

Backfire: Export Controls Helped Huawei and Hurt U.S. Firms

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Huawei is a more innovative company today than it was before the U.S. government sought to choke its supply chain. This case should serve as a lesson: U.S. techno-economic power is weaker than most think, and sanctions often hurt U.S. competitiveness more than China's.

KEY TAKEAWAYS

- The first Trump administration tried to limit sales of Huawei's telecom equipment in America and other nations due to cybersecurity concerns. The administration later imposed export controls on Huawei in an attempt to kill it for doing business with Iran.
- The U.S. government's rationale for its actions against Huawei is a legacy of an earlier era when America had enough power to impose crippling sanctions without harming its own companies' competitiveness.
- Because of U.S. actions, Huawei developed its own operating system (OS), built its own chips, and bought equipment from other nations.
- Despite U.S. actions against Huawei, it remains the world's largest telecom equipment manufacturer, with a 34 percent global market share in 2024, up 2 percentage points from 2018.
- Meanwhile, Huawei succeeded in boosting its global market share in telecom equipment and expanding into new markets, such as smart automotive solutions. Indeed, Huawei asserts that it has built an ecosystem entirely independent from U.S. technologies.
- While export controls made Huawei a more robust competitor, they also hurt U.S. technology companies—reducing their sales to Huawei by \$33 billion between 2021 and 2024—and they triggered retaliation from the Chinese government.
- It's time for the U.S. government to rethink the use of export controls on China, recognizing that this is a new era when the effect is just as likely to backfire and hurt American companies and jobs.

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INTRODUCTION

Does the United States have the power to kill Chinese companies? And can it do so without reducing its own techno-economic power? At least regarding Huawei, the answer to both questions is a definite no.

Due to cybersecurity concerns, since 2018, the U.S. government has gradually banned the sale of Huawei products for U.S. telecommunications networks and encouraged other nations to do the same. But that was not enough for U.S. policymakers; they sought to kill the company. In 2019, the U.S. government sanctioned Huawei for doing business with adversaries, such as Iran, by taking judicial actions and adding the company to the Department of Commerce's Bureau of Industry and Security (BIS) Entity List—attempting to cripple Huawei by disrupting its supply chain. Both the Biden and the second Trump administration have continued to sanction the company.

The export controls backfired. Huawei is the world's largest telecom equipment manufacturer, and its global market share for telecom equipment increased from 29 percent in early 2018 to 31 percent by 2024.¹ At the same time, U.S. technology companies such as Intel, Qualcomm, Teradyne, and others lost more than \$33 billion in sales to Huawei between 2021 and 2024—in a conservative estimate—weakening these American companies globally while strengthening Chinese or other nations' tech companies, including Japan. Additionally, due to the restrictions, Huawei launched its OS, HarmonyOS, in 2019, which now has nearly a billion users and is compatible with mobiles, tablets, and laptops—a direct threat to Google's Android and Microsoft's Windows' global market share.² The company is also catching up on chipmaking, claiming that in 2023 it was able to replace more than 13,000 components and redesign over 4,000 different circuit boards.³ It is also reported that Huawei can substitute Nvidia's H20 chip, a specific model that meets the U.S. government's requirements for exporting semiconductors to China—limiting Nvidia's global sales.⁴ As of August 2025, Huawei claimed to have built an entire ecosystem independent of U.S. technologies.⁵

Huawei was able to do this because it anticipated these U.S. actions as early as 2012 and invested heavily to offset them.⁶ The company's research and development (R&D) investments grew proportionally more than those of any other major technology company—including Alphabet, Apple, and Microsoft—and it increased its reliance on the Chinese market to sustain revenues. In addition, the People's Republic of China (PRC) provided significant financial support to the company to decouple from the United States after the restrictions were in place.

Sanctioning Huawei and attempting to cripple the company has proven to be hubristic and self-defeating—U.S. techno-economic power is weaker than decision-makers in Washington might think.

This should be a wake-up call for U.S. policymakers. It's possible the U.S. government might have been able to cripple Huawei in the late 2000s or early 2010s when its and China's technological capabilities were significantly weaker. But by the late 2010s, it was too late. As a result, the only outcome was to weaken U.S. technology companies and strengthen Huawei and China's innovation.

Sanctioning Huawei and attempting to cripple the company has proven to be hubristic and self-defeating—U.S. techno-economic power is now weaker than decision-makers in Washington

might think. To the extent Huawei poses a cybersecurity threat, excluding it from U.S. networks and urging allies and trade partners to follow suit should have been the sole focus. However, the U.S. government sought to punish Huawei for allegations of doing business with Iran without fully considering the extent of this measure's cost to U.S. companies and for American techno-economic power. Moreover, the U.S. government's attempt to cripple Huawei underestimated the extent of the Chinese government's support for the company, Huawei's technological advancements, and its ability to source non-U.S. inputs or develop them domestically. The U.S. government's approach was outdated, not reflecting the current relative power of the United States.

This report shows how export controls accelerated Huawei's innovations and harmed American companies. It first describes the U.S. actions against the company and how the current context differs from the U.S.-Japan technological rivalry of the 1980s, the last time the United States tried to stop the growth of a competitor. The report also provides a brief overview of Huawei's businesses and its innovations after the export control measures. It then examines how the company overcame the restrictions by receiving support from the PRC and by preparing to offset the measures for over six years. In addition, it highlights how U.S. firms have been directly affected, with lost sales of over \$33 billion between 2021 and 2024, and exposure to retaliation by the Chinese government due to these export controls. The report also explains why this backlash against U.S. companies matters in the context of U.S.-China techno-economic competition.

Finally, the report proposes a framework to address the global rise of Chinese technology companies:

- The United States should press more countries to ban Huawei's imports.
- Export controls should be applied jointly with allies, or not at all.
- Export control measures must consider impacts on U.S. firms and techno-economic power.

HUAWEI 101: ITS BUSINESSES AND U.S. ACTIONS AGAINST THE COMPANY

Huawei is a privately owned company headquartered in Shenzhen, China, with close ties to the Chinese government, and is one of the world's largest technology companies.⁷ The firm reported revenues of \$124 billion in 2024, of which information and communication technologies (ICT) infrastructure accounted for 43 percent, and consumer markets (e.g., smartphones, laptops, wearables, and tablets) accounted for 39 percent.⁸ Other areas of the company's business include smart grids and energy storage technologies, cloud computing, and smart automotive solutions.

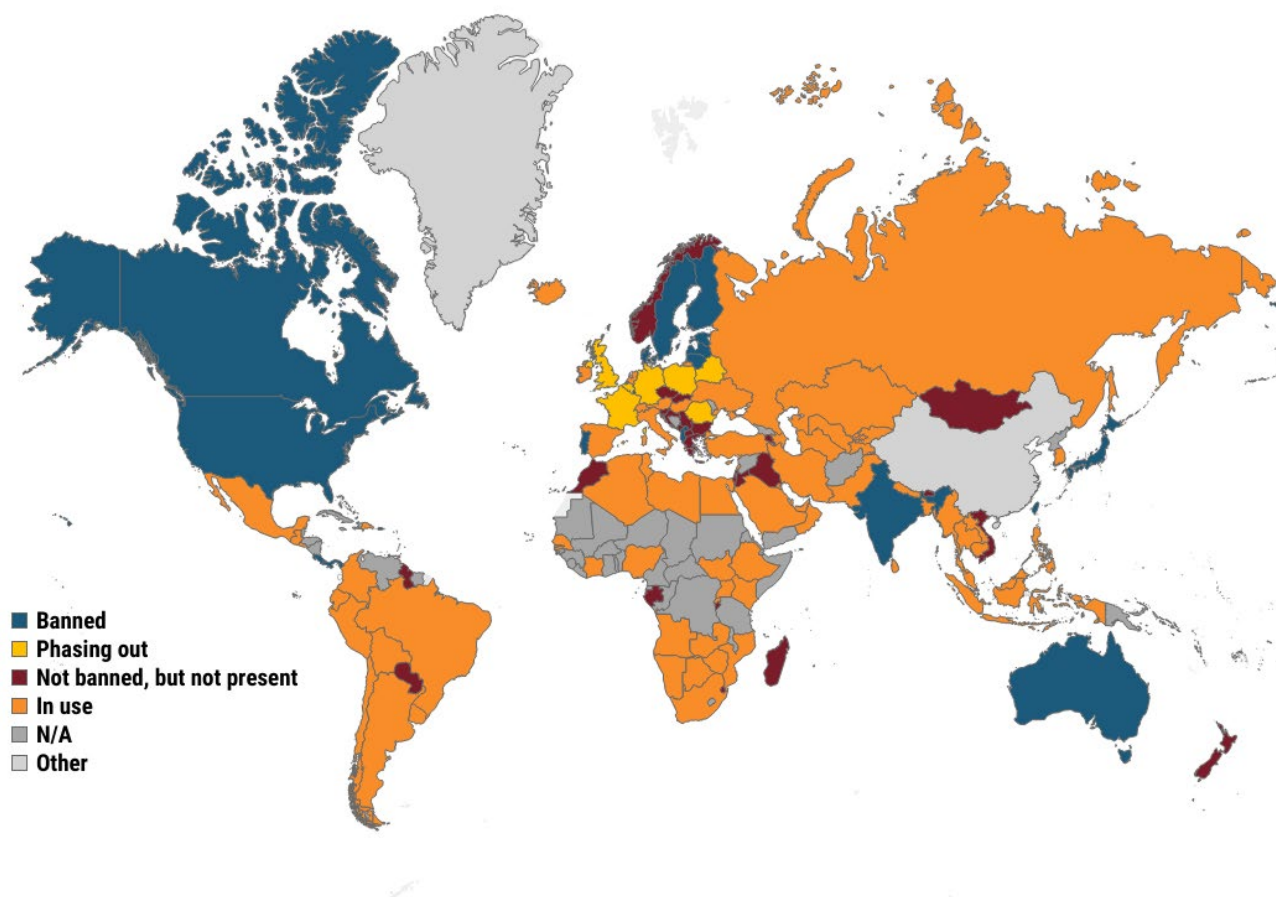
Starting around 2018, U.S. policymakers viewed the growing presence of Huawei within 5G networks as a cybersecurity threat. Policymakers argued that Huawei's technologies could enable the Chinese government to conduct espionage through backdoors.⁹ To address this concern, the U.S. government imposed a de facto import ban on Huawei through a patchwork of measures. (See table 1.) In addition, the global expansion of the company within 5G networks was also assessed as a cybersecurity concern, prompting the government to launch a diplomatic campaign to urge allies and trade partners to follow suit.¹⁰

Table 1. De facto import bans—actions to exclude Huawei from U.S. 5G networks (2017 to present).¹¹

