Development of Lists of Projects and Software Companies*, Development and Reform High Technology [2021] No. 413 issued by the National Development and Reform Commission, MIIT, Ministry of Finance, General Administration of Customs, and General Administration of Taxation on March 29, 2021. This analysis is based on an informal translation and review of these documents by the author.

# China's Broader Semiconductor Industrial Plans

China's state-led efforts to develop an indigenous and vertically integrated semiconductor industry are unprecedented in scope and scale. In June 2014, the Chinese government published a plan, *Guidelines to Promote National Integrated Circuit Industry Development*, "with the goal of establishing a world-leading semiconductor industry in all areas of the integrated circuit supply chain by 2030." The document included measures to support an aggressive growth strategy, with the goal of meeting 70% of China's semiconductor demand with domestic production by 2025. In 2019, China revised the goal upward, setting an objective of expanding its domestic production of



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semiconductors (including from foreign firms in China) to meet 80% of domestic demand by 2030, as part of its *Made in China 2025* industrial strategy.[10] IC Insights estimate that integrated circuits produced in China accounted for approximately 16% of China's total market, valued at $143.3 billion.[11]

China's policies feature a substantial and central role for the government in directing and financing Chinese businesses to obtain foreign IP related to semiconductors. The Chinese government uses production targets; subsidies; tax preferences; trade and investment barriers (including pressure to engage in joint ventures); and discriminatory antitrust, IP, procurement, and standards practices. The policies seek to leverage China's central role in global consumer electronics manufacturing and potential as a semiconductor production hub to incentivize and pressure foreign companies to localize production, share technology, and partner with the Chinese government and affiliated entities. To implement its semiconductor plan, China created a government fund—the China Integrated Circuit Investment Industry Fund (CICIIF)—to channel an estimated $150 billion in state funding in support of domestic industry, state-directed overseas acquisitions, and the purchase of foreign semiconductor equipment. In October 2019, China announced a second semiconductor fund with an estimated capitalization of $28.9 billion.[12]

# Main Provisions of the New Measures

The Chinese government appears to be expanding and deepening a statist approach to developing technologies and sectors prioritized in its *Made in China 2025* and other industrial plans.[13] China's efforts to develop indigenous capabilities have often sought to first obtain the technologies and capabilities it needs from foreign firms. While China is advocating for technology independence in its new 14th Five-Year Plan (2021-2025), details in the new measures show the government is still seeking specific foreign capabilities to fill critical gaps in advancing these goals of technology leadership and independence.[14]

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[10] China's State Council, "Guideline for the Promotion of the Development of the National Integrated Circuit Industry," June 2014; China's State Council, "Notice on Issuing Several Policies to Promote the High-Quality Development of the Integrated Circuit Industry and the Software Industry in the New Period," Guofa (2020) 8, August 4, 2020; Center for International Governance Innovation, "Beyond 'Forced' Technology Transfers Analysis of and Recommendations on Intangible Economy Governance in China," CIGI Papers No. 239, March 2020, at https://www.cigionline.org/sites/default/files/documents/no239_2.pdf; John VerWey, "Chinese Semiconductor Industrial Policy: Past and Present," USITC, *Journal of International Commerce and Economics*, July 2019; and U.S. Chamber of Commerce, *Made in China 2025: Global Ambitions Built on Local Protections*, 2017, at https://www.uschamber.com/sites/default/files/final_made_in_china_2025_report_full.pdf.

[11] Scott Foster, "Get Real about the Chinese Semiconductor Industry," Asia Times, January 18, 2021, https://asiatimes.com/2021/01/get-real-about-the-chinese-semiconductor-industry/.

[12] Christopher Thomas, *A New World Under Construction: China and Semiconductors*, McKinsey & Company, November 2015, at http://www.mckinsey.com/global-themes/asia-pacific/a-new-world-under-construction-china-and-semiconductors; Yoko Kubota, "China Sets up New $29 Billion Semiconductor Fund," *Wall Street Journal*, October 25, 2019, at https://www.wsj.com/articles/china-sets-up-new-29-billion-semiconductor-fund-11572034480; Tianlei Huang, "Government-Guided Funds in China: Financing Vehicles for State Industrial Policy," China Economic Watch, Peterson Institute for International Economics, June 17, 2019, at https://www.piie.com/blogs/china-economic-watch/government-guided-funds-china-financing-vehicles-state-industrial-policy#_ftn2; and OECD, Trade and Agricultural Directorate, Trade Committee, "Measuring Distortions in International Markets: The Semiconductor Value Chain," November 21, 2019, pp. 94-95.

