

Center for American Progress



GETTY IMAGES/STEFAN SAUER

# There Is a Solution to the Huawei Challenge

---

By Melanie Hart and Jordan Link    October 2020

# Contents

- 1 Introduction and summary**
- 5 Beijing's direct and indirect subsidies**
- 10 State-funded export financing**
- 14 Manipulating global standardization bodies**
- 18 How the U.S. can counter Beijing's distortionary  
playbook and compete at full strength**
- 24 Conclusion**
- 25 Appendix**
- 31 About the authors**
- 32 Acknowledgments**
- 33 Endnotes**

# Introduction and summary

Chinese telecommunications titan Huawei is on track to become the world's biggest fifth-generation (5G) mobile network equipment supplier.<sup>1</sup> That is a problem. U.S. intelligence agencies fear that if global networks run on Huawei equipment, Beijing could use that equipment to gather intelligence, steal trade secrets, track down and punish its critics, and potentially bring down networks to incapacitate other nations in times of crisis. The Trump administration is trying to convince other nations that these risks warrant banning Huawei from their 5G networks. Thus far, few countries are signing on to that approach.<sup>2</sup>

The reasons are simple. First, the mobile network equipment market is an oligopoly with just four major vendors to choose from—none of which is a U.S. company. Second, Beijing deploys powerful industrial policies to make Huawei equipment cheaper to deploy than the three alternatives.

For the telecom companies making network equipment purchases—and the national governments who regulate them—the security risks associated with Huawei equipment are theoretical and hard to quantify. But the cost associated with choosing an alternative vendor (Ericsson, Nokia, or Samsung) and forgoing the lucrative incentives Beijing offers to Huawei's customers are immediate and measurable. Thus far, the United States has largely overlooked the market-distorting industrial policies that Beijing uses to make Huawei the global front-runner. This must change. If the United States can successfully counter those policies to make this market more competitive, that will make the security side of the 5G challenge much easier to solve.

The shift from fourth- to fifth-generation mobile telecommunications creates an opportunity for the United States not only to tackle China's market-distorting industrial policies but also to help U.S. firms play a much bigger role. Network equipment is a single-vendor market: When an operator purchases equipment from one vendor, it cannot mix in technology from other companies. This market is overdue for a shift to interoperability. For example, in the personal computing

market, buyers previously had to buy their desktop, monitor, and printer from the same vendor, but today they can mix and match. Mobile telecom operators should be able to do the same, and pressure is growing to move the market in this direction. If the mobile network equipment market becomes truly interoperable, it will no longer be an oligopoly. U.S. firms will have new opportunities to enter the market, and it will be much harder for Beijing to suppress competition and maintain Huawei's dominant position.

While the U.S. Congress is already taking steps to support the shift toward a more diverse and interoperable equipment market, the United States has not yet taken on China's market-distorting industrial policies.<sup>3</sup> Many U.S. observers appear to assume Huawei is a naturally strong competitor that gained its dominant position through good business strategy. Huawei certainly made good decisions along the way, but it owes its rise to Chinese industrial policies that have suppressed global competition for nearly two decades. The United States cannot succeed in bringing new competition to this market—and new opportunities for U.S. firms—until it effectively counters Beijing's market distortions. Three aspects of Beijing's playbook are particularly important:

1. China provides direct and indirect subsidies—including guaranteed market share within China and cheap credit from Chinese state banks—that reduce Huawei's operational costs, speed time to market for Huawei's products, and allow it to price its products well below prices set by its competitors.
2. Chinese state banks provide generous financing to Huawei's customers on terms most commercial banks cannot match, making Huawei equipment cheaper to deploy at any price.
3. Chinese officials interfere in the standardization process at the International Telecommunication Union (ITU) to increase Huawei's share of the emerging global 5G standard, making Huawei equipment even harder to avoid and setting it up to extend its dominance into 6G and beyond.

These three aspects of Chinese industrial policy are mutually reinforcing. Together, they fuel Huawei's takeover of the global telecom market and are making it difficult for the United States to convince other nations to choose a more secure option.

This report details the most important distortionary policies Beijing deploys and offers policy measures the United States can implement to push back. It draws on authors' interviews with 20 technical experts working across the 5G supply chain, ranging from engineers putting forward technical contributions at the ITU to mobile network operators weighing their 5G equipment options. The authors utilized open-source Chinese government documents and media reports to gather new insights about Beijing's intentions and actions. As is often the case, Chinese leaders are straightforward about their aims when speaking to their own domestic audience and sending orders down the massive Chinese government bureaucracy. The authors also tracked Huawei's equipment deals around the world and compiled a database—shared in the Appendix—of the loans Chinese state banks provide to Huawei's global customers.

Countering China's market-distorting industrial policies and speeding the shift toward a more interoperable, diverse, and competitive 5G network equipment market are goals many other nations share. Broadening the U.S. approach to include this aspect of the Huawei challenge will make it easier for the United States to work in concert with its allies and partners. By building a broad coalition, nations can work toward common objectives—instead of working in isolation, as the Trump administration is doing.

To effectively counter China's market-distorting industrial policies, support the shift toward a more diverse and interoperable wireless network ecosystem, and open the door to new U.S. market entrants, this report argues that the United States should:

- **Form a coalition of nations to assess how Beijing's direct and indirect subsidies harm the global market and devise appropriate trade remedies.** The European Commission's 2010–2014 investigation—which reportedly compiled enough evidence to justify countervailing duties of up to 70 percent—provides an excellent starting point.
- **Conduct a comprehensive review to assess how Beijing uses credit to advantage Chinese firms over their competitors and engage the Group of Seven (G-7) industrialized democracies to develop new rules limiting those actions.** Current trade rules allow Beijing to leverage the nation's state banks to distort global markets and drive foreign firms out of business. That cannot continue.

- **Provide fast-track export financing for American vendors deploying disruptive technologies—such as virtualized networks—and conducting their research, development, and manufacturing in the United States.** American companies are developing innovative approaches that could revolutionize 5G, but financing is a challenge, particularly for smaller firms.
- **Form a coalition of export credit agencies to support vendors seeking to compete against Huawei and the loans that Chinese state banks offer its customers.** This coalition should set high standards for interoperability and security, including supply chain security.
- **Engage the key 5G standardization partners—the European Union, Japan, India, and South Korea—to improve leadership transparency and diversity at the ITU.** The ITU should not allow Chinese government officials to move directly from the nation’s telecom ministry to key ITU positions or serve in the same positions without term limits.
- **Provide targeted financial support to increase U.S. participation in ITU standardization forums.** The United States should empower smaller vendors to increase their voice, particularly those working on interoperable or disruptive solutions and those doing their research, development, and manufacturing in the United States.
- **Push the 3rd Generation Partnership Project (3GPP) to adopt the O-RAN Alliance open fronthaul interface as a common global standard.** A truly open interface is needed to give smaller vendors—including disruptive U.S. vendors—a foothold in the 5G ecosystem.
- **Speed time-to-market for disruptive U.S. innovation and reduce global dependence on 5G radios and other network components that are primarily developed and manufactured in China.** Targeted public investments are needed to help U.S. firms overcome the market barriers that Beijing has created through decades of distortionary industrial policy in this sector.

With this set of policies in place, the United States can pursue a much more comprehensive strategy that will address both the security and the market aspects of the Huawei challenge, driving the global market toward a more diverse and competitive ecosystem that will enable the United States to achieve its goals in 5G, 6G, and beyond. Understanding and countering China’s market-distorting industrial policies is the first step.

# Beijing's direct and indirect subsidies

When mobile network operators go shopping for 5G network equipment, they currently have four major vendors to choose from: Huawei, Ericsson, Nokia, and Samsung. Huawei's prices are generally at least 30 percent less than the prices of its competitors.<sup>4</sup> Huawei claims its price advantage is due to a mix of low-cost labor, rapid innovation, management efficiencies that drive down operational costs, and "laziness" among its competitors.<sup>5</sup> In reality, there is ample evidence that Chinese government subsidies—both direct and indirect—are a key factor and have been for decades.

The nature of Beijing's support for Huawei has shifted over time, making that relationship difficult to track. During the first two decades of Huawei's rise (1988 to 2008), Beijing's primary goal was to help Huawei acquire technical know-how from Western firms and muscle into a market where it previously had no presence. Huawei started with few resources, so it depended heavily on direct Chinese government subsidies to fund that process. As Huawei gained global market share, its revenues rose, and Beijing adjusted its subsidization toolkit. In 2002, Huawei and its subsidiaries earned just over \$2 billion in revenues.<sup>6</sup> By 2008, Huawei's annual revenue was just over \$18 billion.<sup>7</sup> By 2018, that number had more than quadrupled, reaching just over \$105 billion.<sup>8</sup> Huawei now has more than enough cash to fund its operations, but Beijing keeps the cash flowing by providing indirect subsidies: guaranteed market share in China and cheap credit from Chinese state banks.

---

## Direct subsidies fueled Huawei's rise in the 2G and 3G eras

Ren Zhengfei founded Huawei in 1988 in Shenzhen, one of the special economic zones where Chinese officials were experimenting with early market reform. Local officials saw Huawei as a worthwhile investment, possibly due to Ren's military connections: Ren had served in the People's Liberation Army (PLA) engineering corps and had represented the PLA at a major Chinese Communist Party National



Congress in Beijing.<sup>9</sup> In the 1990s, two local cadres—Shenzhen Municipal Chinese Communist Party Secretary Li Youwei and Shenzhen Construction Bank President Hui Xiaobing—joined forces to funnel financial support to Huawei. As Li Youwei recounted in a 2019 interview:

*When Ren Zhengfei started his business, he had only a dozen people in his team. At that time, they had technology, products and market, but no capital, loans, guarantees or mortgage. After I organized an inquiry, I suggested Hui Xiaobing, President of the Shenzhen Construction Bank, look into Huawei and President Hui decided to lend Huawei 30 million yuan. At that time, as Ren Zhengfei brought in talent, our personnel bureau and housing bureau provided help for him, and the science and technology bureau provided comprehensive services around Huawei.<sup>10</sup>*

Huawei adopted a business model that revolved around Chinese government contracts and support. It supplied telecom equipment to a variety of state buyers including the People’s Liberation Army, local police and security departments, and China’s rail ministry.<sup>11</sup> And it financed its growth with a steady influx of loans from China’s state banks.