Date	Measure	Instrument
December 2017	Prohibition by the U.S. Department of Defense from purchasing products from Huawei or ZTE for covered missions.	National Defense Authorization Act (NDAA) for fiscal year 2018
May 2018	Ban on retail sales of phones and other telecommunication devices from Huawei and ZTE within U.S. military facilities.	U.S. Department of Defense ruling
August 2018	Prohibition of all federal procurements from Huawei and ZTE. Additionally, it extended the ban to federal grants, loans, and subsidies, thereby broadening the impact of the restriction to most local government entities.	NDAA for fiscal year 2019
May 2019	National emergency declaration due to alleged threats to the national telecommunications supply chain and authorization for the Department of Commerce to ban transactions from organizations considered “foreign adversaries.”	Executive Order (EO) 13873
January 2020	Denial of transactions to purchase equipment from companies categorized as a national security threat to any recipient of federal telecommunications subsidies.	Federal Communications Commission (FCC) ruling
March 2020	Total ban of telecommunication equipment or services that pose a national security risk, and a program to remove any such equipment and services currently used in U.S. networks.	Secure and Trusted Communications Networks Act of 2019
June 2020	Ban of Huawei and ZTE from receiving Universal Service Funds (USF), and force potential U.S. fund recipients to remove their equipment.	FCC ruling
January 2021	Establishment of a review process to potentially ban transactions from companies that pose a national security risk, including Huawei.	2021 Department of Commerce’s to enforcement of EO 13873
January 2021	Forcing of rural carriers to remove and replace Huawei equipment, offering reimbursement.	FCC ruling
November 2022	Prohibition of allowing Huawei telecom or surveillance equipment to enter the United States through the FCC’s Certification process or any other so-called “backdoors.”	FCC ruling
December 2024	Amendment and clarification of the January 2021 Department of Commerce’s interim ruling, closing backdoors that allowed Huawei, for example, to update software.	Department of Commerce’s final rule implementing EO 13873
May 2025	Prohibition of Chinese labs deemed security risks from testing U.S. electronics.	FCC ruling

Despite these efforts, many allied countries and nations from the so-called Global South still use Huawei technologies for their 5G infrastructure. (See figure 1.) As of September 2025, over 3.2 billion people outside China resided in countries that use 5G networks that rely on Huawei equipment, while another 370 million live in countries where Huawei is not banned but is absent from their 5G networks. Huawei remains embedded in the 5G networks of nine U.S. allies—Hungary, Iceland, Italy, South Korea, Spain, the Netherlands, the Philippines, Thailand, and Turkey—and is being phased out from six others: Belgium, France, Germany, Poland, Romania, and the United Kingdom.¹² Among the rest, Huawei’s 5G is banned in 12 countries, and 10 countries have excluded the company without the need for a ban.¹³

Figure 1. Prevalence of Huawei technologies in 5G infrastructure outside China¹⁴



U.S. Government’s Sanctions on Huawei for Alleged Business with Iran

In early 2019, Huawei’s alleged business with the Iranian regime, and to a lesser extent with the North Korean regime, led the U.S. government to take action to penalize the company. The efforts taken to punish Huawei caused the U.S. government to lose focus on strengthening America’s power in the context of its techno-economic competition with China. As this report describes in further sections, these actions ultimately weakened U.S. competitiveness by hurting American companies.

The U.S. government started judicial and administrative actions to sanction Huawei:

- **Judicial actions.** In January 2019, the U.S. Department of Justice unsealed indictments against Huawei and its CFO, Wanzhou Meng, the daughter of the founder, Ren Zhengfei, for bank fraud, wire fraud, conspiracy, and obstruction of justice.¹⁵ Meng’s case was dismissed with prejudice in 2022.¹⁶ The broader criminal case against Huawei is expected to begin in early 2026, which also includes allegations of its business dealings with the North Korean government.¹⁷
- **Administrative actions.** The U.S. Department of Commerce’s BIS announced the inclusion of Huawei and its subsidiaries on the Entity List in May 2019, arguing that the company “has been involved in activities contrary to the national security or foreign policy interests of the United States.”¹⁸ The specific accusation that led to its inclusion on the Entity List was evasion of sanctions by doing business with the Iranian government. The Entity List is an executive tool used to target foreign individuals and organizations, subject to specific license requirements for the transaction of certain goods.¹⁹

U.S. Government’s Attempts to Cripple the Company

U.S. companies had a significant role in Huawei’s supply chain by the time it was included on the Entity List, and U.S. government officials attempted to “kill” or “cripple” the company using this as leverage.²⁰ By 2019, American companies accounted for one-third of Huawei’s expenses, with U.S. firms comprising 33 of its top 92 vendor suppliers.²¹ These companies provided essential inputs to Huawei, such as chipsets used in headsets and telecommunications networks, equipment, electronic components, OSs, and semiconductor design software.²² However, the U.S. government underestimated the Chinese government’s support for Huawei and the company’s innovation capabilities to overcome the attempts to damage its supply chain critically.

The U.S. government attempted to cripple Huawei by enforcing Entity List-based export controls. The inclusion on the Entity List means a ban on any sale or transfer of U.S. technologies without a license from BIS, including R&D collaboration. The requirement for a license is extended to the export and re-export of all products subject to the Export Administration Regulations (EAR), and all applications for licenses are under a “presumption of denial,” meaning the unlikelihood of obtaining exceptions. For Huawei, its inclusion on the Entity List meant that critical inputs from U.S.-based companies would no longer be available, including hardware for its smartphones and other products, as well as software, such as Google Mobile Services.

Huawei enjoyed approximately a year and a half of limited breathing room to navigate the 2019 export controls until August 2020. The restrictions that took immediate effect after its inclusion in the Entity List applied to goods subject to the EAR—U.S.-made products and certain foreign goods manufactured using significant U.S. content. In May 2020, BIS expanded the jurisdiction for export controls on foreign-made chips fabricated with U.S. equipment (i.e., expansion of the Foreign-Produced Direct Product Rule), explicitly citing HiSilicon, a semiconductor subsidiary, as an example of Huawei’s affiliates targeted by these restrictions.²³ Moreover, following the company’s inclusion on the Entity List, BIS issued successive 90-day temporary general licenses (TGLs) that allowed Huawei to continue obtaining certain U.S. technologies, such as software updates.²⁴ An August 2020 amendment stopped the TGLs and tightened the Foreign-Produced Direct Product Rule, including foreign-made chips fabricated “from U.S. technology or software to support the manufacture of indigenous chipsets,” effectively limiting the company’s access to the world’s most advanced chips produced by the Taiwanese firm TSMC.²⁵

The restrictions after August 2020 included some exceptions, as BIS introduced a permanent authorization for “cybersecurity research and vulnerability disclosure.” For instance, in November 2020, Qualcomm and Intel announced that the U.S. government had granted licenses to sell a limited number of products, including 4G technology for mobile devices; these licenses were later revoked in May 2024.²⁶ Microsoft received a license allowing it to include Windows in Huawei’s laptops, which expired in March 2025.²⁷

Additionally, in September 2022, BIS granted a permanent authorization to collaborate with Huawei and its subsidiaries on standards setting and dialogue, aiming to prevent the fragmentation of international 5G and Wi-Fi protocols.²⁸

In 2022, the Biden administration announced export controls on advanced semiconductors and equipment to slow the Chinese semiconductor industry as a whole—i.e., not targeting specific companies.²⁹ These measures led some American companies to redesign some of their products to meet U.S. government standards. A notable example is Nvidia’s H20 chip, which is a second-tier version of its advanced data center chips designed to meet the 2022 restrictions.³⁰ The U.S. government later banned the export of the H20 chip in January 2025—which boosted Huawei’s Ascend 910C chips in the Chinese market almost immediately—and later lifted the ban in July of that year.³¹

Export Controls During the 1980s U.S.-Japan Technological Competition

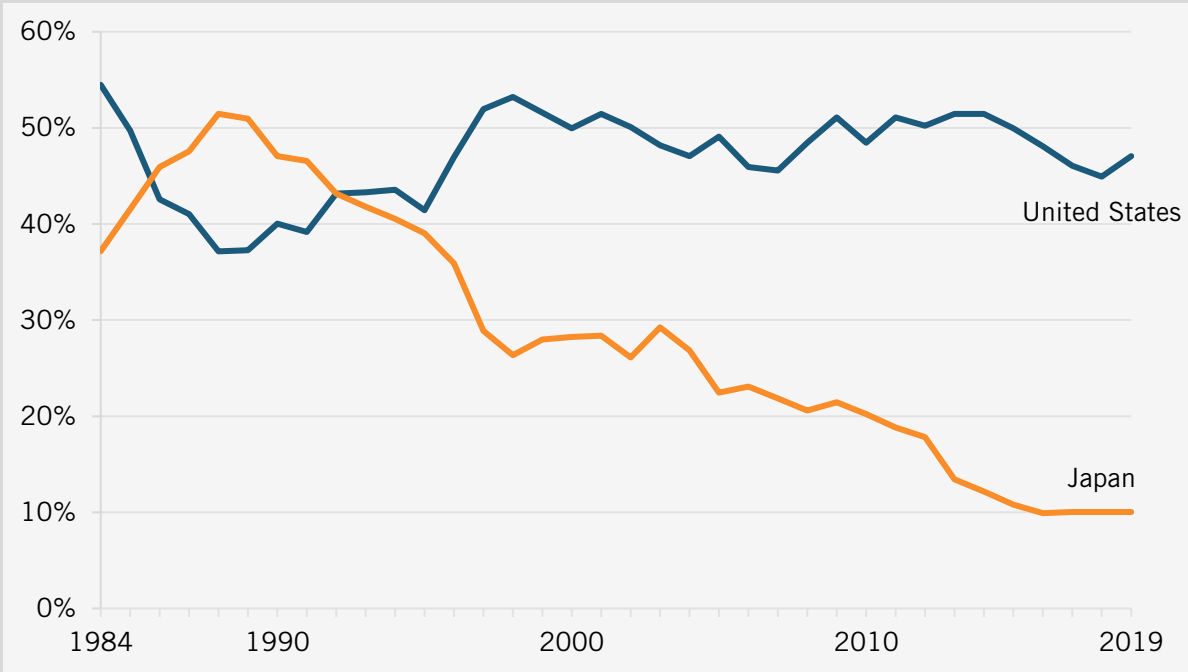
The United States was once able to halt the growth of entire industries that threatened American global leadership, such as the U.S.-Japan technology rivalry in the 1980s, particularly in the semiconductor sector. But the conditions that led the United States to stop the Japanese semiconductor industry’s growth do not apply to today’s U.S.-China techno-economic competition.