[13] See CRS In Focus IF10964, *"Made in China 2025" Industrial Policies: Issues for Congress*, by Karen M. Sutter.

[14] Xinhua, "Authorized Release from Two Sessions) The 14th Five Year Plan and 2035 Long-Term Development Objectives," March 5, 2020; Xi Jinping, "Certain Major Issues in the National Medium and Long-Term Economic and Social Development Strategy," *Qiushi Journal*, October 31, 2020. Unofficial English translation available at



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Although aspects of the new measures show continuity in China's approach to obtain foreign capabilities, they also feature new lines of effort and areas of emphasis. China's current efforts appear to focus on U.S. and foreign technology collaboration that remains unrestricted by the United States and potential countermeasures that seek to work around current U.S. government restrictions on technology ties with China. Overall, the measures reflect a stronger emphasis on foreign R&D collaboration, the use of open source technology platforms, and the use of China's talent programs to attract foreign experts to work in China, all key themes in China's 14th Five-Year Plan.[15] The new preferences appear to be more specific to the types and levels of technology that the Chinese government is seeking in an effort to accelerate the development of these capabilities.[16] In particular, the policies appear to target the following:

- ***Technological advancement***. Preferences are set by level of technology and are calibrated dynamically as companies advance technologically. This could initially favor more advanced domestic firms while encouraging foreign firms to localize advanced capabilities. As has happened previously in semiconductors and other strategic industries prioritized by the Chinese government, the policies could motivate tactics of concern—such as joint venture terms that extract technology, IP theft, and talent poaching—as Chinese firms seek to fill gaps to meet the new requirements. In March 2021, for example, Taiwan authorities accused China's Bitmain of setting up front companies in Taiwan to recruit engineers from Taiwan Semiconductor Manufacturing Corporation (TSMC) and MediaTek.[17]
- ***Import financing and preferences***. Only technologies and products that cannot be produced in China receive preferential tax and tariff treatment, in a potential violation of China's WTO obligations, while the policies encourage the development of domestic capabilities in these same areas. Some of the encouraged products—such as semiconductor production equipment, tools, software design, and materials—are key inputs that support the development of China's domestic production capabilities that appear to aim to displace imports of certain products, such as integrated circuits. Semiconductor equipment can constitute up to half of a foundry's capital expenditures, and China remains dependent on foreign semiconductor equipment, tools, and design software, many of which come from U.S. companies. The new government preferences supplement financing that the government already offers. The Sino IC Fund is set up as a leasing company that funds Chinese companies' purchase of foreign semiconductor equipment through a leasing arrangement. In 2017, for example,

https://cset.georgetown.edu/research/xi-jinping-certain-major-issues-for-our-national-medium-to-long-term-economic-and-social-development-strategy/.

[15] See CRS In Focus IF11684, *China's 14th Five-Year Plan: A First Look*, by Karen M. Sutter and Michael D. Sutherland.

[16] *Notice of Several Policies to Promote the High Quality Development of the Integrated Circuit (IC) and Software Industries in the New Era*, Guofa [2020] No. 8, China's State Council, August 2020; *Notice on the Import Tax Policies for Supporting the Development of the Integrated Circuit Industry and the Software Industry*, Caishui [2021] No. 4, China's Ministry of Finance, the General Administration of Customs, and the State Administration of Taxation, March 16, 2021; and *Notice on the Measures for the Administration of Import Tax Policies to Support the Development of the Integrated Circuit Industry and Software Industry*, Caishui [2021] No. 5, China's Ministry of Finance, the National Development and Reform Commission, the Ministry of Industry and Information Technology, the General Administration of Customs, and the State Administration of Taxation, March 22, 2021.