Then, in 1996, Beijing launched a massive campaign to reduce the nation’s reliance on foreign technology. In the telecom sector—at that time in the second-generation (2G) era—Beijing focused primarily on switching equipment. Chinese leaders selected five domestic switch manufacturers—Huawei, Datang, ZTE, Julong, and Jinpeng—to replace foreign suppliers in the nation’s fast-growing domestic market. Beijing began calling this group of five companies “Great Golden China” and ordered state entities at all levels to funnel support to these firms through a mix of direct subsidies, preferential tax policies, discount loans, credit lines, and other funds that were to increase over time.<sup>12</sup> The end goal was to absorb switch technology from foreign firms, use Chinese government subsidies to produce those same products at prices the foreign suppliers could not match, and drive the foreign firms out of China.

Huawei’s new role in “Great Golden China” turned it into a vehicle for Beijing’s technology ambitions and provided access to the national treasury. Beijing began funding Huawei research and development (R&D) activities through a variety of programs including the National High-tech R&D Program (863 Program), the National Basic Research Program (973 Program), and a variety of technology-specific R&D funds.<sup>13</sup> Most of that support was specifically earmarked for projects that aimed to reduce China’s reliance on foreign firms and foreign technology.<sup>14</sup>



That strategy was a grand success. Flush with Chinese government cash, Huawei rolled out 2G and then 3G network equipment and handsets at prices foreign firms could not match, enabling the firm to rapidly accumulate customers. By the mid-2000s, Huawei had emerged from relative obscurity to gain 10 percent of the global mobile wireless infrastructure market.<sup>15</sup> By 2014, its share had doubled to around 20 percent.<sup>16</sup>

---

## Indirect subsidies critical in 4G and beyond

When mobile operators first launched their 3G networks in the late 1990s and early 2000s, Huawei was still an upstart player with less than \$2 billion in annual revenues. Ten years later, when the operators were ready to roll out 4G, Huawei had moved into a dominant position.

The 2007–2009 global financial crisis rocked Huawei’s competitors, forcing them to ratchet down spending. It also forced many mobile network operators around the world to slow-walk their 4G network rollouts. Beijing saw that as an opportunity for Huawei and other Chinese firms. China has the largest domestic mobile market in the world, and the operators are all state-owned.<sup>17</sup> When the state-owned operators were ready to upgrade their networks for 4G, Beijing ordered them to buy at least 70 percent of their equipment from Huawei and ZTE. Those purchases gave Huawei and ZTE the biggest share of the biggest mobile market in the world. That, in turn, gave them massive economy of scale and massive revenues they could plug into R&D and other expenditures. It also gave them critical commercialization experience: They were rolling out 4G networks before anyone else and working out the technical kinks, making them attractive vendors on the global market.

In 2008, China’s domestic 3G wireless equipment market was still relatively diverse. ZTE was the largest player with 29.1 percent of the market, followed by Huawei (22 percent), Datang (12.7 percent), Ericsson (11 percent), Alcatel-Lucent (6.8 percent), Nokia Siemens (6.8 percent), Motorola (2.7 percent), and Nortel (2.3 percent).<sup>18</sup> Collectively, in 2008, Huawei and ZTE held 51 percent of the market. In the 4G era—after Beijing ordered the state-owned operators to shift more of their purchases from foreign to domestic suppliers—Huawei and ZTE increased their collective share to 70 percent, leaving just 30 percent of the market to foreign suppliers.<sup>19</sup> In the 5G era, their share will reportedly increase to 90 percent, leaving just 10 percent to

An investigation found that Huawei was leveraging state support to underbid its competitors by up to 70 percent.

foreign suppliers.<sup>20</sup> That shift is consistent with the Made in China 2025 plan, which calls for China's mobile operators to buy 75 percent of their network equipment from Chinese firms by 2020 and 80 percent by 2025.<sup>21</sup>

Beijing's ability to provide Huawei a guaranteed market share of the world's biggest mobile market gives it a massive advantage over its competitors. China's 4G mobile equipment market accounts for around 40 percent of the total global market. Its 5G market is projected to account for at least 50 percent of the global market.<sup>22</sup> Multiple telecom equipment vendors interviewed for this report identified Huawei's protected domestic market share as one of the biggest factors tilting the global playing field in its favor. Yet there is no major effort underway to counter those policies. The Trump administration's phase-one trade deal did not touch this issue.<sup>23</sup>

Beijing also continues to support Huawei through the nation's state banks. Huawei claims the loans it receives from Chinese banks are all export financing loans—detailed in the next section of this report—that support its customers instead of its own business operations. However, there is evidence that Huawei is also a major recipient. For example, multiple Chinese media outlets claim that in 2019, Huawei received a five-year 14 billion renminbi loan (just under \$2.1 billion) for general operational support from a consortium of five state-owned banks: the Bank of China, China Construction Bank, China Development Bank, China Merchants Bank, and the Industrial and Commercial Bank of China.<sup>24</sup> Neither the banks nor Huawei has publicly acknowledged that loan. None are required to do so, because the banks are state-owned, Huawei is not a publicly traded company, and the World Trade Organization does not prohibit national governments from using underpriced credit to distort global markets.

Beijing also continues to support Huawei through a variety of direct subsidies. According to its annual reports, in recent years, Huawei has received around \$235 million per year in Chinese government grants—adding up to nearly \$1.2 billion over the past five years—most of which is earmarked for R&D activities.<sup>25</sup> Huawei also benefits from various tax incentives, property discounts, and state-funded employee bonuses.<sup>26</sup> But those direct subsidies currently pale in comparison to the benefits Huawei gains from protected access to China's domestic market and the ability to tap China's state banks.

The European Commission launched a preliminary investigation into these market-distorting subsidies back in 2010.<sup>27</sup> Huawei tried to shut the investigation down by paying the firm that launched the initial complaint \$56 million to withdraw it.<sup>28</sup> The European Commission continued its investigation anyway and gathered substantial evidence that Beijing's subsidies were distorting global markets and harming European vendors. According to then-European Trade Commissioner Karel De Gucht, that investigation found that Huawei was leveraging state support to underbid its competitors by up to 70 percent.<sup>29</sup> Unfortunately, instead of applying trade remedies, in 2014, the European Commission struck a deal with Beijing whereby Beijing promised to provide more China market access for Ericsson, Nokia, and Alcatel-Lucent and the Commission promised not to act on China's market-distorting subsidies.<sup>30</sup> Given that Beijing is now restricting market access rather than expanding it, that deal has not panned out well for Europe. Earlier this year, Beijing even threatened to impose export controls on the products Nokia and Ericsson manufacture in China.<sup>31</sup> The United States should consider reaching out to Europe and other concerned nations to relaunch the 2010–2014 investigation, this time with a specific focus on Huawei's protected market access in China and the loans it receives from Chinese state banks.

# State-funded export financing

In addition to funding Huawei directly, China's state-owned banks—particularly China Development Bank and the Export-Import Bank of China—have provided billions of dollars to Huawei's customers. Beijing calls this relationship an “iron triangle”: China's state banks provide loans to mobile network operators in other nations who use the money to buy Huawei equipment.<sup>32</sup> According to multiple firms interviewed for this report, those loans can make Huawei impossible to beat—even if its competitors can match the company's state-subsidized prices—because China's state banks offer packages that commercial banks generally cannot match. Chinese policy banks can provide loans with relatively low interest rates while delivering financing in advance, enabling Huawei's customers to launch projects without dipping into their own cash reserves.<sup>33</sup> As the United States ramped up its pressure on Huawei, Chinese banks reportedly extended the grace periods for these loans to make them even more enticing, giving some Huawei customers up to three years before the first payment was due.<sup>34</sup> In contrast, Huawei's competitors generally cannot float credit lines for three years; they work with commercial banks, which require repayment to start immediately.

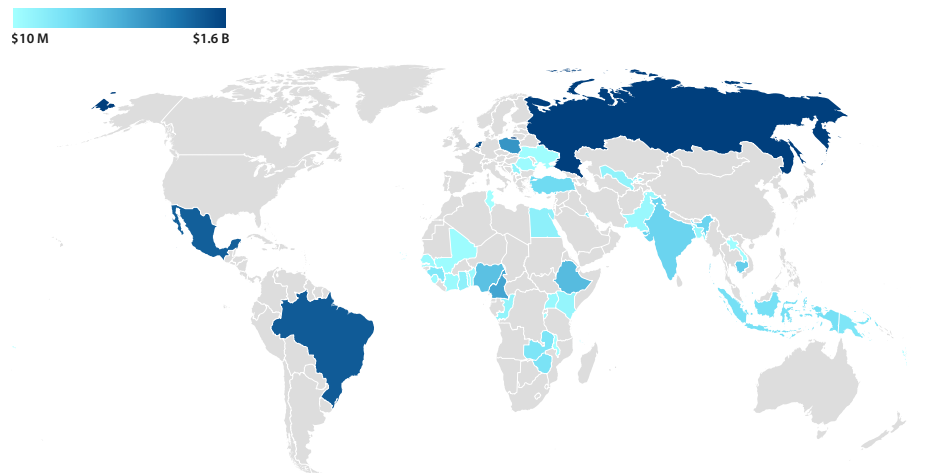
To better understand the role Chinese government financing plays in Huawei's market dominance, the Center for American Progress compiled a dataset of all “iron triangle” deals involving Huawei, Chinese state banks, and buyers outside China. CAP found 99 loan-backed projects across 46 nations, ranging from 1997 to 2019. (see full list in the Appendix) The total value of the 99 loans is just under \$14.8 billion.<sup>35</sup>

Three things stood out. First, everywhere Huawei goes, Chinese state financing often paves the way. CAP found “iron triangle” deals fueling Huawei’s global market expansion across seven major regions. Specifically:

- **Africa:** Africa was the largest regional borrower, with 57 loans totaling \$4.661 billion (accounting for 31.5 percent of all lending by volume in the CAP data). Of these, all loans went to government borrowers and state-owned enterprises.
- **Europe:** CAP found 14 loans supporting Huawei projects in Europe, with a total volume of \$4.379 billion (accounting for 29.6 percent of all lending in the CAP data). Only one loan involved a government borrower (Serbia); the other 13 loans went to private companies.
- **Asia:** CAP found 15 loans supporting Huawei projects in Asia, with a total lending volume of \$2.209 billion (accounting for 14.9 percent of all lending in the CAP data).<sup>36</sup> Of those, six loans went to government borrowers and nine went to private companies.
- **South America:** Telemar Norte Leste/Oi, the privately owned Brazilian telecom operator, is the only South American borrower in the CAP database. Telemar signed three loans totaling \$1.4 billion (accounting for 9.5 percent of all lending in the CAP data).
- **North America:** Two privately owned telecom operators in Mexico—América Móvil and Nextel Mexico—signed financing deals with China Development Bank for \$1 billion and \$375 million, respectively. The total \$1.375 billion accounts for 9.3 percent of all lending in the CAP data.
- **Middle East:** CAP found three loans to governments and private companies in the Middle East totaling \$375.4 million (accounting for 2.5 percent of all lending in the CAP data). VIVA, a private company in Kuwait, signed a loan worth \$270 million. The Pakistani government signed two loans worth \$105.4 million.
- **Oceania:** Governments in the Oceania region received a total of \$378.49 million in loans for Huawei-involved projects and account for 2.6 percent of all lending in the CAP data.