The rapid rise of the Japanese economy during the 1980s was viewed as a threat by some U.S. policymakers. Japanese semiconductor, automotive, and consumer electronics companies were quickly gaining global market share, while Japan’s economy was largely inaccessible to American competitors. In 1985, the United States launched a Section 301 investigation—an instrument of the U.S. Trade Act used to impose trade remedies in response to unfair trade practices—against Japan’s semiconductor and electronics industries based on allegations of dumping and currency manipulation, leading to a 100 percent tariff on Japanese electronics.³² Additionally, in 1986, both countries reached an agreement on semiconductors: Japan committed not to compete against the United States through dumping and allowed U.S. semiconductors to capture a 20 percent share of its domestic market.³³ Some experts consider these measures the “start of the decline for Japan’s semiconductor industry.”³⁴

Japan’s semiconductor industry grew rapidly during the 1980s, and it temporarily held the majority of the global market between 1986 and 1992.³⁵ (See figure 2.) The United States was able to regain its global market share through a mix of measures: addressing Japanese unfair trade practices, implementing industrial policies to support the American semiconductor industry, and capitalizing on shifts in global demand toward microprocessors and logic chips. A notable example of how the United States treated this as a public-private effort is the Semiconductor Manufacturing Technology (SEMATECH) consortium, created in 1987 by 14 U.S. semiconductor firms, which received \$870 million from the U.S. Defense Advanced Research Projects Agency (DARPA).³⁶

An example of the United States sanctioning a specific Japanese company is the “Toshiba-Kongsberg scandal” in 1986, when it was revealed that Toshiba Machine, a subsidiary of the Japanese electronics manufacturer Toshiba Corporation, had sold sensitive technologies to the Soviet Union (USSR).³⁷ Toshiba’s tools, combined with those of the Norwegian weapons manufacturer Kongsberg—a company that was also supplying the USSR—were used to reduce the detection of nuclear submarines.³⁸ Toshiba Machine was sanctioned by the United States in 1988, which banned Toshiba Corp. and Toshiba Machine from public procurement, along with certain Toshiba Machine products, for three years.³⁹

Figure 2: U.S. and Japanese global semiconductor market share, by revenues, 1984–2019⁴⁰



The context and effectiveness of the U.S. government’s measures against Japanese companies in the 1980s differ from the ongoing U.S.-China techno-economic rivalry, as summarized in table 2.

Table 2: Summary of the U.S.-Japan (1980s) vs. U.S.-China (present day) tech rivalry

Context	Similarities	Differences
Geopolitical	Both represent contests between the United States and a rising economy.	Japan was (and remains) a U.S. ally; China is a strategic rival. Japan cooperated; China retaliates and pushes decoupling.
Trade	Large bilateral trade deficits drove/drive tensions.	Today’s globalized supply chains make restrictions harder to enforce and less effective.
Industrial policy	Semiconductors were and remain central to competition. The U.S. responded with industrial policies	U.S.–China rivalry spans more sectors, including advanced and military technologies. Japan’s security risks were

Context	Similarities	Differences
	promoting the semiconductor industry (SEMATECH in 1987; CHIPS Act in 2022).	product-specific, with few IP theft concerns; contrary to the current concerns about Chinese technology firms.
Firm-level support	Both relied/rely on “national champions” (Toshiba, Huawei) that benefited/benefit from state support and protected markets.	Japanese firms are private conglomerates (keiretsu). Chinese firms are state-owned or closely tied to the CCP.

The Effect of Export Controls on Huawei’s Global Market Share

Before the export controls, Huawei and its subsidiaries held a significant global market share in several of their businesses. Huawei has not fully recovered its revenues before the restrictions; however, the company has demonstrated resilience by regaining market share, mainly relying on the Chinese market. Some examples are listed below:

- **Lower market share on smartphone shipments than before the export controls, but a higher participation in the Chinese market.** The company had a 20 percent global market share in smartphone shipments by 2019, which dropped to “virtually zero” after the restrictions, although by December 2024, it had increased to 4 percent.⁴¹ As of April 2025, Huawei was virtually tied with Xiaomi as the most popular mobile phone company in China, with approximately 18 percent market share.⁴²
- **Similar market share in ICT infrastructure before and after export controls.** Huawei currently holds at least 31 percent of the global revenue for radio access network (RAN) products, slightly higher than its 30 percent market share in 2016.⁴³
- **Regaining market share in smartphone chipsets.** The market share of smartphone chipsets from HiSilicon, Huawei’s semiconductor design subsidiary, peaked in the second quarter of 2020 at 16 percent, making it the third-largest supplier worldwide. However, it dropped to zero in the second quarter of 2022 and rebounded to 4 percent in the first quarter of 2025.⁴⁴

Huawei’s Innovations After the Export Controls

After its inclusion in the Entity List, Huawei is focusing on launching products that replace those previously supplied by U.S. companies. Notably, the company claims to have developed “an ecosystem entirely independent of the United States.”⁴⁵ One of the pillars of this independent ecosystem is Huawei’s in-house built OS, HarmonyOS, which was initially developed as a “backup plan” in case of U.S. restrictions; the company now expects it to become “a third mobile operating system for the world.”⁴⁶ HarmonyOS is also compatible with computers, and there are reports that Huawei is rolling out its laptops with this system instead of Microsoft’s Windows.⁴⁷

Huawei is focusing on launching products that replace those previously supplied by U.S. companies, and it claims to have developed “an ecosystem entirely independent of the United States.”

Cutting off Android and Windows OS helped create and accelerate the deployment of Huawei’s OS. HarmonyOS runs on over 1 billion devices, and supports smartphones, laptops, tablets, and over 1,000 peripheral devices such as printers.⁴⁸ Huawei is exploring using HarmonyOS in other developments, such as microsatellites—and with its new generation, HarmonyOS NEXT, the firm expects to complete the decoupling from Western-led OSs.⁴⁹ According to Chinese media, HarmonyOS was developed with the collaboration of 20 research institutes and 10,000 engineers, and the effort has registered over 2,700 patents. Some Western companies operating in China, such as BMW, have already partnered with Huawei to incorporate its OS into their next-generation vehicles.⁵⁰

The effort to build an indigenous OS aligns closely with the PRC’s goals of technological self-reliance and challenges Western dominance in global markets. Android and Apple’s iOS account for nearly 99 percent of the worldwide smartphone market, and Apple, Google, and Microsoft together account for more than 90 percent of the laptop OSs’ share.⁵¹ Moreover, OpenHarmony, the software upon which HarmonyOS is based, is managed by the OpenAtom Foundation, a Chinese government-controlled organization.⁵²

Huawei is also investing in reducing its reliance on foreign chipmaking technologies. The company claims that in 2023 it was able to replace more than 13,000 components and redesign over 4,000 circuit boards.⁵³ HiSilicon designed a 7 nanometer (nm) chip that compensates for its lower computing power by utilizing HarmonyOS and began deploying this chip in its devices in 2023.⁵⁴ Huawei’s AI chip, Ascend 910d, is expected to perform on par with Nvidia’s H100, one of the company’s most advanced products, yet at nearly 60–70 percent of its cost.⁵⁵ However, some reports estimate that Huawei lags significantly behind Western chipmakers, such as Nvidia and AMD, and will struggle to compete outside China.⁵⁶

Reports suggest that Huawei can substitute Nvidia’s H20 chip with the Ascend 920 model, announced in April 2025.⁵⁷ It is expected that Huawei will become China’s top AI chipmaker by 2026, with the opening of three new plants.⁵⁸ Despite this, the company will not have the necessary scale to meet demand in the Chinese market within the next year.⁵⁹ In addition, Nvidia reported halting H20 chip production in August 2025 due to significant pushback from the Chinese government, and reports suggest that Chinese technology companies have been banned from acquiring it since September 2025 due to cybersecurity concerns.⁶⁰

The company is also opening new product lines, directly competing against U.S. firms. For example, Huawei’s smart driving solutions have been implemented in at least half a million cars, and some analysts suggest its technology is superior to Tesla’s.⁶¹ The Huawei MateBook X Pro and Huawei’s Watch D also offer features and specifications that are often considered equal to or superior to those of Western competitors.⁶²

HOW HUAWEI BOUNCED BACK FROM EXPORT CONTROLS

China's Mercantilism Allowed Huawei to Survive

The export controls did not take into account the Chinese government's efforts to secure the company's survival. There is precedent for the Chinese government intervening to rescue the company. Ren Zhengfei, Huawei's founder and president, stated that "Huawei would no longer exist" without protectionist policies to shield it from foreign competitors during its internationalization efforts in the 2000s.⁶³ At that time, Chinese-backed loans, such as those from the China Development Bank and the Export-Import Bank of China, aided Huawei's international expansion, allowing the company to outbid competitors and adopt a "vacuum-cleaner approach ... just sucking up the market."⁶⁴ Over the 2010s, Huawei and state-owned ZTE artificially gained market share from Ericsson and Nokia in telecommunications equipment through direct support from the Chinese government, as well as indirect support such as restricting foreign companies' access to the expanding Chinese market.⁶⁵

Following the U.S. export controls in 2019, Huawei continues to receive support from the PRC through financial support, direct procurement from state-owned Chinese companies, and a continued preferential treatment as a "national champion" for strategic national initiatives.

Huawei's success stands on the shoulders of Chinese innovation mercantilism. By 2019, Huawei had received \$75 billion in state support since its establishment, including \$1.6 billion in grants, \$46.3 billion in credit facilities, \$25 billion in tax breaks, and \$2 billion in subsidized land purchases.⁶⁶ This helped the company gain market share, particularly in the global telecommunications equipment market. The company has also benefited from various other types of government support, including its role as a recipient of Belt and Road Initiative (BRI) projects, which helped the company expand its global footprint and build the necessary connections to navigate restrictions.⁶⁷ The Chinese government has implemented various practices to support Huawei and other national champions, including protecting the domestic market, undervaluing the currency, promoting exports, and ignoring intellectual property (IP) theft.⁶⁸

The Information Technology and Innovation Foundation (ITIF) has a longstanding record of reporting on how the PRC has subsidized Huawei and other Chinese telecommunications companies, such as ZTE. Huawei's and ZTE's global market share, primarily accumulated during the 2010s, was a direct result of China's mercantilist policies and programs, such as closing China's market to foreign companies, thereby securing a sizable customer base.⁶⁹ A 2020 ITIF study found that if Ericsson and Nokia had captured Huawei's and ZTE's equivalent market shares, the world would have seen a 20 percent increase in telecommunications equipment R&D investments and 75 additional essential 5G patents.⁷⁰ Hence, Chinese state support for Huawei not only helps advance China's agenda of techno-economic dominance at the expense of Western incumbents, but also undermines overall global innovation.

Following its inclusion in the Entity List in 2019, Huawei continues to receive support from the PRC. For example, the company has received more than 215 billion yuan (\$30 billion) from the central and Shenzhen governments to acquire two chip plants and to build at least three others.⁷¹ The PRC's continued support is reflected in several additional ways:

- **Favorable financial support to mitigate the effects of the export controls.** HONOR, a former Huawei subsidiary, is a budget-brand smartphone whose business was heavily affected by U.S. restrictions, as it relied on U.S. semiconductors for its hardware and had access to the Google Play Store for its software.⁷² HONOR was acquired in 2020 for 100 billion yuan (\$15.2 billion) by a consortium of private and state-backed investors.⁷³ In this transaction, the Chinese government acted as the “investor of first resort,” allowing Huawei to divest from an asset subject to export controls under its ownership, while the PRC government secured the continuation of production for a company that, after the acquisition, was able to keep importing foreign chips.⁷⁴
- **Direct procurement from state-owned Chinese companies.** The PRC has consistently favored China’s national champions through the procurement of public agencies or state-owned companies. For example, in 2021, China Mobile, a state-owned Chinese telecommunications company, announced that Huawei would be the vendor for 60 percent of 5G network station contracts.⁷⁵ (ZTE acquired nearly 30 percent, while Western competitors such as Ericsson and Nokia received the remaining few contracts.) China Mobile allocated Huawei 52 percent of a \$1.1 billion contract for 5G network deployment between 2023 and 2024.⁷⁶ (Ericsson and Nokia received 13 percent of the resources; notably, another Chinese state-owned company, Datang Mobile, received awards in addition to ZTE.)