[17] Sam Reynolds, "Taiwan Prosecutors Accuse China's Bitmain of Illegally Poaching TSMC, MediaTek Engineers," WCCF Tech Inc., March 9, 2021, https://wccftech.com/19-taiwanese-chip-engineers-detained-for-working-for-chinese-front-company/.



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Semiconductor Manufacturing International Corporation (SMIC) and Sino IC Leasing signed an agreement under which Sino IC-Leasing provides $1.2 billion in state funds—through a series of leasing and buy back arrangements—to pay for SMIC's imports of foreign semiconductor production equipment.[18]

- ***Export Promotion.*** The new policies promote the export of Chinese ICs, software, and information technology services through specific government actions, financing, and insurance that could violate WTO rules on export subsidies.[19] This new emphasis on China's targeted role as a major exporter provides another data point on the scope and scale of China's global ambitions.
- ***Chinese government funding.*** State financial support includes funding from government guidance funds; streamlined bond and equity listings; and, technology and IP insurance. The Chinese government has already channeled an estimated $150 billion to China's semiconductor industry and has allocated $1.4 trillion for strategic industries, including semiconductors, in its 14th Five-Year Plan (2021-2025).[20] In March 2021, the Shenzhen government announced a $2.3 billion investment and a 23% stake in China's leading foundry, Semiconductor Manufacturing International Corporation.[21] The new measures appear to widen the door for U.S. and foreign firms to obtain Chinese state funding and other financial preferences, including access to domestic capital and debt markets, if they meet the government's criteria and adhere to China's industrial policies.
- ***State direction and funds for foreign acquisitions.*** Chinese enterprise bids for foreign semiconductor firms are typically state-backed, as exemplified by the attempts by Tsinghua Unigroup—a member of CICIIF—to buy South Korea's SK Hynix, and U.S. companies Fairchild, Western Digital, and Micron.[22] Recent developments show that the government is still directing funds toward acquisitions. In March 2021, a Chinese government-tied fund invested $1.4

[18] "Measuring Distortions in International Markets: The Semiconductor Value Chain," Trade and Agricultural Directorate, Trade Committee, OECD, November 21, 2019, pp. 94-95, http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=TAD/TC(2019)9/FINAL&docLanguage=En.

[19] Office of the U.S. Trade Representative, "2020 Report to Congress on China's WTO Compliance," January 2021, https://ustr.gov/sites/default/files/files/reports/2020/2020USTRReportCongressChinaWTOCompliance.pdf; "Made in China 2025: Global Ambitions Built on Local Protections," U.S. Chamber of Commerce, 2017, https://www.uschamber.com/sites/default/files/final_made_in_china_2025_report_full.pdf; and "Countering China: Ensuring America Remains the World Leader in Advanced Technologies and Innovation," Written Testimony from the Semiconductor Industry Association, Hearing by the House of Representatives Committee on Oversight and Government Reform, Subcommittee on Information Technology, September 26, 2018, https://republicans-oversight.house.gov/wp-content/uploads/2018/09/Neuffer-SIA-Statement-China-9-26.pdf.

[20] Stephen Ezell, "Moore's Law Under Attack: The Impact of China's Policies on Global Semiconductor Innovation," February 18, 2021, Information Technology and Innovation Foundation, https://itif.org/publications/2021/02/18/moores-law-under-attack-impact-chinas-policies-global-semiconductor: Dorcas Wong, "How Can Foreign Technology Investors Benefit from China's New Infrastructure Plan?," China Briefing, Dezan Shira and Associates, August 7, 2020, https://www.china-briefing.com/news/how-foreign-technology-investors-benefit-from-chinas-new-infrastructure-plan/. Also see CRS In Focus IF11684, *China's 14th Five-Year Plan: A First Look*, by Karen M. Sutter and Michael D. Sutherland.

[21] "China Chipmaker SMIC to Invest in $2.35 billion facilities in Shenzhen," *Reuters*, March 17, 2021, https://www.reuters.com/article/us-smic-shenzhen/china-chipmaker-smic-to-invest-in-2-35-billion-facilities-in-shenzhen-idUSKBN2B9250.

[22] Stu Woo and Yuko Kubota, "Chinese Chip Makers Get Biggest Stake Boost, Report Finds," *The Wall Street Journal*, December 12, 2019, https://www.wsj.com/articles/chinese-chip-makers-get-biggest-state-boost-report-finds-11576164610.