Second, these loans are difficult to track. Despite the large role that Chinese state financing plays in Huawei’s expanding global footprint, neither Huawei nor its state bank partners publish detailed information on these financing packages. In fact, they actively seek to avoid transparency—and competition—reportedly offering the best financing packages to customers who agree to a nonpublic tender.<sup>37</sup>

**FIGURE 1**  
**Chinese loan-backed projects involving Huawei globally**



Sources: For a full list of sources, see the Appendix to Melanie Hart and Jordan Link, "There Is a Solution to the Huawei Challenge" (Washington: Center for American Progress, 2020), available at <https://www.americanprogress.org/?p=491476>; Center for American Progress, "Sources for Huawei global equipment deals with Chinese state bank export financing" (2020), available at <https://cdn.americanprogress.org/content/uploads/2020/10/09083634/HuaweiReportAppendixSources.pdf>.

These loans are even harder to track when they run through Huawei instead of from state banks directly to Huawei's customers. China Development Bank has provided Huawei with \$30 billion in global lines of credit: \$10 billion in 2004 and an additional \$20 billion in 2009.<sup>38</sup> These credit lines are likely the source of funding for suppliers' credits the company offers to customers, but it is difficult to verify exactly how Huawei spent these lines of credit across the globe.<sup>39</sup> In June 2011, Fred Hochberg, then chairman and president of the U.S. Export-Import Bank, claimed Huawei's \$30 billion China Development Bank credit line enabled the company to undercut competitors' financing packages, giving Huawei a substantial market advantage.<sup>40</sup> Huawei responded by claiming that it had only extended \$2.99 billion of the available \$30 billion to its customers.<sup>41</sup> That claim directly contradicted a statement published in an open letter earlier that year by Hu Houkun, Huawei's vice chairman and chairman of the Board of Directors of Huawei USA. Hu claimed that approximately \$10 billion of the credit lines had been used.<sup>42</sup>

Even for loans that are referenced publicly, it is difficult to find detailed information about the lending terms. Of the 99 total loans in the CAP database, the authors were only able to identify the interest rates for 32. Of those, 16 had interest rates of 2 percent or lower.

Third, compared with traditional infrastructure, digital infrastructure is relatively cheap to finance. The average size of the loan in the CAP database is \$155.57 million. In comparison, traditional infrastructure projects frequently cost more than \$1 billion. For example, China Development Bank is providing a \$4.5 billion loan to fund the Jakarta-Bandung railway in Indonesia.<sup>43</sup> The mobile operators buying Huawei network equipment often have relatively thin profit margins; for them, these loans are a lifeline. However, from the standpoint of China's state banks, these loans deliver massive impact at a relatively small cost.

Washington often views Chinese state bank loans as predatory: offering big loans to countries that cannot pay them back, which critics argue gives Beijing political influence over those governments.<sup>44</sup> The United States has largely overlooked the degree to which China uses preferential lending terms to boost Huawei and other Chinese firms and undercut their competitors, distorting global markets. This is another area ripe for coordinated policy action.



# Manipulating global standardization bodies

At first glance, technical standards seem innocuous: They make it possible for communication networks and devices to interoperate across borders. However, Beijing has long recognized that the companies whose technologies make up the bulk of global standards enjoy an edge over their competitors. Global standards comprise a mix of technical contributions from different firms; once a standard is set, the companies that utilize that standard to produce and sell products must pay licensing fees to the original technology contributors. Those revenues give patent holders a leg up over the competition: The more a firm receives royalties instead of paying them, the more it can lower its prices vis-à-vis its competitors. Washington has always left this process to the private sector, assuming the U.S. firms who produce great technologies will earn their way into global standards based on merit. In contrast, Beijing directly intervenes to promote Chinese firms, particularly Huawei.

In mobile telecommunications, the primary action is at the International Telecommunication Union, which is the U.N. agency responsible for setting common global standards for information and communication technologies. Within the ITU, the 3rd Generation Partnership Project is the organization responsible for setting 5G standards. 3GPP is a consortium among seven partnership organizations from the United States, China, Europe, Japan, South Korea, and India. Individual companies register with the partner organizations in the regions where they do business, becoming 3GPP “members.”<sup>45</sup> When a new technology is emerging, the member companies making those advancements file technical contributions through their respective partner organizations. Member companies with an interest in that particular technology can send representatives to assess those contributions and decide collectively which combination of technologies should be included in a new global standard.

Beijing exerts influence over this assessment process through a variety of channels.

First, Beijing inserts current and former Chinese telecom officials across the ITU and leverages them to tilt the standard-setting agenda in Huawei’s favor.

Current ITU Secretary-General Zhao Houlin is a former Chinese telecom official. Current Chinese Premier Li Keqiang is on record ordering Zhao to leverage his ITU position to support China's standardization ambitions. In 2015, he publicly told Zhao, "As a Chinese national serving as a senior official in an international organization, while you are fulfilling your duties well [to the ITU], I hope you will simultaneously care about China's development and promote the good development of China's information and communication technologies and standards."<sup>46</sup>

Within 3GPP, Wang Zhiqin has served multiple terms as chairman of the 3GPP Project Coordination Group (PCG), the organization's key agenda-setting and decision-making body.<sup>47</sup> Wang held either the PCG chair or one of the three vice-chair positions in 2006, 2007, 2012, 2014, 2016, 2018, and 2019.<sup>48</sup> At home in Beijing, Wang chairs China's IMT-2020(5G) Promotion Group and serves as deputy director of the China Academy of Information and Communications Technology (CAICT), the Ministry of Industry and Information Technology think tank tasked with implementing Chinese industrial policy in the 5G space.<sup>49</sup> Wang's day job is to promote Chinese companies in the 5G space, and her ITU positions are a key avenue for doing so. She referenced the utility of those positions in a December 2017 interview, telling a reporter from China's *Economic Information Daily* that Chinese nationals occupy at least 30 crucial positions in 5G standard-setting organizations and that those positions are helping expand Beijing's influence over the standard-setting process.<sup>50</sup>

In addition to stacking the ITU leadership deck with Chinese telecom officials tasked with carrying out Beijing's ambitions, China provides funding to Huawei and other Chinese companies to help them submit technical contributions and send engineers to participate in the standardization decision-making process. According to multiple firms interviewed for this report, full participation in 3GPP costs an average of \$300,000 per engineer per year.<sup>51</sup> U.S. companies must also pay a \$50,000 entry fee to the Alliance for Telecommunications Industry Solutions (ATIS, the U.S. partner organization) to join the process and gain a seat at the 3GPP table. For Western firms operating on hard budget constraints, these costs are a major barrier to 3GPP participation. In contrast, Huawei can tap the deep coffers of the Chinese state and the revenues it amasses from large-volume equipment sales in China. Huawei currently has a team of 400 employees working full time on standardization contributions.<sup>52</sup> As of November 2019, according to data from IPlytics, Huawei has dispatched 3,098 engineers to attend 5G standard-setting meetings and has filed 19,473 technical contributions.<sup>53</sup> In contrast, Qualcomm—the largest U.S. contributor—has a much smaller presence, with 1,701 engineers and 1,994 technical contributions.<sup>54</sup>

Within 3GPP, Beijing also orders all participating Chinese companies to operate as a unified block. Chinese officials—often the above-mentioned Wang—convene all Chinese member representatives before key 3GPP forums to share Beijing’s priorities and how individual members are expected to fulfill them. That block often includes non-Chinese companies as well. Huawei reportedly pressures the companies that buy its equipment—and receive Chinese government financing—to support Huawei’s efforts to insert its own technologies into the emerging global 5G standard.<sup>55</sup>

Beijing leverages this multifront approach—stacking the leadership deck with its own officials, subsidizing Chinese firm participation, and ordering those firms to vote as a block to support China’s national interests over their own corporate interests—to sway 5G standardization decisions in Huawei’s favor.

The process to select a 5G coding scheme shows how this can play out. Qualcomm owns the most-proven coding method, called LDPC. In 2010, Huawei purchased intellectual property from a Turkish inventor for a potential new coding scheme called polar codes.<sup>56</sup> In 2016, 3GPP was ready to select a coding scheme for 5G, and Huawei wanted polar codes to be in the mix. Qualcomm’s LDPC technology was the more proven alternative; from a technical standpoint, polar codes did not merit consideration as a potential global coding standard for 5G. But Huawei rallied a massive group to push for polar codes to be put on table.<sup>57</sup> One participant described the debate as “one of the biggest political battles we’ve ever seen” within 3GPP.<sup>58</sup> The above-mentioned Wang was serving at that time as PCG chairman.<sup>59</sup> Under her leadership, 3GPP decided to split the choice for a coding standard into two parts, each to be decided by an open vote among members: one for the data channel and another for the coding channel. That decision gave Huawei two opportunities to make it into the standard instead of one. Even then, Huawei was still not likely to win based on merit—even Chinese tech giant Lenovo, which has much to lose from flouting Beijing’s edicts, has stated that it would have preferred Qualcomm’s technology for both channels.<sup>60</sup> But the CAICT and the China Communications Standards Association reportedly ordered all Chinese companies to support Huawei, and Huawei lobbied its customers to do the same.<sup>61</sup> The end result was a compromise: Qualcomm got one, and Huawei got the other. That compromise gave Huawei a toehold that it would not have received without Beijing’s influence.

This dynamic is playing out again and again. Beijing leverages a mix of strategically placed officials in key leadership positions across the ITU, state subsidization for Chinese firms to boost their presence at key ITU decision-making forums, state subsidization to boost Chinese technical contributions (and thus Chinese intellectual property) in emerging standards, and state-directed coordination among Chinese firms and customers to sway the selection process in Huawei's favor. The result: As of January 2020, 32 percent of the technical contributions that the 3GPP members have accepted and approved to become part of the emerging 5G standard came from Chinese companies.<sup>62</sup> In contrast, U.S. companies made just 14 percent of the approved contributions.<sup>63</sup> If this trend continues, it will give Huawei an edge in 6G and beyond, and Beijing is already doubling down. Chinese leaders recently launched a new China Standards 2035 initiative that includes plans to boost Chinese participation in and influence over the ITU and other global standardization bodies.<sup>64</sup> That effort has a governance component: Beijing is directing Chinese officials and companies to “actively participate in the governance of international standards organizations and the formulation of major policy rules” to support the nation's ambition to turn more Chinese technologies into global standards.<sup>65</sup>

The United States has thus far largely ignored this aspect of Chinese industrial policy in the 5G space. It is ripe for coordinated action among the key 3GPP participating nations—namely, the United States, Europe, Japan, South Korea, and India.