What ITIF stated in 2020 remains valid in 2025: “The only reason a non-Chinese firm is allowed to gain 5G market share is to continue the illusion of an open competitive market, and to give the Chinese government leverage over European governments that seek to limit Huawei deployment in Europe. If the EU threatens to take strong action against unfair Chinese practices, the Chinese government can retaliate by threatening to completely exclude European providers.”⁷⁷

- **Continued preferential treatment as a “national champion” for strategic national initiatives.** Huawei has been one of the primary beneficiaries of China’s industrial policies aimed at promoting the country’s strategic industry upgrades. For instance, the 2023 expansion of the semiconductor R&D tax incentive served as a de facto subsidy for Huawei and HiSilicon (Huawei’s semiconductor design subsidiary), among others, since semiconductor R&D expenditure can yield up to a 220 percent deduction from the company’s taxable income.⁷⁸ In 2023, the PRC designated Huawei—along with Advanced Micro-Fabrication Equipment (AMEC), Naura, and Semiconductor Manufacturing International Corporation (SMIC)—as targets for increased governmental support for semiconductors, without requiring the demonstration of performance objectives.⁷⁹ (To be sure, semiconductor tax credits can be legitimate tools for nations to use to promote their semiconductor industries, so long as those tax credits are made available equally to companies from all countries competing in a nation’s market.)

Since 2012, Huawei has shifted toward greater reliance on the Chinese domestic market to buffer against restrictions, invested heavily in R&D, developed capabilities to produce in-house critical hardware and software, and stockpiled resources to survive the first year after restrictions.

Huawei Had More Than Six Years to Prepare “Spare Tires” to Deal With Export Controls⁸⁰

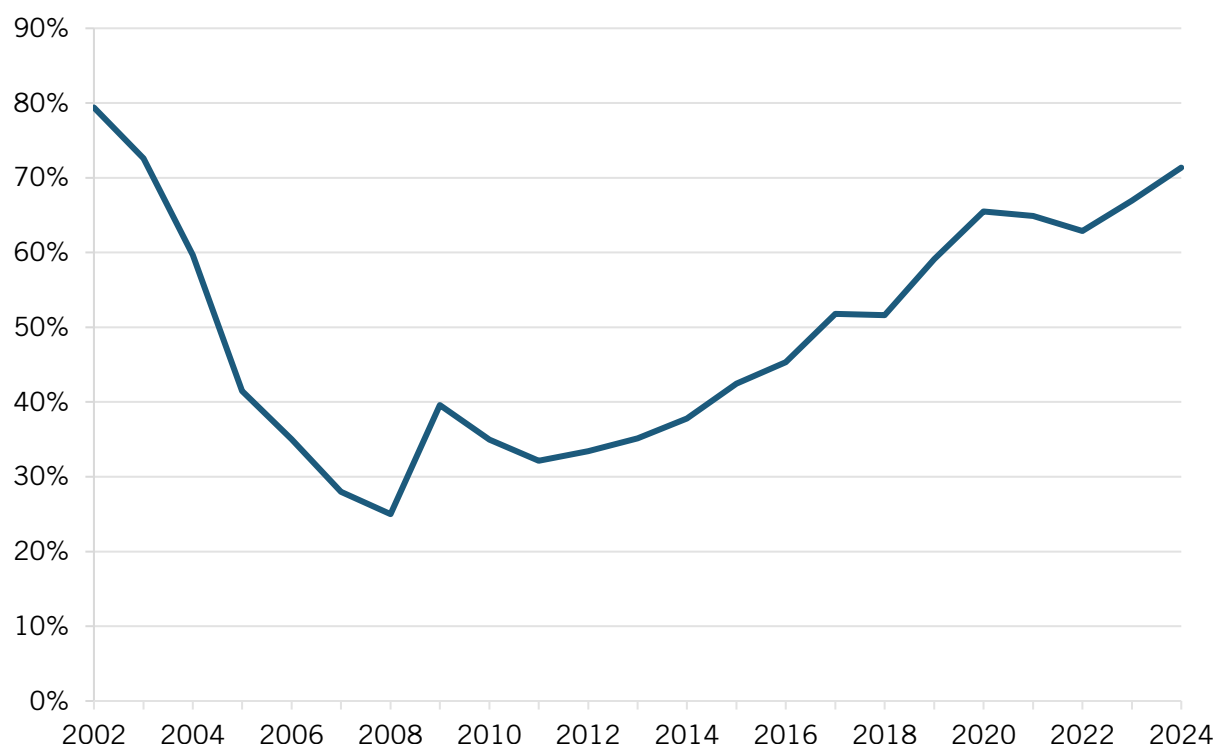
ITIF noted in 2020 that export controls were “shooting U.S. exporters in the foot,” as they went beyond protecting the U.S. telecommunications networks for cybersecurity reasons, limited U.S. company exports, and incentivized Huawei “to produce its own inputs, including computer chips.”⁸¹ This assessment proved to be accurate. Moreover, the export controls overlooked that Huawei had prepared for a restrictions scenario for over six years before the company was added to the Entity List in 2019. Notably, a 2012 U.S. House Permanent Select Committee on Intelligence special report revealed the company’s unfair practices and its ties with the People’s Liberation Army (PLA) acted as an early warning.⁸² Since 2012, Huawei has shifted toward greater reliance on the Chinese domestic market to buffer against restrictions, invested heavily in R&D, developed capabilities to produce in-house critical hardware and software, and stockpiled resources to survive the first year after restrictions.

A year after the 2012 House report, Huawei initiated an aggressive public relations campaign in the United States to improve its image. When the campaign did not lessen the scrutiny over the company’s practices and cybersecurity concerns, it officially declared that it was “not interested in the U.S. market anymore,” noting that its U.S. market sales were only \$1 billion.⁸³ (This ignored the fact that the company relied heavily on U.S. technology components for all its operations.)

Expanding Reliance on the Local Market

While the 2000s were a decade of international expansion for Huawei, the company reversed this trend in the subsequent decade. Before the 2008 global financial crisis, Huawei’s global expansion led to a significant increase in its non-Chinese revenues, jumping from 21 percent in 2005 to 75 percent in 2008. As the shock from the crisis led the company to increase its share in Chinese markets by 15 percentage points from 2008 to 2009, Huawei slowly recovered its income from non-Chinese markets by 2011. However, since 2012, Huawei has significantly expanded its presence and increasingly relied on revenues from China. By 2019, China represented 59 percent of Huawei’s revenues, and in its latest 2024 annual report, China provided 71 percent of revenues.

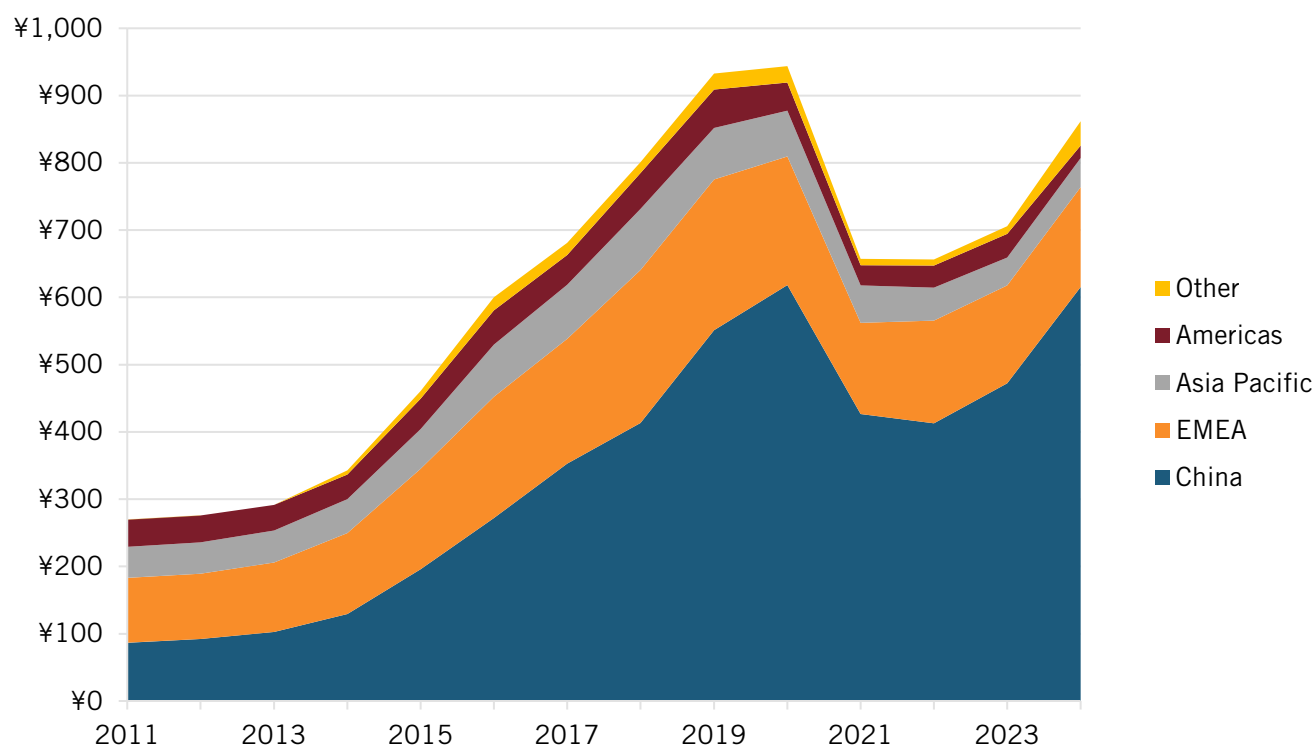
Figure 3: Huawei's revenues from China as a share of total revenues⁸⁴



While revenues from China have increased in relative terms for the company since 2012, revenues from the rest of the world also rose in the years leading up to the U.S. restrictions. As shown in figure 4, Huawei's global revenues increased 2.5 times between 2011 and 2020, the years when revenues peaked. However, revenues generated in China grew sixfold during this period, whereas revenues from non-Chinese markets rose by 78 percent.

Revenues from China have served as a buffer to offset the impact of U.S. export controls. During the first year after them, revenues from China increased by 12 percent, offsetting the 14 percent decline in non-Chinese markets, which enabled Huawei to report an overall year-over-year increase. In the following years, revenues from China bounced back rapidly. Between 2019 and 2024, revenues from China increased by 4 percent, while revenues from non-Chinese markets declined by 7 percent.