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billion in South Korea's Magnachip Semiconductor, a manufacturer of power chips and light-emitting diode (LED) drivers.[23]

- ***U.S. and foreign research collaboration and partnerships.*** The new policies encourage research cooperation with foreign universities and companies, a priority in China's 14th Five-Year Plan. With greater U.S. and foreign government scrutiny of Chinese acquisitions, China has sought other forms of cooperation, including joint ventures, technology licensing, and research partnerships. China's Huawei is reportedly investing $1.2 billion in an optoelectronics R&D and production center in Cambridge, England.[24] China is also turning to U.S.-led open source technology platforms—such as RISC-V, the Open Compute Project (OCP), and the ORAN Alliance—as a vehicle for technology collaboration. These platforms appear to have provided a way for Chinese and other entities—including state institutes and firms on the U.S. Department of Commerce's Entity List—to design semiconductor chips.[25]
- ***Access to U.S. and foreign talent.*** The new policies emphasize the role of the government's talent programs and related government funds to develop expertise. Specific efforts include the use of talent platforms, such as the China Academy of Sciences' IC Personnel International Training Center.[26] The new policies' staffing criteria may necessitate foreign talent given reports of apparent talent shortfalls.[27] Semiconductor capabilities rely on decades of knowledge and expertise. In an effort to advance rapidly in the industry, China has deployed a set of policies to encourage the return of expatriates, the hiring of specialized industry talent (particularly from Taiwan), and cross-border exchanges of expertise through formal agreements and exchanges. Under these policies, Taiwan has reportedly lost an estimated 3,000 semiconductor engineers to China since 2015.[28] For example, the top executives of China's SMIC are the former Chief Operations Officer and R&D director at Taiwan's leading foundry, TSMC.[29]

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[23] Xu Wei, "South Korea Probe Casts Doubt on Chinese Fund Wise Road's USD 1.4 Billion Magnachip Takeover," *Yicai Global*, March 31, 2021, https://www.yicaiglobal.com/news/south-korean-probe-casts-doubt-on-chinese-fund-wise-road-usd14-billion-magnachip-takeover-.

[24] "Huawei to Build an Optoelectronics R&D and Manufacturing Centre in Cambridge," Huawei Company Press Release, June 25, 2020, https://www.huawei.com/us/news/2020/6/huawei-optoelectronics-rd-manufacturing-centre-cambridge.

[25] Jeffrey Burt, "Alibaba on the Bleeding Edge of RISC-V with XT910," The Next Platform, August 21, 2020, https://www.nextplatform.com/2020/08/21/alibaba-on-the-bleeding-edge-of-risc-v-with-xt910/. For a list of RISC-V's international members, see https://riscv.org/members/. For the latest version of the U.S. Department of Commerce's Entity List, see https://www.bis.doc.gov/index.php/documents/regulations-docs/2326-supplement-no-4-to-part-744-entity-list-4/file.

[26] School of Microelectronics, University of Chinese Academy of Sciences (CAS), Institute of Microelectronics, CAS website at http://english.ime.cas.cn/et/.

[27] Rachel Zhang and Teddy Ng, "China's Tech Push Includes Plans to Lure More Skilled Migrants," *South China Morning Post*, March 10, 2021, https://www.scmp.com/news/china/diplomacy/article/3124886/chinas-tech-push-includes-plans-lure-more-skilled-migrants.

[28] Kensaku Ihara, "Taiwan Loses 3,000 Chip Engineers to 'Made in China 2025'," *Nikkei Asia*, December 3, 2019, https://asia.nikkei.com/Business/China-tech/Taiwan-loses-3-000-chip-engineers-to-Made-in-China-2025.

[29] Josh Ye, Semiconductor Giant SMIC Rewards Senior Taiwanese Executive with Hefty Compensation as China Builds Up Chip Sector's Hi-Tech Talent Pool," *South China Morning Post*, April 7, 2021, https://www.scmp.com/tech/big-tech/article/3128650/semiconductor-giant-smic-rewards-senior-taiwanese-executive-hefty; Cheng Ting-Fang, "China's Top Chipmaker Hires Sought-After former TSMC Executive," *Nikkei Asia*, December 16, 2020, https://asia.nikkei.com/Business/China-tech/China-s-top-chipmaker-hires-sought-after-former-TSMC-executive.