# How the U.S. can counter Beijing's distortionary playbook and compete at full strength

The policies described above are interlocking and complementary. They aim to make Huawei the predominant global vendor for mobile network equipment. They do so by tilting global markets in its favor and making it cost prohibitive for telecom operators around the world to choose anyone but Huawei, even when Huawei equipment brings growing national security and privacy concerns.

A successful and comprehensive U.S. response to the broad array of challenges China poses in 5G—and 6G and beyond—must effectively address the suite of industrial policies Beijing deploys to distort global markets. Once those distortions are reduced or eliminated, the security angles of the Huawei problem will be much less daunting.

The United States should pursue a three-part goal: counter China's market-distorting industrial policies; support the shift toward a fully interoperable global market with a more diverse array of vendors to choose from; and enable more American firms to enter this market and compete at full strength. The United States can achieve those goals by expanding its 5G strategy to include the following key policies.

---

Form a coalition of nations to assess how Beijing's direct and indirect subsidies harm the global market and devise appropriate trade remedies

The European Commission's 2010–2014 investigation—which reportedly compiled enough evidence to justify countervailing duties of up to 70 percent—provides an excellent starting point.<sup>66</sup> The United States should partner with the commission and other concerned nations to launch a plurilateral investigation, sharing intelligence to effectively map the full range of Chinese government subsidization and its distortionary impact on the global market. That mapping process should include both current and historical subsidies, as the latter played a

key role in enabling Huawei to achieve many of its current market advantages. It should also include the full range of indirect subsidies that play a key role today, such as Huawei's protected market access in China. This process should aim to result in coordinated, evidence-based remedies to counteract Beijing's market distortions across the 5G supply chain.

---

Conduct a comprehensive review to assess how Beijing uses credit to advantage Chinese firms over their competitors, and engage the G-7 industrialized democracies to develop new rules limiting those actions

For decades, state bank credit has been one of the biggest distortionary tools in Beijing's arsenal. Beijing leverages the nation's state-owned banks to provide its national champions with billions of dollars in cheap and virtually unlimited credit, which they use to acquire leading-edge technical know-how and equipment from foreign firms, scale up production at rates most commercial firms cannot match, and price their products at below-market rates. These credit transfers are opaque and difficult to track: China's system does not require either the state banks or the recipient firms to publicize these transfers. Often, opacity is the point: Huawei and other Chinese national champions go to great lengths to deny that Chinese state funds played a role in their success. Yet there is ample evidence of these transfers sprinkled throughout open-source Chinese government documents and media reports. The U.S. government should fund a new research effort to collect all available evidence on those credit transfers—starting in the information and communications technology sector—and leverage that evidence to make macro-level estimates about the scale of these indirect subsidies and how they affect global markets. With that evidence in hand, the United States should engage the other G-7 nations—Canada, France, Germany, Italy, Japan, and the United Kingdom—to craft new rules limiting these distortionary credit programs.

---

Provide fast-track EXIM financing for U.S. vendors deploying disruptive technologies—such as virtual networks—and conducting their research, development, and manufacturing in the United States

New U.S. market entrants, smaller firms, and firms deploying new technologies report difficulties securing U.S. Export-Import Bank (EXIM) backing for overseas deals. Smaller firms do not have the funds to invest in legal counsel to shepherd their applications through the byzantine EXIM application process, and network

operators in other nations are hesitant to invest in that process themselves, particularly when the potential U.S. vendor associated with the EXIM loan is a new market entrant selling innovative but less-proven network solutions.

---

Form a coalition of export credit agencies to support vendors seeking to compete against Huawei and the loans Chinese state banks offer its customers

The U.S. Export-Import Bank charter specifically gives the bank a mandate to offer favorable rates and terms where needed to compete with Chinese state bank loans in critical high-tech sectors, including mobile telecom equipment.<sup>67</sup> Yet the United States is not leveraging EXIM in this manner. That is likely because the United States does not yet have a major vendor in the 5G equipment market—policymakers may be concerned about using public funds to support Ericsson, Nokia, or Samsung. The United States should launch an EXIM 5G lending program and work with other nations to form a coalition of export credit agencies willing to support vendors from partner nations. That program should include the following parameters.

#### High interoperability standards

EXIM should only support vendors that are willing to embrace full interoperability, including a fully open radio access network fronthaul interface.

#### High security standards

Congressional legislation may be needed to apply a security test for 5G hardware and software components. For example, the test may require hardware manufacturing and software coding for critical network elements to occur in the United States or other trusted supplier nations. At minimum, EXIM should not support the export of equipment manufactured in mainland China, even if that manufacturing occurs as part of the supply chain for non-Chinese firms. Beijing has already threatened to impose export controls on Nokia and Ericsson equipment manufactured in China;<sup>68</sup> if EXIM supports equipment manufactured elsewhere—including in the United States—that will bring more diversification and resilience to the global supply chain, further reducing China’s stranglehold on this sector.



EXIM may provide loans to support non-U.S. equipment vendors if the above factors apply and the firm's home-nation export financing agencies relax their own rules as well, creating a similar carveout for U.S. firms to receive export financing from other nations' credit agencies

It is in the U.S. national interest to prevent a hostile power from overtaking the global 5G equipment market. To support that objective, EXIM can temporarily relax U.S. content requirements for 5G network equipment, effectively making these loans available to the customers of non-U.S. vendors who meet certain requirements, such as those outlined above. In the near term, this will reduce Huawei's global market dominance and the associated security challenges this presents for the United States. Over the longer term, this will create a more open and balanced market, keeping the door open for new U.S. market entrants to play a much larger role in global supply chains.

Leverage the U.S. International Development Finance Corporation (DFC) to counter Chinese lending in key developing nations

The United States should pair the EXIM program with DFC lending, targeting developing nations of particular concern. That may include nations where the United States has a particular security interest in secure mobile networks (such as nations hosting U.S. military bases) or democracies seeking to push back against China's digital authoritarianism.

---

Engage the key 5G standardization partners—the European Union, Japan, India, and South Korea—to improve leadership transparency and diversity at the ITU

Urgent reform is needed to push back against China's takeover of the International Telecommunication Union. The United States should work with other concerned nations to push for reforms that improve diversity, transparency, representation, and merit-based decision-making. That could include a ban on allowing current government officials to take on key leadership roles; the ITU could consider requiring a cool-off period following government service. It could also include banning representatives from any one nation from holding certain constellations of key leadership positions at the same time, including deputy-level positions and leadership positions in key decision-making bodies such as 3GPP and term limits blocking individuals from serving in the same leadership role consecutively.

---

## Provide targeted financial support to increase U.S. participation in ITU standardization forums

There are currently 683 3GPP members. Of those, just 54 participate under the U.S. umbrella, compared with 111 from China and 435 from Europe.<sup>69</sup> Many U.S. firms interviewed for this report—particularly the smaller innovators who could become major market disrupters—report that 3GPP participation is too costly. The National Institute of Standards and Technology (NIST) should work to build equity for participation in ITU standardization processes by providing grants to support U.S. enterprise participation in critical issue areas, starting with 5G. These grants should aim to empower smaller vendors to increase their voice, particularly those working on interoperable or disruptive solutions and those doing their research, development, and manufacturing in the United States. Funding support should cover the membership fee of the Alliance for Telecommunications Industry Solutions; travel to participate in ITU meetings; and personnel funding to support developing, writing, and submitting technical contributions. These grants should be available to companies across the 5G ecosystem, including those working on not only core network components but also 5G-enabled sectors such as mobile cars. The IRS should also make expenses associated with ITU participation deductible under the R&D tax credit.

---

## Push the ITU to adopt the O-RAN fronthaul interface as a common global standard

A truly open radio interface is needed to give smaller vendors—including disruptive U.S. vendors—a foothold in the 5G ecosystem. Today, there is no common global standard for the radio access network. 3GPP allows vendors to treat the RAN as a black box: There are no standard interfaces or protocols within it, so operators cannot mix and match. They are forced to stick with one of the major vendors, locking out new market entrants. That impedes the shift toward a more interoperable and diverse market. The O-RAN Alliance is an industry consortium working outside the ITU to develop common standards for a truly interoperable fronthaul interface. Vendors can register with the O-RAN Alliance to manufacture equipment and software based on these common standards, allowing full interoperability and significantly lowering barriers to market entry.<sup>70</sup> The United States should push the ITU to accept this open interface—without renegotiating it—as a component of the emerging 5G standard under 3GPP.

---

Speed time-to-market for disruptive U.S. innovation and reduce global dependence on 5G radios and other network components that are primarily developed and manufactured in China

Targeted public investments are needed to help U.S. firms overcome the market barriers Beijing has created through decades of distortionary policy. Some U.S. firms are developing and deploying virtualized RAN 5G systems that, if successful and adopted by the global market, could completely eliminate many of Huawei's current advantages. Virtual systems replace a wireless network's legacy hardware components with software, substantially reducing the amount of equipment an operator must purchase and reducing rollout prices to levels below what Huawei is currently charging. However, these systems are not yet ready for large-scale (i.e., covering an entire city) deployment, and some of the hardware components they do still need (such as 5G radios, connectors, jumpers, and antennas) are primarily made in China. The United States should provide fast-track targeted public support to help innovative American firms speed time-to-market for virtualized networks and other potential disruptive approaches to wireless communication. The United States should also provide targeted support to speed efforts to manufacture all critical equipment—such as 5G radios—in the United States, eliminating U.S. and global reliance on Chinese exports that Beijing has already threatened to cut off.

# Conclusion

Huawei is currently on a path to become the world's biggest 5G mobile network equipment provider, but it is by no means traveling that path alone. Huawei owes its rise to Chinese industrial policies that have suppressed global competition for nearly two decades. Effectively countering those policies is a critical first step in allowing the global community to move toward a more open, secure, and diverse mobile network ecosystem. That transition will benefit the United States and all other nations that prefer a level playing field over one in which Beijing determines global market outcomes. The policies outlined above can help the United States pave the way toward this new path.