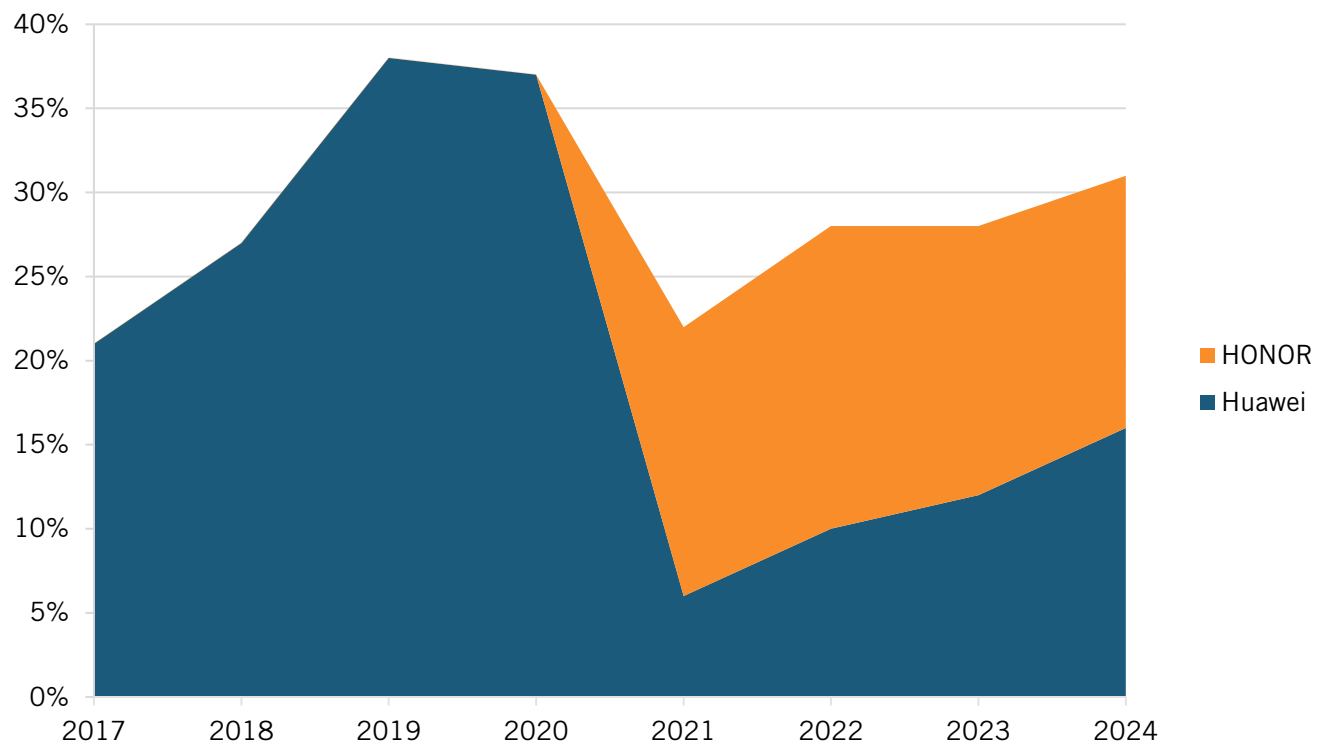
Figure 4: Huawei's revenues by region (billion CNY, 2024 prices)⁸⁵



Revenues from China have served as a buffer to offset the impact of U.S. export controls.

One example of how the Chinese market has served as a buffer is Huawei's market share for smartphone devices. The company once dominated the Chinese smartphone market, accounting for 37 percent and 38 percent of total sales in 2019 and 2020, respectively. As the export controls affected the firm's production, by 2021, this market share had fallen to approximately 5 percent. Considering that HONOR spun off from Huawei through the previously described state-supported acquisition, the comparison of post-restrictions market share should involve both companies. In this context, despite a challenging 2021, the combined market share of Huawei and HONOR in China averaged 29 percent for the 2022 to 2024 period. (See figure 5.) As of 2025, Huawei's market share in this sector has virtually tied with Xiaomi, making it one of the two most dominant ICT companies in China.

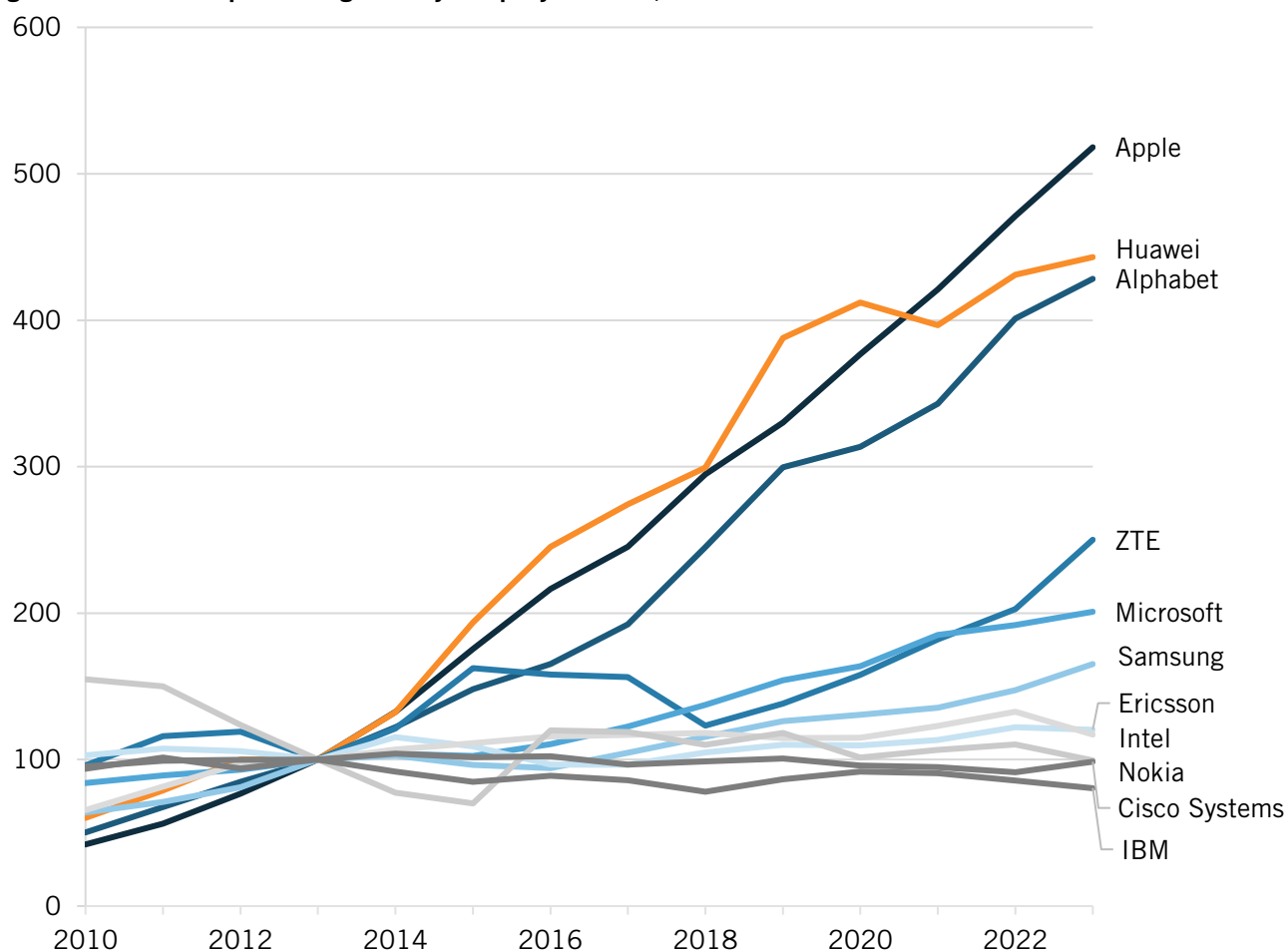
Figure 5: Huawei's market share in China for smartphone sales⁸⁶



Huawei Overinvested in R&D Capabilities Before Restrictions, and Kept Investing After Them

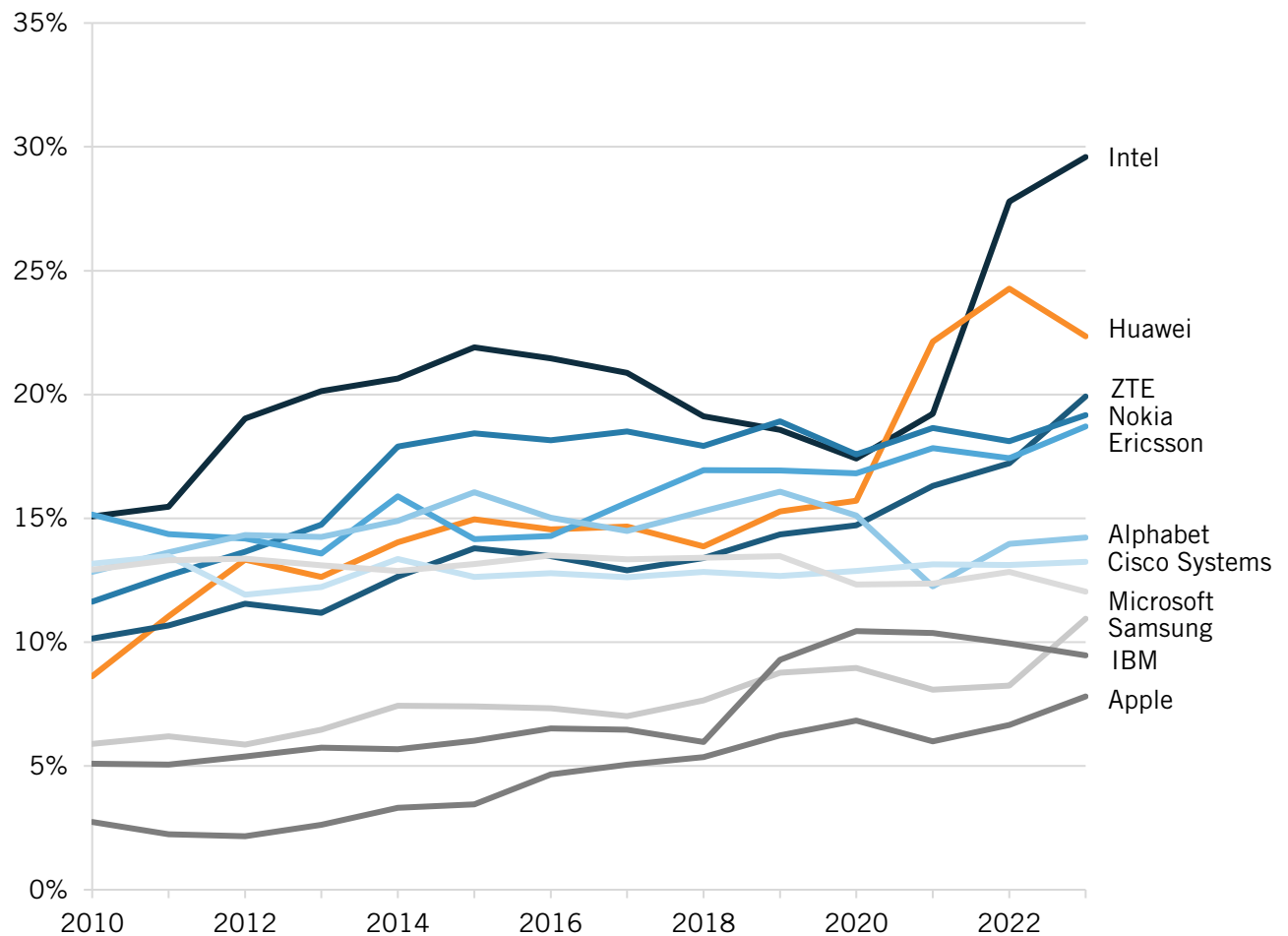
Huawei outperformed all its competitors in terms of R&D investment before the U.S. restrictions. Between 2013 (the first full year after the October 2012 House report on Huawei) and 2020, Huawei increased its real R&D expenditure by more than threefold, surpassing that of any other peer company, as shown in figure 6. Regardless of whether this investment—which exceeded that of the rest of the industry—was motivated by global expansion or by the fact that Huawei executives were indeed accounting for restrictions risks, in practice, these years of R&D overspending allowed the company to build a knowledge base to confront the restrictions challenge.