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- ***Use of domestic regulatory tools.*** The IC policies call for the use of IP, standards, procurement, and competition authorities to advance China's semiconductor goals. China has used its antitrust authorities to impose terms on foreign semiconductor firms in ways that advance China's industrial policies. China's review of the Dutch firm NXP's acquisition of U.S. firm Freescale set terms that forced the sale of NXP's RF power transistor business to JAC Capital, a company controlled by China's State Council.[30] China imposed antitrust terms on Qualcomm in 2015 that not only required Qualcomm to pay a $975 million fine, but also required the company to license its essential 3G and 4G patents to Chinese companies, and enter into a joint venture with the Guizhou provincial government to jointly manufacture server chips in order for Qualcomm to access China's lucrative wireless market.[31] In 2020, China reportedly leveraged its antitrust purview to complicate Applied Material's bid for Kokusai Electric and Nvidia's bid for Japan's SoftBank-controlled ARM.[32]
- ***Use of litigation***. In IP, Chinese semiconductor companies such as Fujian Jinhua and AMEC have used aggressive patent litigation tactics against their global competitors to challenge exclusive use of certain proprietary technologies, to pressure for better licensing terms, and to create counter pressures on U.S. court procedures by initiating copycat versions of U.S. cases in China's courts. These cases often rely on utility or use patents that are easier to create and harder to challenge.[33]
- ***Strengthened ties with foreign industry associations.*** The policies call for strengthening ties with foreign industry associations. In March 2021, the China Semiconductor Industry Association (CSIA) announced a working group with the U.S.-based Semiconductor Industry Association (SIA) to share information about technology and trade restrictions and discuss industry countermeasures to U.S. restrictions.[34] CSIA, like many associations in China, is closely aligned with the

[30] Chester Yung and Archie van Riemskijk, "NXP Semiconductors Sells Unit to Chinese Firm for $1.8 Billion," *The Wall Street Journal*, May 28, 2015, https://www.wsj.com/articles/nxp-semiconductors-sells-unit-to-chinese-firm-for-1-8-billion-1432812018.

[31] Noel Randewich and Matthew Miller, " Qualcomm to Pay $975 million to Resolve China Antitrust Dispute," *Reuters*, February 9, 2015, https://www.reuters.com/article/us-china-qualcomm/qualcomm-to-pay-975-million-to-resolve-china-antitrust-dispute-idUSKBN0LD2EL20150210, and "Qualcomm and Guizhou Province Sign Strategic Cooperation Agreement and Form Joint Venture to Design and Sell World-Class Server Chipsets in China," Qualcomm Press Release, January 17, 2016, https://www.qualcomm.com/news/releases/2016/01/16/qualcomm-and-guizhou-province-sign-strategic-cooperation-agreement-and-form.

[32] "Applied Materials Terminates $2.2 Billion Deal for Japan's Kokusai Electric," *Reuters*, March 29, 2021, https://www.reuters.com/article/us-kokusai-m-a-applied-materials/applied-materials-terminates-2-2-billion-deal-for-japans-kokusai-electric-idUSKBN2BL1I4; "Nvidia's Acquisition of ARM Throws Company into Tech Spat Between U.S. and China," *Reuters*, September 14, 2020, https://www.reuters.com/article/arm-holdings-ma-nvidia-china/analysis-nvidia-acquisition-of-arm-throws-company-into-tech-spat-between-u-s-and-china-idUSL4N2GB1JG.

[33] "AMEC Wins Injunction in Patent Infringement Dispute Involving Veeco Instruments (Shanghai) Co., Ltd, ," *PR Newswire*, December 8, 2017, https://www.prnewswire.com/news-releases/amec-wins-injunction-in-patent-infringement-dispute-involving-veeco-instruments-shanghai-co-ltd-300569295.html; "Veeco, AMEC and SGL Settle MOCVD Wafer Carrier Patent Litigation," Semiconductor Today, February 8, 2018, http://www.semiconductor-today.com/news_items/2018/feb/veeco-amec-sgl_080218.shtml; and "Micron Provides Statement on Fujian Province Patent Litigation," Micron Company News Release, July 5, 2018, https://investors.micron.com/news-releases/news-release-details/micron-provides-statement-fujian-province-patent-litigation.