# Appendix

TABLE 1

**Huawei global equipment deals with Chinese state bank export financing**

| <b>Africa</b> |            |   |                        |                     |           |      |
|---------------|------------|---|------------------------|---------------------|-----------|------|
| Country       | Project ID | Purpose   | Financier              | Borrower            | USD       | Year |
| Burundi       | BI.001     | Global System for Mobile Communications (GSM) project                       | Eximbank               | Burundian gov.      | \$8 M     | 2004 |
| Tunisia       | TN.001     | Tunisie Telecom network switches  | Eximbank               | Tunisian gov.       | \$17 M    | 2004 |
| Guinea        | GN.004     | Equipment purchases   | Huawei                 | Guinean gov.        | \$32.67 M | 2005 |
| Nigeria       | NG.002     | Zenith Bank project   | Eximbank               | Nigerian gov.       | \$23 M    | 2005 |
| Nigeria       | NG.007     | Code-division multiple access (CDMA) 450 network                            | China Development Bank | Nigerian gov        | \$200 M   | 2005 |
| Guinea        | GN.001     | E-government project  | Eximbank               | Guinean gov.        | \$9 M     | 2006 |
| Kenya         | KE.002     | Rural telecommunications development project                                | Eximbank               | Kenyan gov.         | \$25 M    | 2006 |
| Sierra Leone  | SL.001     | Wireless telephone system extension   | Eximbank               | Sierre Leonean gov. | \$17 M    | 2006 |
| Senegal       | SN.001     | E-government project, phase I   | Eximbank               | Senegalese gov.     | \$49.26 M | 2006 |
| Tunisia       | TN.002     | Mobile network development  | Eximbank               | Tunisian gov.       | \$6 M     | 2006 |
| Uganda        | UG.001     | National backbone transmission, project II                                  | Eximbank               | Ugandan gov.        | \$61 M    | 2006 |
| Uganda        | UG.002     | National backbone transmission, project I                                   | Eximbank               | Ugandan gov.        | \$30 M    | 2006 |
| Uganda        | UG.003     | National backbone transmission, project III                                 | Eximbank               | Ugandan gov.        | \$15.4 M  | 2006 |
| Ivory Coast   | CI.001     | E-government data center  | Eximbank               | Ivory Coast gov.    | \$30 M    | 2007 |
| Cameroon      | CM.004     | 300,000-line code-division multiple access (CDMA) network                   | Eximbank               | Cameroonian gov.    | \$55.5 M  | 2007 |
| Ghana         | GH.002     | National communication backbone infrastructure project, phase I             | Eximbank               | Ghanaian gov.       | \$30 M    | 2007 |
| Kenya         | KE.001     | National Optic Fibre Backbone Infrastructure (NOFBI), phase I: e-government | Eximbank               | Kenyan gov.         | \$43 M    | 2007 |
| Sierra Leone  | SL.003     | Wireless telecommunications equipment                                       | Unspecified            | Sierra Tel          | \$16.6 M  | 2008 |

*continues*

TABLE 1 CONT'D

**Huawei global equipment deals with Chinese state bank export financing**

| <b>Africa</b>  |                   |  |                  |                     |            |             |
|----------------|-------------------|--|------------------|---------------------|------------|-------------|
| <b>Country</b> | <b>Project ID</b> | <b>Purpose</b>   | <b>Financier</b> | <b>Borrower</b>     | <b>USD</b> | <b>Year</b> |
| Uganda         | UG.005            | Terrestrial Trunked Radio (TETRA) communications system  | Unspecified      | Ugandan gov.        | \$5 M      | 2008        |
| Cameroon       | CM.001            | Fiber optic backbone network   | Eximbank         | Cameroonian gov.    | \$52 M     | 2009        |
| Togo           | TG.001            | Code-division multiple access (CDMA) 800 network project   | Eximbank         | Togolese gov.       | \$32 M     | 2009        |
| Cameroon       | CM.006            | 350,000-line code-division multiple access (CDMA) capacity expansion   | Eximbank         | Cameroonian gov.    | \$31.83 M  | 2010        |
| Cape Verde     | CV.001            | E-government, phase I: national data center  | Eximbank         | Cape Verdean gov.   | \$17 M     | 2010        |
| Comoros        | KM.001            | Submarine optical fiber  | Eximbank         | Comorosian gov.     | \$32 M     | 2010        |
| Zimbabwe       | ZW.003            | 2G and 3G network expansion  | Eximbank         | Zimbabwean gov.     | \$45 M     | 2010        |
| Cameroon       | CM.002            | Electronic postal program (data center, data communication network, internal communication system, customer service system, and business application system) | Eximbank         | Cameroonian gov.    | \$69 M     | 2011        |
| Cameroon       | CM.003            | Cameroon national broadband network, phase I: 4G mobile broadband (LTE)  | Eximbank         | Cameroonian gov.    | \$168 M    | 2011        |
| Eritrea        | ER.001            | Eritrean telecommunications reconstruction project, phase II   | Unspecified      | Eritrean gov.       | N/A        | 2011        |
| Ghana          | GH.001            | E-government platform project  | Eximbank         | Ghanaian gov.       | \$150 M    | 2011        |
| Mali           | ML.001            | Fiber optics and telecommunications modernization project  | Eximbank         | Malian gov.         | N/A        | 2011        |
| Kenya          | KE.003            | National Optic Fibre Backbone Infrastructure (NOFBI), phase II: e-government   | Eximbank         | Kenyan gov.         | \$71 M     | 2012        |
| Nigeria        | NG.001            | Galaxy backbone project for national security development system   | Eximbank         | Nigerian gov.       | \$100 M    | 2012        |
| Sierra Leone   | SL.002            | National optic fiber backbone project  | Eximbank         | Sierre Leonean gov. | \$15 M     | 2012        |
| Senegal        | SN.002            | E-government project, phase II   | Unspecified      | Senegalese gov.     | \$48 M     | 2012        |
| Ethiopia       | ET.001            | Telecommunications equipment for 4G broadband network in Addis Ababa and 3G throughout the rest of the country   | Huawei           | Ethiopian gov.      | \$700 M    | 2013        |
| Burundi        | BI.002            | Metropolitan area telecommunications network   | Eximbank         | Burundian gov.      | \$15 M     | 2014        |

*continues*

TABLE 1 CONT'D

## Huawei global equipment deals with Chinese state bank export financing

| Africa                |            |  |   |                            |            |      |
|-----------------------|------------|--|---|----------------------------|------------|------|
| Country               | Project ID | Purpose  | Financier   | Borrower                   | USD        | Year |
| Guinea                | GN.002     | Sotelgui national telecommunications, 4G network                               | Eximbank  | Guinean gov.               | \$50 M     | 2014 |
| Guinea                | GN.003     | National backbone fiber optics   | Eximbank  | Guinean gov.               | \$214.2 M  | 2014 |
| Zimbabwe              | ZW.001     | Equipment for network upgrades, 2G, 3G, and 4G                                 | Eximbank  | Zimbabwean gov.            | \$219 M    | 2014 |
| Benin                 | BJ.001     | Telecommunications infrastructure, fiber optic broadband                       | Eximbank  | Beninese gov.              | \$69 M     | 2015 |
| Cameroon              | CM.008     | National telecommunications broadband network project, phase II                | Eximbank  | Cameroonian Gov            | \$337 M    | 2015 |
| Cameroon              | CM.009     | Village solar power station  | Eximbank  | Cameroonian Gov            | \$77 M     | 2015 |
| Ghana                 | GH.005     | Data center  | Eximbank  | Ghanaian gov.              | \$20 M     | 2015 |
| Mali                  | ML.002     | National broadband network   | Eximbank  | Malian gov.                | \$62.5 M   | 2015 |
| Togo                  | TG.003     | E-government project   | Eximbank  | Togolese gov.              | \$25 M     | 2015 |
| Zambia                | ZM.001     | National information and communication technology development project, phase I | Eximbank  | Zambian gov.               | \$65.55 M  | 2015 |
| Zimbabwe              | ZW.004     | Data center and national broadband project                                     | Eximbank  | TelOne Zimbabwe            | \$98 M     | 2015 |
| Ivory Coast           | CI.002     | Abidjan video surveillance platform  | Eximbank  | Ivory Coast gov.           | \$56.7 M   | 2016 |
| Malawi                | MW.001     | National fiber backbone  | Unspecified   | Malawian gov.              | \$21.7 M   | 2016 |
| Burundi               | BI.003     | ONAMOB network modernization   | Huawei  | Onatel                     | \$30 M     | 2017 |
| Republic of the Congo | CG.002     | National telecommunications, phase III   | Eximbank  | Republic of the Congo gov. | \$160.88 M | 2017 |
| Cameroon              | CM.007     | South Atlantic Inter Link (SAIL) undersea cables                               | Eximbank  | Cameroonian Gov            | \$85 M     | 2017 |
| Cape Verde            | CV.002     | E-government, phase II   | Eximbank  | Cape Verdean gov.          | \$13 M     | 2017 |
| Zambia                | ZM.002     | Communications towers project, phase II  | Eximbank  | Zambian gov.               | \$280 M    | 2017 |
| Zimbabwe              | ZW.005     | Network expansion and modernization, 250 rural base stations                   | Eximbank  | NetOne                     | \$71 M     | 2017 |
| Egypt                 | EG.002     | 4G network   | Bank of China and China Export & Credit Insurance Corporation | Telecom Egypt              | \$200 M    | 2018 |

continues



TABLE 1 CONT'D

## Huawei global equipment deals with Chinese state bank export financing

| <b>Africa</b> |            |  |   |                         |           |      |
|---------------|------------|--|---|-------------------------|-----------|------|
| Country       | Project ID | Purpose  | Financier   | Borrower                | USD       | Year |
| Nigeria       | NG.005     | National and Communication Technology Infrastructure Backbone (NICTIB), phase II   | Eximbank  | Galaxy Backbone         | \$328 M   | 2018 |
| Sierra Leone  | SL.005     | Fiber optic backbone network, phase II   | Eximbank  | Sierre Leonean gov.     | \$30 M    | 2019 |
| <b>Asia</b>   |            |  |   |                         |           |      |
| Country       | Project ID | Purpose  | Financier   | Borrower                | USD       | Year |
| Uzbekistan    | UZ.001     | Code-division multiple access (CDMA) 450 mobile telecommunications network         | China Development Bank  | Uzbekistani gov.        | \$15.5 M  | 1997 |
| Cambodia      | KH.001     | Code-division multiple access (CDMA) equipment                                     | Eximbank  | Azcom Technology        | \$31.17 M | 2005 |
| Uzbekistan    | UZ.002     | Equipment purchases  | China Development Bank  | Uzbektelecom            | \$15.7 M  | 2005 |
| Cambodia      | KH.002     | Cambodia Google Mobile Services-IS section, phase I                                | Unspecified   | Telecom Cambodia        | \$17 M    | 2007 |
| India         | IN.004     | Equipment for Global System for Mobile Communications (GSM) network expansion      | China Development Bank  | Reliance Communications | \$500 M   | 2008 |
| Bangladesh    | BD.001     | Global System for Mobile Communications (GSM) equipment                            | China Development Bank  | Robi/Asiacom            | \$100 M   | 2010 |
| Cambodia      | KH.004     | CamGSM equipment and services contract with Huawei                                 | Bank of China   | CamGSM                  | \$500 M   | 2010 |
| Indonesia     | ID.001     | Equipment purchases  | China Development Bank  | Axis Telecom            | \$400 M   | 2011 |
| Turkey        | TR.003     | Equipment purchases  | China Development Bank  | Turkcell                | \$250 M   | 2011 |
| India         | IN.002     | Equipment purchases  | Industrial and Commercial Bank of China, China Development Bank, Eximbank | Reliance Communications | N/A       | 2012 |
| Turkey        | TR.001     | Equipment purchases and service  | China Development Bank  | Türk Telekom            | \$200 M   | 2012 |
| Laos          | LA.002     | Police command center and a government hotline                                     | Unspecified   | Laotian gov.ernemnt     | \$39.9 M  | 2014 |
| Mongolia      | MN.001     | Electronic medical equipment   | Eximbank  | Mongolian gov.          | N/A       | 2014 |
| Uzbekistan    | UZ.004     | Global System for Mobile Communications (GSM) equipment using LTE technologies, 4G | China Development Bank  | Uzmobile                | \$100 M   | 2014 |