Figure 6: Real R&D expenditure growth by company (indexed; 2013 = 100)⁸⁷



Growth in Huawei's R&D expenditures declined after the restrictions, yet it still set a record for the company in 2023 and 2024.⁸⁸ Huawei's efforts to develop (or catch up with) frontier technologies have not diminished. One way to approximate this is by examining R&D intensity, which considers the company's R&D expenditure as a share of total revenues for a given year. Huawei had historically lagged behind in corporate R&D compared to competitors such as Ericsson and Nokia.⁸⁹ However, as figure 7 shows, U.S. restrictions forced the company to increase its R&D intensity to an average of 20 percent between 2019 and 2023, outperforming all competitors except Intel (which competes with Huawei only in one of Huawei's businesses: semiconductors).

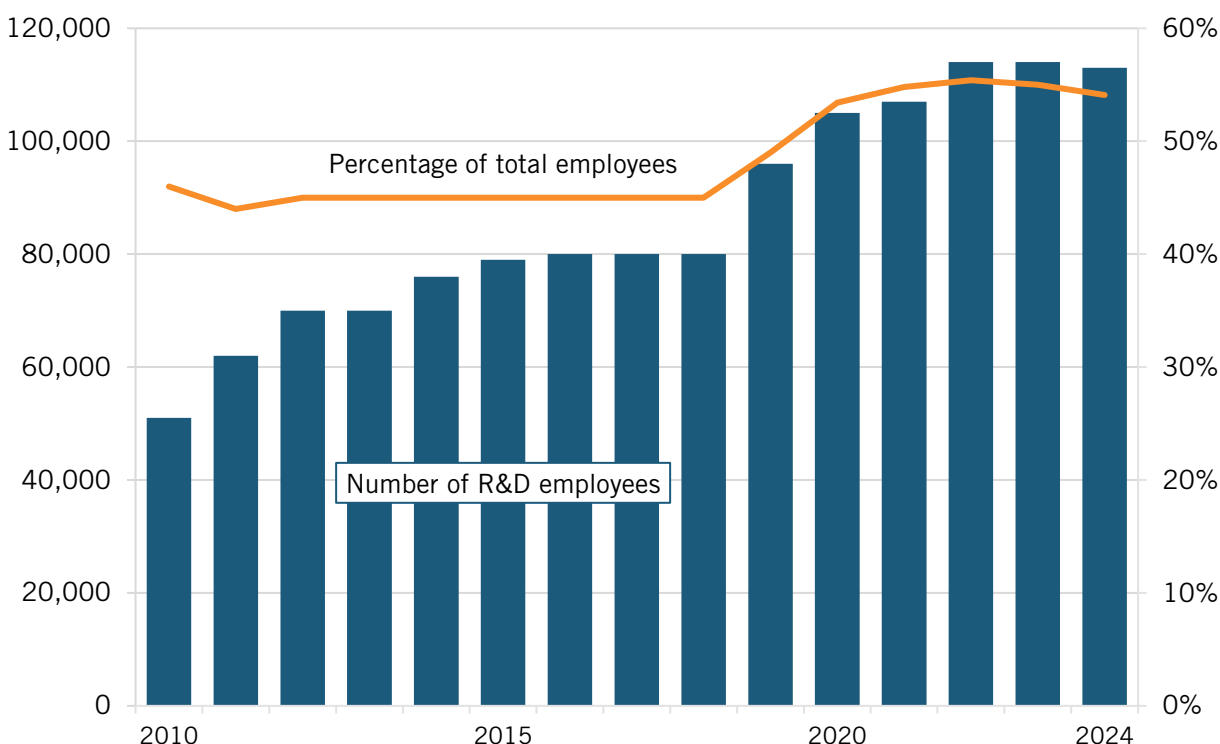
Figure 7: R&D intensity by company (R&D expenditure as a share of net sales)⁹⁰



Huawei took advantage of the TGL granted after its designation to the Entity List to release HarmonyOS.

Additionally, Huawei increased its number of R&D personnel since the U.S. restrictions were imposed, hiring more than 17,000 employees in this field between 2019 and 2024. (See figure 8.) While Huawei's R&D staff accounted for 45 percent of the total staff count during the five years preceding the restrictions (2014–2018), this proportion rose to an average of 55 percent in the five years following the U.S. inclusion of the company on the Entity List (2020–2024). There is no available information about the specific units or research projects to which these additional R&D researchers have been assigned.

Figure 8: Number of R&D employees and R&D personnel as a share of total employees for Huawei⁹¹



Huawei Started Working on an Indigenous OS Years Before the Export Controls

The export control for software, in practice, began in August 2020 after BIS stopped granting the TGL.⁹² This meant that Huawei would lose access to all non-open-source dealings, such as licensing for Google’s Android OS, Google’s Play Store app ecosystem, and any other software-related business with U.S.-headquartered companies. Huawei sold its handsets with Android Open Source Project in China (since Google’s services were blocked in the country due to censorship) and the Google-certified Android OS for the rest of the world as the integrated OS. Microsoft enjoyed a license until March 2025, allowing it to include Windows OS in Huawei’s laptops.⁹³

Huawei took advantage of the TGL granted after its designation to the Entity List to release HarmonyOS in August 2019. The company had previously explored using another OS instead of Android, such as Microsoft’s Windows Phone OS or Samsung’s Tizen in 2014.⁹⁴ Huawei explicitly built its in-house OS in anticipation of potential U.S. restrictions—two months before the restrictions, a spokesperson stated, “Huawei does have backup systems but only for use in extenuating circumstances.”⁹⁵ Some reports indicate that the company has been prepared for “worst-case scenarios” since the 2012 House report.⁹⁶

Evidence suggests that the firm was preparing for an indigenous OS as early as 2013–2014. For example, LiteOS, an OS for real-time Internet-of-Things devices, was launched in 2015.⁹⁷ Some of the functions of LiteOS used to build HarmonyOS and its open-source version, OpenHarmony, are described as its direct predecessors.⁹⁸ Similarly, the technology enabling cross-device tasks and efficient resource allocation scheduling for the OS patent application dates back to May 2015, suggesting that at least part of the research was conducted in 2014 or earlier.⁹⁹

Investing in Semiconductors Was Critical to Continue the Company's Operations

Huawei developed semiconductor capabilities to achieve self-sufficiency in the event of U.S. restrictions. To achieve this goal, the company took three clear actions: invested in its main chip design subsidiary (HiSilicon), began working with companies that have complementary strengths in the semiconductor supply chain, and created incentives to develop an ecosystem within China through an investment platform. HiSilicon, fully owned by and originating as a spin-off of Huawei in the 2000s, served as the cornerstone of Huawei's backup plans for chips. The day after the export controls were announced in May 2019, HiSilicon's CEO sent a letter warning that the company had been preparing a "spare tire" for the survival of Huawei.¹⁰⁰

HiSilicon provided Huawei with the organizational and staffing capabilities to develop physical components that could replace U.S. technologies. By 2012, HiSilicon had developed at least 120 chip designs and distributed at least 150 million chips.¹⁰¹ HiSilicon has been developing chips branded as Kirin since 2014 and helped design the world's first 7 nm chipset commercialized with 5G support, Kirin 980, in 2018 in partnership with TSMC.¹⁰² HiSilicon produced more than \$7 billion worth of chips during the period before the 2019 restrictions.¹⁰³

The second action taken was to collaborate with companies that have complementary capabilities. For example, in 2015, Huawei announced a joint venture with SMIC (a partially state-owned Chinese company), Imec (a Belgian research consortium), and Qualcomm (a U.S. semiconductor company) called SMIC Advanced Technology Research & Development (Shanghai) Corporation. This joint venture, majority owned by SMIC, focused on R&D to develop 14 nm semiconductor technology for mass production by 2020.¹⁰⁴ SMIC announced the start of volume production for the 14 nm chip in late 2019, and the first commercialization took place in 2020 with HiSilicon's 14 nm Kirin 710A chip.¹⁰⁵

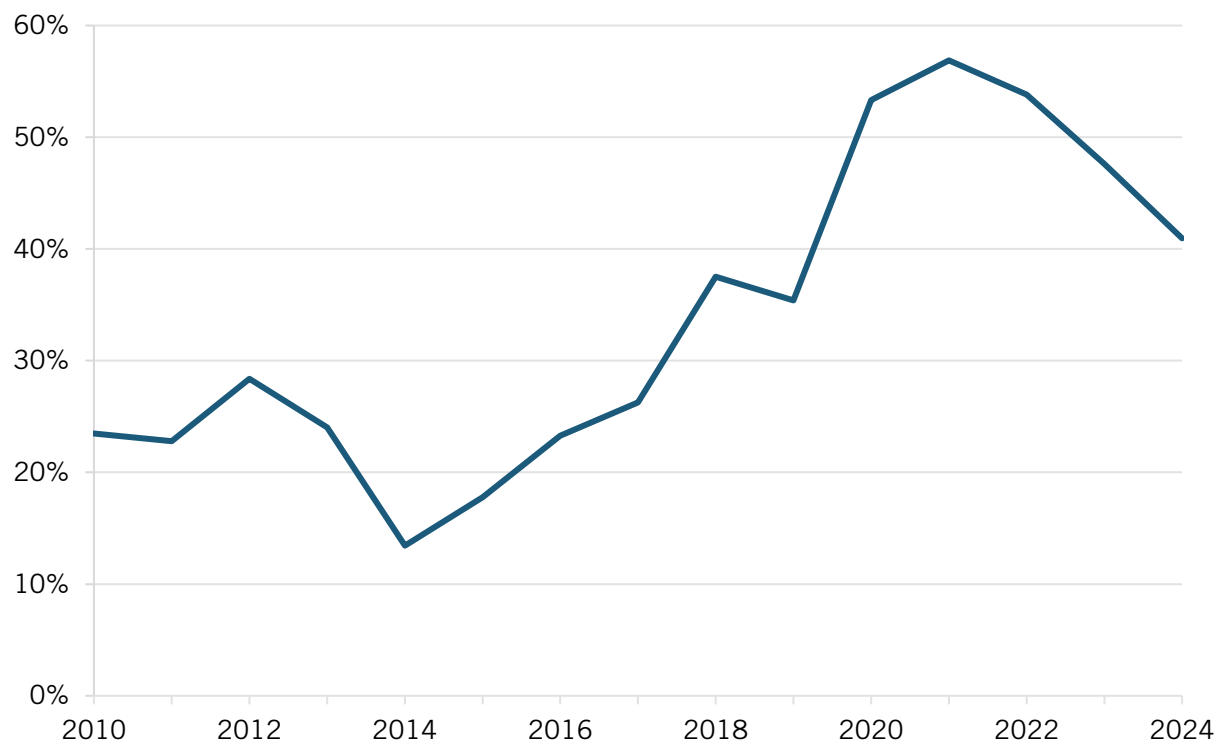
Finally, Huawei sought to build a local ecosystem of suppliers to strengthen China's self-sufficiency in semiconductors. In 2019, before Huawei's inclusion on the Entity List, the company launched Hubble, a venture capital subsidiary designed as an investment vehicle for semiconductor startups, with a registered capital exceeding \$100 million. Before the establishment of Hubble, Huawei had maintained a practice of not investing in third-party companies.¹⁰⁶ To date, Hubble has invested in at least 100 startups.¹⁰⁷ For example, it is an investor in companies developing key semiconductor fabrication processes, such as Focuslight Technologies (a photolithography equipment maker), Suzhou Everbright Photonics (a gallium-nitride chipmaker), and Xuzhou Chemicals (which develops photoresist technologies used in lithography).¹⁰⁸ Hubble is currently being used to further promote Huawei's ecosystem by funding startups that would be locked into it, for instance, by investing in humanoid robots that can integrate the company's new developments in chips (Huawei's Ascend AI chips), large language models (Pangu), and HarmonyOS.¹⁰⁹