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government, provides direct policy input, and is tasked by the government to implement certain policies, including the application process for the new IC measures.[35] CSIA's leadership includes representatives of state research institutions and former senior officials.[36] Members include Chinese military firms and companies listed on the U.S. Department of Commerce's Entity List.[37]

# Outlook and Considerations for Congress

Recent congressional initiatives to support the U.S. semiconductor industry stem in part from the challenge that China poses. Issues before Congress include what should be the appropriate role of U.S. government in assisting U.S. industry; how best to focus federal financial assistance; the amount of funding proposed activities would need to accomplish goals for sustaining U.S. semiconductor competitiveness; and how to coordinate and integrate federal activities internally and with initiatives of the U.S. semiconductor and related industries. Legislation was introduced in the 116th Congress (S. 4130 and S. 3933/H.R. 7178), and reintroduced in the 117th Congress (H.R. 7178), to increase federal funding for semiconductor research and development efforts; collaboration between government, industry, and academic partners; and tax credits, grants, and other incentives to spur U.S. production.[38]

Within these broad considerations for Congress are underlying and overarching questions about how to address China's ambitious industrial plans, trade practices of concern, and the role of U.S. firms and capital in developing China's emerging semiconductor market. China appears to be reinforcing its statist approach to developing its semiconductor industry and is continuing to target U.S. and foreign capabilities in semiconductors and other critical and emerging technologies. In response, Congress might consider whether additional domestic and global measures are needed that would seek to more specifically protect and advance U.S. capabilities and interests vis-a-vis China. Specifically, Congress might consider

- Whether additional conditions and protections are needed as part of any broad or specific funding outlays should Congress decide to increase federal government investments in semiconductors, including R&D and operations. Such provisions might consider the entire semiconductor supply chain, the life and use of a particular technology that the government funds, and any potential touchpoints for China to access or obtain the know-how through the entire lifecycle of a technology, from the initial research stage through commercialization.
- Relatedly, Congress might consider assessing whether China's targeting of U.S. R&D capabilities and open source technologies merits additional government oversight and controls over U.S. basic and applied research, as well as the technical expertise that U.S. industry shares with China over open source technology platforms.

[35] Dieter Ernst, "China's Bold Strategy for Semiconductors—Zero-Sum Game or Catalyst for Cooperation?," Innovation and Economic Growth Series No. 9, East-West Center Working Papers, September 2016, https://www.eastwestcenter.org/system/tdf/private/iegwp009_0.pdf?file=1%26type=node%26id=3579; "About CSIA," China Semiconductor Industry Association website at http://www.csia.net.cn/wsc/AboutCSIA.asp.

[36] "CSIA Leadership," CSIA website at http://www.csia.net.cn/wsc/CSIALeadership.asp.

[37] "CSIA Membership," CSIA website at http://www.csia.net.cn/wsc/CSIAMembership.asp. For the latest version of the U.S. Department of Commerce's Entity List, see https://www.bis.doc.gov/index.php/documents/regulations-docs/2326-supplement-no-4-to-part-744-entity-list-4/file.

[38] For a full discussion of issues and considerations for Congress, see CRS Report R46581, *Semiconductors: U.S. Industry, Global Competition, and Federal Policy*, by Michaela D. Platzer, John F. Sargent Jr., and Karen M. Sutter.



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- Congress might explore whether additional conditions or controls are needed on the export of U.S. semiconductor equipment, tools, and software, which play a critical role in advancing China's fabrication capabilities. U.S. sales of these items to China have increased three-fold since 2014 when the Chinese government launched its national semiconductor policy.
- Congress might consider whether new global trade rules or arrangements are needed. Congress might consider whether to encourage the Biden Administration to accelerate efforts with Japan and the EU to develop new plurilateral rules to counter Chinese state subsidies and other practices of concern. Congress might consider whether to press the Administration for joint action and collaboration on R&D and export controls among allies and like-minded countries as part of efforts to foster resiliency in critical U.S. supply chains.