continues

TABLE 1 CONT'D

## Huawei global equipment deals with Chinese state bank export financing

| <b>Asia</b>        |            |   |                            |                          |           |      |
|--------------------|------------|---|----------------------------|--------------------------|-----------|------|
| Country            | Project ID | Purpose   | Financier                  | Borrower                 | USD       | Year |
| Uzbekistan         | UZ.003     | Telecommunications reconstruction projects  | China Development Bank     | Uzbektelecom             | \$40 M    | 2019 |
| <b>Europe</b>      |            |   |                            |                          |           |      |
| Country            | Project ID | Purpose   | Financier                  | Borrower                 | USD       | Year |
| Poland             | PL.001     | 3G equipment  | China Development Bank     | Play                     | \$993 M   | 2007 |
| Russia             | RU.008     | Equipment purchases   | China Development Bank     | MegaFon                  | \$85 M    | 2007 |
| Russia             | RU.006     | Equipment purchases   | China Development Bank     | MegaFon                  | \$300 M   | 2009 |
| Russia             | RU.009     | Equipment purchases   | Bank of China              | Mobile TeleSystems       | \$212.5 M | 2009 |
| Netherlands        | NL.001     | Equipment purchases   | China Development Bank     | VimpelCom Amsterdam B.V. | \$500 M   | 2012 |
| Romania            | RO.001     | Transelectrica-Huawei partnership   | China Development Bank     | Transelectrica           | \$60 M    | 2012 |
| Romania            | RO.002     | 2K Telecom-Huawei partnership   | Eximbank                   | 2K Telecom               | \$10 M    | 2012 |
| Serbia             | RS.002     | Modernization of the integrated system of telecommunications of JSC Serbian Railways, phase I | Eximbank                   | Serbian Railways         | \$24.7 M  | 2013 |
| Netherlands        | NL.002     | Equipment purchases   | China Development Bank     | VimpelCom Ltd.           | \$1 B     | 2014 |
| Russia             | RU.001     | Equipment purchases and services  | China Development Bank     | MegaFon                  | \$500 M   | 2014 |
| Russia             | RU.003     | Equipment purchases and services  | China Development Bank     | Mobile TeleSystems       | \$200 M   | 2015 |
| Russia             | RU.007     | Equipment purchases   | China Development Bank     | MegaFon                  | \$300 M   | 2015 |
| Ukraine            | UA.001     | Telecommunications network upgrade  | China Development Bank     | Ukrtelecom               | \$50 M    | 2015 |
| Serbia             | RS.001     | Telecommunications fixed-line modernization project   | Eximbank and Bank of China | Telekom Srbija           | \$144 M   | 2017 |
| <b>Middle East</b> |            |   |                            |                          |           |      |
| Country            | Project ID | Purpose   | Financier                  | Borrower                 | USD       | Year |
| Kuwait             | KW.001     | Network expansion   | Unspecified                | VIVA                     | \$270 M   | 2010 |
| Pakistan           | PK.003     | Islamabad safe city project   | Eximbank                   | Pakistani gov.           | \$68 M    | 2010 |
| Pakistan           | PK.002     | China-Pakistan cross-border optical cable project   | Eximbank                   | Pakistani gov.           | \$37.4 M  | 2013 |

*continues*

TABLE 1 CONT'D

**Huawei global equipment deals with Chinese state bank export financing**

| <b>North America</b> |                   |  |                        |                        |            |             |
|----------------------|-------------------|--|------------------------|------------------------|------------|-------------|
| <b>Country</b>       | <b>Project ID</b> | <b>Purpose</b>   | <b>Financier</b>       | <b>Borrower</b>        | <b>USD</b> | <b>Year</b> |
| Mexico               | MX.002            | Telecommunications network infrastructure and equipment    | China Development Bank | América Móvil          | \$1 B      | 2009        |
| Mexico               | MX.001            | Nextel Mexico 3G network                                   | China Development Bank | Nextel Mexico          | \$375 M    | 2011        |
| <b>Oceania</b>       |                   |  |                        |                        |            |             |
| <b>Country</b>       | <b>Project ID</b> | <b>Purpose</b>   | <b>Financier</b>       | <b>Borrower</b>        | <b>USD</b> | <b>Year</b> |
| Vanuatu              | VU.001            | E-government project and government backbone network       | Eximbank               | Vanuatuan gov.         | \$29.5 M   | 2009        |
| Papua New Guinea     | PG.001            | Integrated government information system                   | Eximbank               | Papua New Guinean gov. | \$53 M     | 2010        |
| Samoa                | WS.001            | Samoa national broadband highway fiber optic cable network | Eximbank               | Samoa gov.             | \$20.49 M  | 2011        |
| Papua New Guinea     | PG.002            | National identity card registry                            | Unspecified            | Papua New Guinean gov. | \$63 M     | 2013        |
| Papua New Guinea     | PG.003            | Government broadband internet via submarine cable          | Unspecified            | Papua New Guinean gov. | \$212.5 M  | 2017        |
| <b>South America</b> |                   |  |                        |                        |            |             |
| <b>Country</b>       | <b>Project ID</b> | <b>Purpose</b>   | <b>Financier</b>       | <b>Borrower</b>        | <b>USD</b> | <b>Year</b> |
| Brazil               | BR.003            | Fixed-line and broadband services and mobile operations    | China Development Bank | Telemar Norte Leste/Oi | \$300 M    | 2009        |
| Brazil               | BR.004            | Equipment purchases  | China Development Bank | Telemar Norte Leste/Oi | \$500 M    | 2009        |
| Brazil               | BR.005            | Purchase of telecommunications equipment and services      | China Development Bank | Telemar Norte Leste/Oi | \$600 M    | 2015        |

Source: For a full list of sources, see Center for American Progress, "Sources for Huawei global equipment deals with Chinese state bank export financing" (2020), available at <https://cdn.americanprogress.org/content/uploads/2020/10/09083634/HuaweiReportAppendixSources.pdf>.

---

## About the authors

**Melanie Hart** is a senior fellow and director of China Policy at the Center for American Progress. She leads the organization's work on China and U.S.-China relations. Her most recent work focuses on developing a comprehensive U.S. strategy toward China, analyzing the domestic political factors driving Chinese foreign policy in the Xi Jinping era, tracking Chinese industrial policy in the energy and information technology sectors, and assessing China's intentions toward the global order.

Hart has worked on Chinese domestic and foreign policy issues for nearly two decades. Before joining the Center, she worked primarily in the information technology sector, helping American businesses understand China's emerging industrial policies. Hart currently serves on the board of the American Mandarin Society, a nonprofit organization dedicated to supporting the professional development of current and future stewards of the U.S.-China relationship.

Hart has a Ph.D. in political science from the University of California, San Diego, and a B.A. from Texas A&M University. She studied Chinese at China Foreign Affairs University in Beijing and has worked as a Chinese-English translator for *Caijing Magazine*.

**Jordan Link** is the China policy analyst for National Security and International Policy at the Center. He focuses on understanding the strategic and economic challenges that the Chinese Communist Party presents for the future of American foreign policy.

Before joining the Center, Link worked as the research manager of the Johns Hopkins School of Advanced International Studies China-Africa Research Initiative, where he led the China-Africa loans database research team and conducted quantitative and qualitative studies of China-Africa trade, finance, and security affairs. He also worked at National Defense University's Center for the Study of Chinese Military Affairs.

Link has an M.A. in Asian studies from the Elliott School of International Affairs at George Washington University and a B.A. in international relations from the College of William & Mary. He is professionally proficient in Mandarin Chinese.

---

## Acknowledgments

The authors would like to thank Center for American Progress Vice President for Technology Policy Adam Connor, who provided helpful guidance throughout this project. Special thanks to China Program Coordinator Laura Edwards and China research interns Ngor Luong and Anna Lipscomb for their invaluable research support.

Some PDF sources for loans in Africa were generously provided by Johns Hopkins School of Advanced International Studies' China-Africa Research Initiative's Research Manager, Kevin Acker.

The CAP Huawei database builds upon the work of other databases tracking Chinese lending and technology projects, including the China-Africa Research Initiative, AidData at the College of William & Mary, the Australian Strategic Policy Institute's "Mapping China's Tech Giants," and the Lowy Institute's Pacific Aid Map.