Other Short-Term Measures

The cumulative congressional and executive actions raising concerns about Huawei during late 2017 onward allowed the company to take actions to mitigate potential U.S. measures against it. For example, Huawei's inventories of raw materials expanded by more than 86 percent from 2017 to 2018, and the company has kept a high level of stockpiles of raw materials since the restrictions relative to other inventories. (See figure 9.) These raw materials include electronic components and sub-assemblies used in manufacturing telecommunication equipment and

consumer devices, as well as large orders of the 7 nm Tiangang core chips, manufactured by TSMC using U.S. wafer fabrication equipment and supplying Huawei until the end of the TGL.¹¹⁰ These inventory levels allowed the company to effectively boost its revenues during the first year after it was added to the Entity List, in addition to other measures such as issuing bonds in the Chinese market for over \$800 million to increase liquidity and reduce its financial reliance on foreign markets.¹¹¹

Figure 9: Huawei's raw materials as a share of total inventories¹¹²



HOW EXPORT CONTROLS ON HUAWEI ARE AFFECTING U.S. COMPANIES

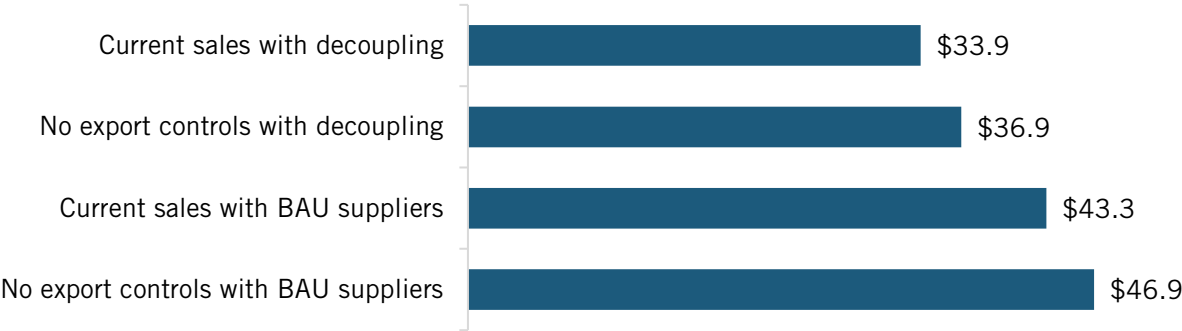
The U.S. actions against Huawei served as an incentive for the company to accelerate its decoupling from U.S. technologies. U.S. exports to Huawei exceeded \$11 billion when the firm was added to the Entity List.¹¹³ Without those inputs, it created a “void” in Huawei’s supply chain that was mostly filled by Huawei’s in-house processes or Chinese technologies. Restrictions against the company harmed U.S. businesses by reducing sales of former Huawei suppliers and triggering retaliation from the PRC against them.

Export Controls Cut U.S. Businesses’ Sales by at Least \$33 billion

ITIF estimates that restrictions on doing business with Huawei caused U.S. companies to lose at least \$33 billion in sales between 2021 and 2024. This estimation is based on two main priors. Before U.S. restrictions, Huawei spent roughly 33 percent of its operating costs on American suppliers.¹¹⁴ Following the August 2020 amendment to terminate the TGLs, BIS authorized a limited number of export licenses from 2021 to 2024; however, this information is not publicly available.¹¹⁵ Anecdotal evidence suggests that Huawei purchased between 5 and 10 percent of its operating costs from U.S. firms during this period; ITIF conservatively estimates that share to be 15 percent.¹¹⁶

To model what would have happened without the export controls, ITIF combined two different types of alternatives for Huawei, creating a total of four different estimations, summarized in figure 10. The first case involves trying to infer what Huawei’s growth would be without U.S. restrictions. To do this, ITIF modeled two scenarios: the “current sales” scenario (using existing data on Huawei’s performance) and a “no export controls scenario,” which assumes that Huawei’s sales would follow the same pattern as the average of its main Western competitors (Alphabet, Apple, Ericsson, Nokia, and Microsoft) from 2021–2024. The second consideration for Huawei in this analysis is whether the company was already on a path to decouple from U.S. technologies, regardless of U.S. actions. To explore this, ITIF modeled two cases: a base case wherein U.S. firms accounted for roughly 33 percent of Huawei’s operating costs for all years (business-as-usual suppliers, or “BAU suppliers,” scenario) and a “decoupling scenario,” assuming Huawei would fully decouple from U.S. technologies by 2027—the 100th anniversary of the PLA.

Figure 10. Lost sales to U.S. suppliers due to export controls against Huawei between 2021 and 2024 (billions)¹¹⁷



Sales from U.S. firms to Huawei helped sustain American market share in key technology products and funded R&D projects, preventing China from capturing that share. At the industry level, Huawei often did not represent a significant portion of the revenues of American advanced manufacturing companies. (See table 3.) However, these sales helped U.S. companies reach the necessary volumes and margins to invest in innovation, ultimately maintaining competitiveness and market share.

Restrictions against Huawei directly harmed U.S. businesses by reducing sales of former Huawei suppliers and triggering retaliation from the PRC against them.

The restrictions also had a secondary effect on American companies supplying Huawei. Many of them reported in their annual statements that U.S. action negatively impacted the overall demand for their products. For example, Analog Devices Inc., an American semiconductor company, reported in its 2020 annual report that restrictions were “causing our current or potential customers to amass large inventories of our products, replace our products with products from another supplier that is not subject to the export restrictions, or focus on building indigenous semiconductor capacity to reduce reliance on U.S. suppliers.”¹¹⁸

Table 3: Examples of U.S. advanced manufacturing companies affected by the export controls¹¹⁹

Company	Example of What It Supplied to Huawei	Relevant Financial Information
Analog Devices Inc.	Chips used in radio systems for 5G telecommunications networks	Sales to Huawei represented between 2 and 3 percent of total sales by 2020.
Broadcom	Wireless communication chips for smartphones and other devices	Huawei represented 4 percent of Broadcom's revenues in 2019, or \$900 million.
Cadence	Electronic design automation software (EDA), also provided to HiSilicon	In May 2025, the U.S. government imposed new export controls on EDA sales to Chinese companies.
Intel	License to ship laptop central processors to Huawei in 2020 (revoked in 2024)	When the 2024 license was revoked, Intel maintained its revenue expectation for the year, but "below the midpoint" between \$12.5 billion and \$13.5 billion.
Micron Technology	Dynamic Random Access Memory (DRAM)	Huawei represented 13 percent of revenues by February 2019.
Qorvo	Radio frequency (RF) supplier for Huawei handsets and base stations	Huawei accounted for 13 percent of 2019 revenues, 10 percent in 2020, and 5 percent in 2021, after which it stopped reporting significant sales.
Qualcomm	License in 2020 to sell older 4G chips to Huawei (revoked in 2024)	Between October 2023 and May 2024, revenues from Huawei represented \$560 million (1.4 percent for the fiscal year ending in September 2024)
Texas Instruments	Analog chips for Huawei smartphones and telecom equipment	Sales to Huawei represented between 3 and 4 percent of total sales in 2019.

Giving Away Market Share to a Foreign Competitor: The Case of Teradyne

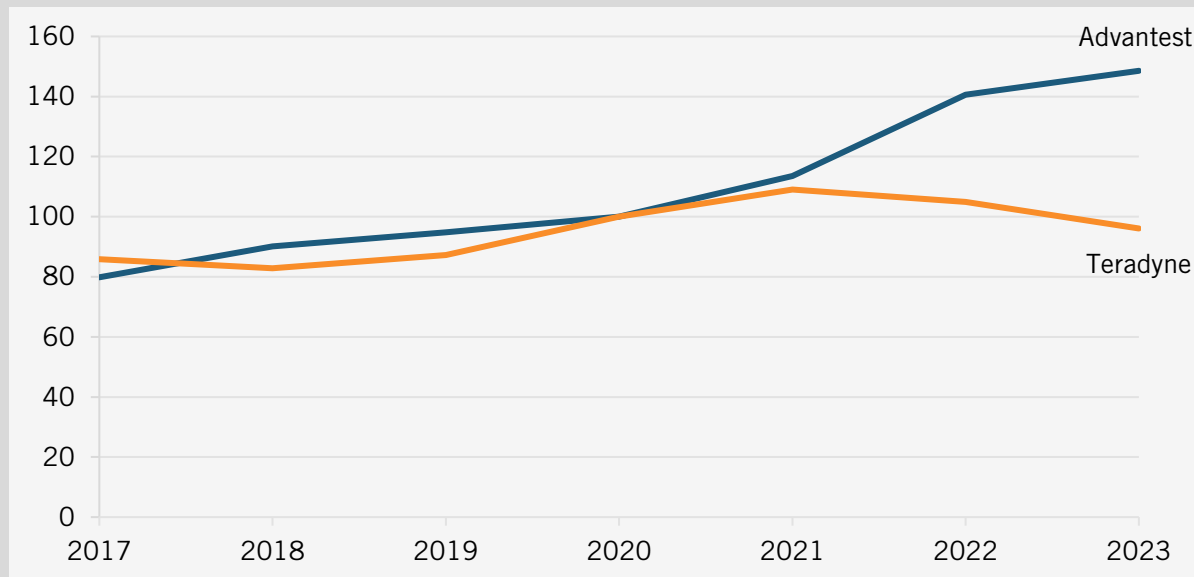
Teradyne is an American manufacturing company specializing in Automated Test Equipment (ATE) for the semiconductor industry. ATE plays a critical role in semiconductor manufacturing, as it guarantees essential quality controls during the different stages of the process. Teradyne, along with its Japanese competitor Advantest, together account for roughly 80–90 percent of the global market for semiconductor testers in many segments.¹²⁰ Teradyne is also a global leader in advanced robotics through its subsidiary Universal Robots.¹²¹

As the export controls against Huawei limited the supply of U.S. technologies to the firm, but were not coordinated with allies, Teradyne was impacted, but its Japanese competitor was not. Thus, Huawei replaced Teradyne's inputs with Advantest's, giving up global market share.¹²² Advantest's global market share for semiconductor testers grew from 43 percent in 2020 to 58 percent in 2024, while Teradyne's declined roughly in a similar, inverse proportion.¹²³

The restrictions have also harmed Teradyne's ability to keep investing in innovation capabilities. The company observed two consecutive years of revenue decline, from \$3.7 billion in 2021 to

\$2.7 billion in 2023. As of September 2025, it had not recovered its pre-restriction sales. This revenue loss has impacted the firm’s innovation capabilities. Figure 11 shows the R&D expenditure for Advantest and Teradyne, indexed in 2020, when restrictions began. After the restrictions came into effect for ATE products, Advantest was able to expand its R&D expenditure by roughly 50 percent, while Teradyne observed a decrease in real R&D expenditure.