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# Appendix.

**Table A-1. Selected Highlights of China's Policies Promoting the Semiconductor and Software Industries**

(August 2020)

| Measure | Selected Provisions for Enterprises and Projects Encouraged by the State |
|---|---|
| **Corporate Income Tax (CIT)** | **General:**<br>• Preferential treatment is provided for technology and inputs that cannot be produced in China or whose performance cannot meet demand.<br>• Losses incurred in a tax year can be carried forward to subsequent years for up to 10 years.<br>• The preferential tax policy period starts from the first year an enterprise makes a profit, or when a project receives income from production and operations.<br>• The conditions and scope of preferential tax policies shall be dynamically adjusted according to technological progress.<br>**IC Manufacturing:**[39]<br>• IC production lines (28 nanometers (nm) and below) are exempt from CIT for 10 years.<br>• IC production lines (65 nm and below) are exempt from CIT for 5 years.<br>• IC production lines (130 nm and below) are exempt from CIT for 2 years and pay half the statutory rate (12.5%) for the next 3 years.<br>**IC Design, Equipment, Software, Materials, and Packing and Testing:**<br>• Exempt from CIT for the first two years and pay a 12.5% rate for the subsequent 3 years.<br>• Key IC design and software firms are exempt from CIT for the first 5 years; and pay a 10% rate for subsequent years. |
| **Trade and Trade-Related Taxes** | **Value Added Tax (VAT)**<br>• Preferential value-added tax policies are continued.<br>**Import VAT**<br>• Imports of new equipment may pay the VAT in installments.<br>**Import Tariffs**<br>• Producers of logic and memory chips (65 nm and below), specialty processes (0.25 microns or less) compound ICs (0.5 microns or less), and advanced packaging and testing companies may import duty free key raw materials and inputs, including: masks, 8-inch and above silicon single crystals and wafers, photoresists, packaging substrates, special building materials for clean rooms and related systems, manufacturing equipment, and related technology (e.g., software and parts).<br>• IC design and software companies receive preferential customs and import tariff treatment for manufacturing equipment and testing tools, related software, hardware, and components.<br>**Export Promotion**<br>• Promote the export of ICs, software and information technology services.<br>• Support companies in building global sales networks via specific Ministry of Commerce measures.<br>• Provide export financing and insurance for certain software contracts. |

[39] Feature size describes the size of the transistor gate length as measured in billionths of a meter, or nanometers (nm).



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| Measure | Selected Provisions for Enterprises and Projects Encouraged by the State |
|---|---|
| **Investment and Financing** | • Strengthen services and guidance for the construction of major IC projects. Guide and standardize development of the IC industry (emphasis on planning and avoiding redundancies).<br>• Support IC and software companies to integrate resources. National government departments and local governments should actively support and guide corporate reorganization and mergers.<br>• Provide direct financing, equity financing, equity transfer, and other financial support. Make full use of existing national and local government investment funds to support development of the IC and software industry. Establish investment funds and increase investment in these funds. Encourage venture capital fund raising through multiple channels.<br>• Encourage local governments to establish mechanisms to provide funding—such as state financing guarantee funds—that compensate for lending risks.<br>• Offer supply chain finance and other financing that uses pledges of a company's IP, equity, and accounts receivable as collateral. Provide technology and IP insurance.<br>• Encourage financial institutions to provide medium- and long-term loans. Offer innovative credit products that specifically promote these industries.<br>• Increase financial support for major projects; guide insurance funds to invest in equities. Support bank wealth management companies, insurance, trusts, and other non-bank financial institutions to create specialized asset management products.<br>• Vigorously support companies to list and raise funds domestically and overseas. Accelerate China's domestic listing review process. Smooth exit options for original shareholders.<br>• Encourage companies to issue corporate bonds. Broaden financing channels to allow firms to issue medium- and long-term bonds as well as short- and medium-term notes. |
| **R&D** | • Develop R&D capabilities for core technologies of high-end chips; IC equipment and process technology; IC materials; IC design tools; and basic, industrial, and application software.<br>• Establish a new nationwide system for technological research. Continue to use national key R&D plans and major national S&T projects to provide support.<br>• Build innovation platforms with "industry characteristics" for advanced storage, computing, manufacturing, packaging and testing, key equipment, and new-generation technology. Provide government support to implement these projects.<br>• Encourage software companies to implement national standards for software quality and information security. Create IC standardization organizations, improve the standards system, and strengthen standard verification.<br>• A software annex lists specific requirements to boost R&D, IP, and design capabilities in a range of applications including high-performance processors and field-programmable gate array (FPGA), and memory chips; smart sensors; and industrial, communications, automotive, and security chips. The annex covers basic software and software for industrial production; emerging technology; information security; and applications for key industries, Party and government offices, and national defense. |
| **Talent** | • Strengthen academic programs and cultivate advanced-level talent in universities in accordance with national industrial development needs.<br>• Encourage cooperation between universities and companies to create pilot microelectronics colleges. Prioritize the creation of industry-academic integrated enterprises. Thirty percent of investment amounts in these enterprises can be deducted from education surcharge taxes.<br>• Encourage the government's-industry funds to increase investment in university programs, joint industry-corporate programs, and IC talent training. |