## Endnotes

- 1 It already has more commercial contracts than Nokia or Ericsson, even in Europe, where Finland's Nokia and Sweden's Ericsson should have a home-court advantage. Ma Si, "Huawei secures most 5G contracts around world," *China Daily*, February 9, 2020, available at <https://global.chinadaily.com.cn/a/202002/22/WS5e50491ea3101282172796b9.html>.
- 2 Thus far, only the United States, the United Kingdom, and Australia have explicitly banned Huawei equipment from their 5G networks. Canada and India are blocking Huawei but have not adopted a formal ban. For a detailed overview, see Sean Keane, "Huawei ban timeline: UK finds flaw of 'national significance' in Huawei tech," CNET, October 2, 2020, available at <https://www.cnet.com/news/huawei-ban-full-timeline-us-restrictions-china-trump-android-google-ban-antitrust/>.
- 3 For recent congressional action, see Office of Sen Mark R. Warner, "Warner, Rubio, colleagues push to encourage adoption of OpenRAN," Press release, October 1, 2020, available at <https://www.warner.senate.gov/public/index.cfm/2020/10/warner-rubio-colleagues-push-to-encourage-adoption-of-openran>; Office of Sen. Jack Reed, "Reed Leads Bipartisan Call for Trump Admin to Name 5G Coordinator," Press release, November 19, 2019, available at <https://www.reed.senate.gov/news/releases/reed-leads-bipartisan-call-for-trump-admin-to-name-5g-coordinator>; Office of Sen. Mark Warner, "National security senators introduce bipartisan legislation to develop 5G alternatives to Huawei," Press release, January 14, 2020, available at <https://www.warner.senate.gov/public/index.cfm/2020/1/national-security-senators-introduce-bipartisan-legislation-to-develop-5g-alternatives-to-huawei>.
- 4 Ellen Nakashima, "U.S. pushes hard for a ban on Huawei in Europe, but the firm's 5G prices are nearly irresistible," *The Washington Post*, May 29, 2019, available at [https://www.washingtonpost.com/world/national-security-for-huawei-the-5g-play-is-in-europe-and-the-us-is-pushing-hard-for-a-ban-there/2019/05/28/582a8ff6-78d4-11e9-b7ae-390de4259661\\_story.html](https://www.washingtonpost.com/world/national-security-for-huawei-the-5g-play-is-in-europe-and-the-us-is-pushing-hard-for-a-ban-there/2019/05/28/582a8ff6-78d4-11e9-b7ae-390de4259661_story.html); Chuin-Wei Yap, "State Support Helped Fuel Huawei's Global Rise," *The Wall Street Journal*, December 25, 2019, available at <https://www.wsj.com/articles/state-support-helped-fuel-huaweis-global-rise-11577280736>.
- 5 Tuo Yannan, "Huawei warns of 'strong action' against possible EU probe," *China Daily*, May 18, 2013, available at [http://europe.chinadaily.com.cn/business/2013-05/18/content\\_16508757.htm](http://europe.chinadaily.com.cn/business/2013-05/18/content_16508757.htm); *Sina Finance*, "Oumeng dui hua wei zhongxing fanqingxiao diaocha zhuanjia cheng qingxiao shi jiekou" (European Union antidumping investigation into Huawei and ZTE: Experts say dumping is an excuse), December 11, 2012, available in Chinese at <http://finance.sina.com.cn/chanjing/gsnews/20121211/065613960705.shtml>.
- 6 Huawei Technologies Co., Ltd., "Annual Report 2006" (Shenzhen, China: 2007), p. 4, available at [https://www.huawei.com/ucmf/groups/public/documents/annual\\_report/092583.pdf](https://www.huawei.com/ucmf/groups/public/documents/annual_report/092583.pdf).
- 7 Huawei, "Annual Report 2008" (Shenzhen, China: 2009), p. 2, available at [https://www.huawei.com/ucmf/groups/public/documents/annual\\_report/092581.pdf](https://www.huawei.com/ucmf/groups/public/documents/annual_report/092581.pdf).
- 8 Huawei Investment & Holding Co., Ltd., "2018 Annual Report" (Shenzhen, China: 2019), p. 8, available at [https://www.huawei.com/-/media/corporate/pdf/annual-report/annual\\_report2018\\_en\\_v2.pdf](https://www.huawei.com/-/media/corporate/pdf/annual-report/annual_report2018_en_v2.pdf).
- 9 Huawei, "Mr. Ren Zhengfei: Director, CEO," available at <https://www.huawei.com/us/executives/board-of-directors/ren-zhengfei> (last accessed July 2020).
- 10 HOU Runfang, "Shenzhen qian shiwei shuji li you wei: Shenzhen bixu jie jue fangji guo gao de wenti" ("Former Shenzhen Municipal Committee Secretary Li Youwei: Shenzhen must resolve the problem of excessive housing prices"), *Xinjing baowang*, August 27, 2019, available in Chinese at <http://www.bjnews.com.cn/finance/2019/08/27/619861.html>.
- 11 C114 Communication Network, "Huawei zhong biao Jiangsu gong an san ji wang" ("Huawei Wins Tender for Jiangsu Public Security Tertiary Network"), November 22, 2000, available at <http://www.c114.com.cn/news/126/a104316.html>; Tai Ming Cheung, *Fortifying China: The Struggle to Build a Modern Defense Economy* (Ithaca, NY: Cornell University Press, 2013); Voice of America Chinese Edition, "Lulu pengbi huawei wei he nan ling xifang shiyi" ("Again and again hitting the wall, why Huawei has difficulties dispelling Western doubts"), December 11, 2018, available at <https://www.voachinese.com/a/china-huawei-impact-2018211/4695653.html>.
- 12 P.R.C. Ministry of Science and Technology, "Zhonghua renmin gongheguo cujin keji chengguo zhuanhua fa," ("Law of the People's Republic of China on Promoting the Transformation of Scientific and Technical Achievements"), May 15, 1996, available in Chinese at [http://www.most.gov.cn/ztzl/jqzxcx/zxcxcxzao/zxcxcxz/zxcxgncxz/200512/t20051230\\_27320.htm](http://www.most.gov.cn/ztzl/jqzxcx/zxcxcxzao/zxcxcxz/zxcxgncxz/200512/t20051230_27320.htm).
- 13 For a good overview, see Micah Springut, Stephen Schlaikjer, and David Chen, "China's Program for Science and Technology Modernization: Implications for American Competitiveness" (Arlington, VA: CENTRA Technology Inc., 2015), available at [http://sites.utexas.edu/chinaecon/files/2015/06/USCC\\_Chinas-Program-for-ST.pdf](http://sites.utexas.edu/chinaecon/files/2015/06/USCC_Chinas-Program-for-ST.pdf).
- 14 For example, in 2004, Huawei received 18 million renminbi from the 863 Program to design base station components for China's homegrown 3G standard, a suboptimal approach to 3G that Beijing was propping up in a bid to reduce the nation's reliance on U.S. and European technology. "863 Jihua 2004 nian di er pi xin lixiang keti xinxi lingyu (52 xiang)" ("The second batch of new projects of the 863 plan in 2004 in the field of information (52 projects)"), available at <http://m.1mpi.com/doc/ec36d-faa203d4e89b977182d/2>. See also "863 Jihua 2005 nian di er pi lixiang keti mingdan: Xinxi jishu lingyu (65 xiang)," ("List of the second batch of projects approved by the 863 Program in 2005: Information Technology (65 projects)"), November 23, 2006, available at <http://muchong.com/html/200510/128507.html>. For more on the 863 program, see State Council of the People's Republic of China, "Guanyu yinfa guojia gao jishu yanjiu fazhan jihua (863 jihua) guanli banfa" ("National High Technology Research and Development Plan (863 Program) Management Measures"), December 2001, available in Chinese at [http://www.gov.cn/gongbao/content/2002/content\\_61702.htm](http://www.gov.cn/gongbao/content/2002/content_61702.htm).
- 15 *The Economist*, "Can Huawei survive an onslaught of bans and restrictions abroad?," December 18, 2018, <https://www.economist.com/business/2018/12/15/can-huawei-survive-an-onslaught-of-bans-and-restrictions-abroad>.
- 16 Ibid.
- 17 Beijing exerts control over the state-owned operators through multiple channels, including leadership appointments. Beijing routinely reshuffles the operators' leadership, rotating officials among the state-owned telecom firms and the nation's telecom ministry. For a recent reshuffling, see Gerry Shih, "China's state-owned telecoms firms shuffle top executives," Reuters, August 24, 2015, available at <https://www.reuters.com/article/china-mobile-managementchanges/update-1-chinas-state-owned-telecoms-firms-shuffle-top-executives-idUSL4N10Z20520150824>.