Figure 11. R&D expenditure (indexed; 2020 = 100).¹²⁴



U.S. restrictions also compelled American companies to cancel their contracts with Huawei, such as the earlier removal of Google’s Play Store from Huawei devices. This meant that Huawei’s wearables could not be updated to meet Google’s security and development standards.¹²⁵ A similar pattern occurred with Microsoft and its laptop OS, the Windows series. Windows’ license to Huawei expired in March 2025, giving the Chinese company enough time to incorporate HarmonyOS into its laptops.¹²⁶ After March 2025, reports indicate that Huawei is only rolling out laptops using its in-house-built OS, HarmonyOS, threatening Microsoft’s market share.¹²⁷

Export Controls Triggered the PRC to Retaliate Against U.S. Companies

While there has not been a formal retaliation from the Chinese government against the United States due to Huawei’s inclusion on the Entity List, the PRC has since taken actions that effectively serve as a response to the restrictions. A few months after the restrictions were imposed in 2019, Cisco executives declared that the company was “uninvited” to compete in bids by Chinese state-owned companies.¹²⁸ Thus, Cisco was de facto barred from continuing to sell telecommunications infrastructure to Chinese carriers. (Cisco still sells equipment to other Chinese companies, such as electric vehicle makers.)¹²⁹

In December 2019, the PRC instructed all government agencies to phase out foreign-made technologies, including hardware and software, by 2022.¹³⁰ This measure was directly targeted at reducing the market share of American firms, such as Dell, HP, and Microsoft, while being functional to the PRC’s goal of technological self-sufficiency. Likewise, local governments in China, such as Shenzhen, started promoting the adoption of HarmonyOS as their primary system, under the “Shenzhen Action Plan for Supporting the Development of Native HarmonyOS Open

Source Applications in 2024,” which is seen as a basis for a nation-wide initiative to phase out American OS.¹³¹

In addition, the PRC established its version of the Entity List in May 2019, called the “Unreliable Entity List,” with a justification similar to that of the American version.¹³² This tool provides the PRC with a legal basis to target retaliatory measures against specific companies, primarily American ones. The Unreliable Entity List uniquely includes American companies, and it has been utilized by the Chinese government as a “bargaining tool” during ongoing trade negotiations, highlighting the retaliatory nature of the measure.¹³³

WHY THIS MATTERS

The U.S.–China techno-economic rivalry plays out across every strategic sector, including those in which Huawei competes with American firms for global market share. As ITIF has reported, China is rapidly catching up with the United States in robotics, electronic displays, and artificial intelligence, and it lags behind in machine tools and semiconductors.¹³⁴ These are all critical links in Huawei’s supply chain. Because U.S. policy has shaped Huawei’s innovation path, its continued growth erodes America’s competitive edge.

The business opportunity loss for American firms doing business with Huawei ultimately matters for the U.S. public interest for three reasons:

1. The acceleration of Huawei’s decoupling from using U.S. technologies impacts American global market share in key products, such as OSs.
2. The loss of revenues from doing business with Huawei undermines American competitiveness, as it limits U.S. firms’ ability to reinvest in R&D and advanced production.¹³⁵
3. The acceleration of Huawei’s decoupling from U.S. technologies is leading to a lock-in of consumers to products within an ecosystem that privileges Chinese standards and supply chains.

U.S. technology companies are now in a weaker position to lead globally due to Huawei’s accelerated decoupling. As Nokia and Ericsson were ultimately unable to offset the unfair competition against Huawei and ZTE in 5G, this pattern will likely repeat for the cases of HarmonyOS, the new generation of Huawei’s wearables competing against American firms, or both. The result is likely to be a decline in global market share for companies such as Google and Microsoft.

POLICY RECOMMENDATIONS

The rationale used by the U.S. government’s actions against Huawei is a legacy of an earlier era, when America could impose sanctions without significantly harming its competitiveness and could hinder the production capabilities of its adversaries. This framework is outdated, as global supply chains have become increasingly complex and Chinese techno-economic power has reached, in some cases, unassailable levels.

The United States needs a realistic approach. The fact that the United States is incapable of crippling a company such as Huawei does not preclude the need to take actions against Chinese

mercantilism. A modern framework should pair import bans for cybersecurity reasons with limited, targeted export controls on advanced technologies.

Some of the measures that U.S. policymakers should consider for this modern framework include the following:

- **Press more countries to ban Huawei's imports.** In 2020, ITIF recommended that the U.S. government urge its allies to exclude Huawei and ZTE from their markets, particularly in the telecommunications network infrastructure and equipment sector, to counter the companies' artificial competitiveness resulting from Chinese support and the lack of opportunities for rivals to access the Chinese domestic market.¹³⁶ This assessment has not changed.

Despite foreign policy's efforts across multiple U.S. administrations, Huawei remains in many European markets—even as its predatory practices have particularly harmed Ericsson and Nokia. Some allies are phasing out Huawei from their 5G network. Germany, for example, plans to phase out Huawei from core 5G networks by 2026 and from the radio and management layers by 2029.¹³⁷ However, nine U.S. allies—Hungary, Iceland, Italy, South Korea, Spain, the Netherlands, the Philippines, Thailand, and Turkey—continue to use Huawei in their 5G infrastructure without a plan to phase out the company entirely.

The U.S. government needs to reverse course on its go-it-alone approach to competitiveness and start to bring in a “coalition of the willing” that understands the threat to the West from Chinese national power industry predation and is willing to take collective steps in self-defense. One such step should be to ban further sales of Huawei telecom equipment.

A modern framework should pair import bans for cybersecurity reasons with limited, targeted export controls on advanced technologies.

- **Export controls should be applied jointly with allies, or not at all.** Export controls, in part, were ineffective because regulatory loopholes allowed Huawei to fully offset American inputs of the same cost and quality as those of U.S. allies, including Japan. As this report shows, blanket export controls on Huawei have undermined American competitiveness in markets where the company has other substitutes, such as the case of ATE for chipmaking tests. This experience demonstrates that unilateral export controls, besides being ineffective and harmful to U.S. companies, actually work to the advantage of American allies.
- **Export control measures must consider impacts on U.S. firms and techno-economic power.** For decades, U.S. foreign policy makers and mavens were willing to spend U.S. techno-economic power to achieve foreign policy goals, such as sanctioning a country we wanted to punish, such as Iran. America can no longer afford such spending of its “technology capital.” Huawei's experience demonstrates that export controls are detrimental to the United States in both absolute and relative terms: they reduced the resources available for U.S. companies to invest in R&D and innovation, and helped shape Huawei as a

competitor in new products, such as OSs, which now threaten U.S. dominance in this global market. It is time for an intellectual and operational reset.

U.S. policymakers cannot assume that the United States maintains global leadership in advanced sectors. American competitiveness is faltering and requires a coordinated strategy, led by the federal government, to reverse this trend.

CONCLUSIONS

The approach taken by the U.S. government against Huawei, with export controls to sanction the company and cripple it, was hubristic—and ultimately backfired. An import ban on Huawei's 5G network in the United States, along with urging allies and trade partners to follow suit, would have addressed the cybersecurity concerns about the company. Yet, the measures went beyond. The U.S. government took actions against the company for its alleged business with adversaries, such as Iran, which turned out to be costly for U.S. firms and damaging to American competitiveness. It later tried to cripple the company, underestimating Huawei's innovation capabilities and the PRC's support. Moreover, as this report shows, a 2012 Congressional report denouncing the company's predatory practices and cybersecurity risks served as an early warning that prompted the company to invest in decoupling from U.S. technologies.

Huawei's resiliency threatens American competitiveness and market share. After the implementation of export controls, the company has successfully launched its in-house OS, HarmonyOS, which is now being rolled out on mobile devices, tablets, and laptops—potentially threatening U.S. firms' market share in these sectors. The company is also catching up in chipmaking and exploring new business lines, such as energy storage technologies and smart automotive solutions. Additionally, this report demonstrates how export restrictions harm U.S. companies, resulting in over \$33 billion in lost sales and, in some cases, a relative reduction in R&D investments.

The failure of U.S. policies against Huawei evidences an outdated rationale to address Chinese mercantilism. The current U.S.-China techno-economic competition differs significantly from earlier episodes when U.S. technological leadership was challenged. For example, the United States regained its semiconductor lead during the U.S.-Japan rivalry of the 1980s and today commands nearly five times Japan's global market share. It succeeded by combining restrictions, diplomacy with an allied partner (Japan), and sustained innovation. None of those conditions applies today: Chinese support offsets restrictions, the rivalry is with an adversary rather than an ally, and China has caught up or even pulled ahead in many strategic technologies. In other words, the United States is using yesterday's tools against a fundamentally different adversary; it needs a realistic, not hubristic, policy approach.

Acknowledgments

Huawei's building "spare tires" in anticipation of U.S. sanctions is based on the company's own statements, notably by Ren Zhengfei in 2019. However, the broader narrative of Huawei's preparations for U.S. restrictions and the "spare tire" concept was first fully documented and gained broad attention through detailed reporting in Eva Dou's book *House of Huawei: The Secret History of China's Most Powerful Company*.

"Backfire," the title of this report, is also the title of one of Annabel Yao's singles. Annabel Yao, a Chinese pop star and one of Ren Zhengfei's daughters, is often referred to as the "Huawei Princess."

The author wishes to thank the following individuals for assisting with this report: Robert Atkinson, Daniel Castro, Eli Clemens, Randolph Court, and Stephen Ezell.

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About ITIF

The Information Technology and Innovation Foundation (ITIF) is an independent 501(c)(3) nonprofit, nonpartisan research and educational institute that has been recognized repeatedly as the world's leading think tank for science and technology policy. Its mission is to formulate, evaluate, and promote policy solutions that accelerate innovation and boost productivity to spur growth, opportunity, and progress. For more information, visit itif.org/about.

ENDNOTES

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