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| Measure | Selected Provisions for Enterprises and Projects Encouraged by the State |
|---|---|
| | • Cooperate with foreign universities and multinational companies, and introduce foreign teachers and resources to jointly develop China's talent.<br>• Attract top foreign experts through talent programs.<br>• Promote IC personnel international training centers in China to train "urgently needed" professionals.<br>• Encourage local governments to reward talent contributions, including engineers and R&D designers, according to national regulations, and improve financial incentives.<br>• Create and implement an annual plan to attract and train talent. Guide market development and talent flows within industry to avoid "vicious" competition. |
| **Intellectual Property Rights (IPR)** | • Encourage companies to register in China their exclusive rights for IC layout designs and software copyrights.<br>• Vigorously develop IP services that support companies' IPR protections and legal rights.<br>• Strictly enforce IPR protections and increase penalties for violations. Strengthen the protection of the exclusive rights of digital IC design and software copyrights.<br>• Explore creating a mechanism for software legalization that requires all computers sold in China to have legal or legitimate software pre-installed. Implement government procurement measures and promote the standardized use of legal or legitimate software in important industries. |
| **Market Considerations** | • Support the creation of IC clusters and build high-end software industry parks.<br>• Support backbone enterprises, scientific research institutes, and universities to create technology accelerators, business incubators, and university science parks.<br>• Develop information technology and R&D service businesses that support the government (e.g., e-government, data centers, and data processing).<br>• Improve digital privacy and trade-secret protections.<br>• Promote software products and services that meet government security requirements.<br>• Strengthen anti-monopoly enforcement, crack down on monopolistic behaviors, review operators, and maintain fair competition.<br>• Government support in the role of industry associations and standardization agencies. Accelerate the formulation of standards for ICs and software. Promote specifications to evaluate IC quality and software development costs. |
| **International Cooperation** | • Encourage domestic universities and research institutes to strengthen cooperation with foreign counterparts.<br>• Encourage foreign companies to build R&D centers in China.<br>• Strengthen communication and exchanges between domestic and foreign industry associations.<br>• Support domestic enterprises to cooperate with foreign firms in China and overseas.<br>• Actively participate in setting global standards. |
| **Supplementary Provisions** | • All qualified IC and software companies established in China, ***regardless of the nature of ownership***, can enjoy this policy. |

**Source:** CRS with information from the *Notice of Several Policies to Promote the High Quality Development of the Integrated Circuit (IC) and Software Industries in the New Era*, Guofa [2020] No. 8 issued by the State Council in August 2020; *Notice on the Import Tax Policies for Supporting the Development of the Integrated Circuit Industry and the Software Industry*, Caishui [2021] No. 4 issued by the Ministry of Finance, the General Administration of Customs, and the State Administration of Taxation on March 16, 2021; and the *Notice on the Measures for the Administration of Import Tax Policies to Support the Development of the Integrated Circuit Industry and Software Industry*, Caishui [2021] No. 5, issued by the Ministry of Finance, the National Development and Reform Commission, the Ministry of Industry and Information Technology, the General Administration of Customs, and the State Administration of Taxation on March 22, 2021. This analysis is based on an informal translation and review of these documents by the author.



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