- 18 For the 2008 domestic market share, see ZTE, "China's Mobile Infrastructure Equipment Market in 2008," available at [https://www.zte.com.cn/global/about/magazine/zte-technologies/2009/5/en\\_405/171480.html](https://www.zte.com.cn/global/about/magazine/zte-technologies/2009/5/en_405/171480.html) (last accessed October 2020).
- 19 Authors' interviews. This aligns with the Made in China 2025 plan, which calls for domestic firms to supply 75 percent of China's wireless mobile equipment market by 2020 and 80 percent by 2025. For an overview of those and other targets in the Made in China 2025 plan, see U.S.-China Business Council, "Unofficial USCBC Chart of Localization Targets by Sector Set in the MIIT Made in China 2025 Key Technology Roadmap" (Washington), available at <https://www.uschina.org/sites/default/files/2-2-16%20Sector%20and%20Localization%20Targets%20for%20Made%20in%20China%202025.pdf> (last accessed October 2020).
- 20 Authors' interviews. See also Juan Pedro Tomas, "Huawei, ZTE already secured over 80% of China's 5G contracts: Report," RCR Wireless News, April 27, 2020, available at <https://www.rcrwireless.com/20200427/5g/huawei-zte-already-secured-over-80-china-5g-contracts-report>.
- 21 U.S.-China Business Council, "Unofficial USCBC Chart of Localization Targets by Sector Set in the MIIT Made in China 2025 Key Technology Roadmap."
- 22 Juan Pedro Tomás, "China Unicom, China Telecom deploy 150,000 5G base stations in H1," RCR Wireless News, August 12, 2020, available at <https://www.rcrwireless.com/20200812/5g/china-unicom-china-telecom-deploy-150000-5g-base-stations-h1>.
- 23 Office of the United States Trade Representative, "Economic and trade agreement between the United States of America and the People's Republic of China," January 15, 2020, available at [https://ustr.gov/sites/default/files/files/agreements/phase%20one%20agreement/Economic\\_And\\_Trade\\_Agreement\\_Between\\_The\\_United\\_States\\_And\\_China\\_Text.pdf](https://ustr.gov/sites/default/files/files/agreements/phase%20one%20agreement/Economic_And_Trade_Agreement_Between_The_United_States_And_China_Text.pdf).
- 24 This loan is referenced in multiple sources, including Bloomberg and Sina Technology News. Neither Huawei nor the Chinese banks reportedly involved in this deal publicized information about the loan. That lack of transparency is a feature of the Chinese system and a challenge when seeking to map exactly how and to what degree Huawei benefits from state financing. Sina Technology, "It is rumored that five Chinese banks have loaned to Huawei: a 5 year period for an amount of 14 billion yuan," March 5, 2019, available in Chinese at <https://tech.sina.com.cn/t/2019-03-05/doc-ihsnxvvh0071993.shtml>; Bloomberg, "Huawei Considers \$1.5 Billion General-Purpose Loan," Caixin Global CX Tech, November 29, 2019, available at <https://www.caixinglobal.com/2019-11-29/huawei-considers-15-billion-general-purpose-loan-101488664.html>.
- 25 Huawei Investment & Holding Co., Ltd., "2015 Annual Report" (Shenzhen, China: 2016), available at [https://www.file.huawei.com/-/media/corporate/pdf/annual-report/annual-report2015\\_en.pdf](https://www.file.huawei.com/-/media/corporate/pdf/annual-report/annual-report2015_en.pdf); Huawei Investment & Holding Co., Ltd., "2016 Annual Report" (Shenzhen, China: 2017), available at [https://www.huawei.com/-/media/CORPORATE/PDF/annual-report/AnnualReport2016\\_en.pdf?la=en](https://www.huawei.com/-/media/CORPORATE/PDF/annual-report/AnnualReport2016_en.pdf?la=en); Huawei Investment & Holding Co., Ltd., "2017 Annual Report" (Shenzhen, China: 2018), available at [https://www.huawei.com/-/media/corporate/pdf/annual-report/annual\\_report2017\\_en.pdf?la=en](https://www.huawei.com/-/media/corporate/pdf/annual-report/annual_report2017_en.pdf?la=en); Huawei Investment & Holding Co., Ltd., "2018 Annual Report" (Shenzhen, China: 2019), available at <https://www.huawei.com/en/annual-report/2018>; Huawei Investment & Holding Co., Ltd., "2019 Annual Report" (Shenzhen, China: 2020), available at [https://www.file.huawei.com/-/media/corporate/pdf/annual-report/annual\\_report\\_2019\\_en.pdf?la=en-us](https://www.file.huawei.com/-/media/corporate/pdf/annual-report/annual_report_2019_en.pdf?la=en-us). Average based on reported annual renminbi totals of government grants from 2015 to 2019. Conversion to U.S. dollars is based on the year-end exchange rate of renminbi to U.S. dollars.
- 26 Chuin-Wei Yap, "State Support Helped Fuel Huawei's Global Rise," *The Wall Street Journal*, December 25, 2019, available at <https://www.wsj.com/articles/state-support-helped-fuel-huaweis-global-rise-11577280736>; Ryan McMorrow, "Huawei a key beneficiary of China subsidies that US wants ended," *Phys.org*, May 30, 2019, available at <https://phys.org/news/2019-05-huawei-key-beneficiary-china-subsidies.html>.
- 27 Mary Watkins, "EU Opens Subsidy Probe into China Modems," *Financial Times*, September 17, 2010, available at <https://www.ft.com/content/2147dffc-c1b3-11df-9d90-00144feab49a>; Matthew Dalton, "EU Finds China Gives Aid to Huawei, ZTE," *The Wall Street Journal*, February 3, 2011, available at <https://www.wsj.com/articles/SB10001424052748703960804576120012288591074>.
- 28 Belgian manufacturer Option filed the complaint that launched the investigation. Dalton, "EU Finds China Gives Aid to Huawei, ZTE."
- 29 Nakashima, "U.S. pushes hard for a ban on Huawei in Europe, but the firm's 5G prices are nearly irresistible."
- 30 Matthew Dalton, "EU, China Complete Deal on Telecoms Equipment," *The Wall Street Journal*, October 20, 2014, available at <https://www.wsj.com/articles/eu-china-reach-deal-on-telecoms-equipment-1413797081>.
- 31 Liza Lin, Stu Woo, and Lingling Wei, "China May Retaliate Against Nokia and Ericsson If EU Countries Move to Ban Huawei," *The Wall Street Journal*, July 20, 2020, available at <https://www.wsj.com/articles/china-may-retaliate-against-nokia-and-ericsson-if-eu-countries-move-to-ban-huawei-11595250557>.
- 32 China Development Bank, "Fuwu guojia zhanlue de jinrong xianfeng: Guojia kaifa yinhang zhichi jingji shehui fazhan jishi" ("A financial pioneer serving national strategy: China Development Bank supports economic and social development record of events"), Ren Min Zheng Xie Bao (China People's Political Consultative Conference News), March 6, 2013, available in Chinese at [http://www.cdb.com.cn/xwzx/mtjj/201512/t20151224\\_1138.html](http://www.cdb.com.cn/xwzx/mtjj/201512/t20151224_1138.html).
- 33 Authors' interviews.
- 34 Authors' interviews.
- 35 China Development Bank (CDB) and The Export-Import Bank of China (Chexim) funded the bulk of the loans to Huawei customers. CDB is the biggest financier by volume: It financed 24 loans-backed projects involving Huawei worth just more than \$7.7 billion. Chexim was the second largest: It financed 73 of the identified loans-backed projects, valuing just more than \$4.5 billion. Huawei directly financed four projects totaling \$868 million. The authors were unable to identify the financier for five loans totaling just more than \$420 million.
- 36 Of the loan to customers in Asia, nine loans were signed by governments, and 10 were signed by private companies. The authors could not identify the borrower for one loan.
- 37 Authors' interviews.
- 38 ZHAO Xiaohui and TAO Junjie, "Guo jia kai fa yin hang yu hua wei qian shu 300 yi mei yuan zhan lue he zuo xie yi" ("China Development Bank and Huawei sign a USD 30 billion strategic cooperation agreement"), Xinhua News Agency, September 22, 2009, available in Chinese at [http://www.gov.cn/jrzq/2009-09/23/content\\_1423891.htm](http://www.gov.cn/jrzq/2009-09/23/content_1423891.htm).
- 39 Jordan Link, "How Huawei could survive Trump," *The Washington Post*, June 10, 2019, available at <https://www.washingtonpost.com/politics/2019/06/10/what-do-we-know-about-huaweis-africa-presence/>.

- 40 Center for American Progress, "How the U.S. Can Lead the World in Exports: Retooling Our Export Finance Strategy for the 21st Century," Event transcript, June 15, 2011, available at <https://www.americanprogress.org/wp-content/uploads/events/2011/06/av/exports-transcript.pdf>.
- 41 Bill Plummer, vice president for External Affairs for Huawei, acknowledged Huawei had received a \$10 billion credit line from China Development Bank in 2004 and another \$20 billion credit line in 2009, but insisted this had in no way driven Huawei's growth. Plummer stated Huawei customers had only attempted to tap \$4.25 billion of the export credit and that a mere \$2.99 billion had actually been extended. For further details, see Doug Palmer, "Huawei rejects Eximbank chief's China aid claim," Reuters, June 16, 2011, available at <https://www.reuters.com/article/us-usa-china-huawei/huawei-rejects-eximbank-chiefs-china-aid-claim-idUSTRE75F71220110616>.
- 42 Ken Hu, "Huawei Open Letter," *The Wall Street Journal*, February 25, 2011, available at <http://online.wsj.com/public-resources/documents/Huawei20110205.wsj>.
- 43 China Development Bank, "Loan Agreement Signed for Indonesia's Jakarta-Bandung High-Speed Railway Project," May 14, 2017, available at [http://www.cdb.com.cn/English/xwzx\\_715/khdt/201708/t20170829\\_4510.html](http://www.cdb.com.cn/English/xwzx_715/khdt/201708/t20170829_4510.html).
- 44 For example, see "Remarks by National Security Advisor Ambassador John R. Bolton on the Trump Administration's New Africa Strategy," The White House, December 13, 2018, available at <https://www.whitehouse.gov/briefings-statements/remarks-national-security-advisor-ambassador-john-r-bolton-trump-administrations-new-africa-strategy/>.
- 45 There are currently 683 members. 3rd Generation Partnership Project, "Partners," available at <https://www.3gpp.org/about-3gpp/partners> (last accessed October 2020).
- 46 YU Zheng and HAO Yalin, "Li Keqiang huijian guo ji dian xian lian meng mi shu zhang Zhao Houlin" ("Li Keqiang Meets with International Telecommunication Union Secretary General ZHAO Houlin"), Xinhua News Agency, January 23, 2015, available in Chinese at [http://www.gov.cn/guowuyuan/2015-01/23/content\\_2808739.htm](http://www.gov.cn/guowuyuan/2015-01/23/content_2808739.htm).
- 47 For an overview, see 3GPP, "Project Coordination Group (PCG)," available at <https://www.3gpp.org/about-3gpp/project-coordination-group-pcg> (last accessed October 2020).
- 48 PCG leaders serve in these positions for one full calendar year. Wang served as PCG chairman in 2019, 2016, and 2007. There are three vice-chair positions; Wang held one of those positions in 2018, 2014, 2012, and 2006. For 3GPP leadership records, see 3GPP, "3GPP history of Officials for group: 3GPP PCG ("PCG")," available at <https://www.3gpp.org/DynaReport/TSG-WG-PCG-officialsHistory.htm> (last accessed October 2020).
- 49 For information on CAICT, see Paul Triolo and Graham Webster, "Profile: China Academy for Information and Communications Technology (CAICT)," *New America*, October 16, 2018, available at <https://www.newamerica.org/cybersecurity-initiative/digichina/blog/profile-china-academy-information-and-communications-technology-caict/>.
- 50 HOU Yunlong, "Quan qiu 5G chan ye jue qi shou ge ban ben 5G guo ji biao zhun ming nian 6 yue chu lu" ("Global 5G Industry Rises: First Release of Global 5G Standard Emerging Next June"), *Jing ji can kao bao (Economic Information Daily)*, December 22, 2017, available in Chinese at [http://www.xinhuanet.com/2017-12/22/c\\_1122149216.htm](http://www.xinhuanet.com/2017-12/22/c_1122149216.htm).
- 51 Authors' interviews.
- 52 Authors' interviews.
- 53 IPlytics, "Who is leading the 5G patent race? A patent landscape analysis on declared 5G patents and 5G standards contributions" (Berlin: 2019), available at [https://www.iplytics.com/wp-content/uploads/2019/01/Who-Leads-the-5G-Patent-Race\\_2019.pdf](https://www.iplytics.com/wp-content/uploads/2019/01/Who-Leads-the-5G-Patent-Race_2019.pdf).
- 54 Ibid.
- 55 Authors' interviews.
- 56 Ben Sin, "The Key for Huawei, and China, in 5G race is a Turkish professor," *Forbes*, July 27, 2018, available at <https://www.forbes.com/sites/bensin/2018/07/27/the-key-for-huawei-and-china-in-5g-race-against-the-u-s-is-a-turkish-professor/#4938281f222b>.
- 57 Josh Chin, Sarah Krouse, and Dan Strumpf, "The 5G Race: China and U.S. Battle to Control World's Fastest Wireless Internet," *The Wall Street Journal*, September 9, 2018, available at <https://www.wsj.com/articles/the-5g-race-china-and-u-s-battle-to-control-worlds-fastest-wireless-internet-1536516373>.
- 58 Ibid.
- 59 Wang served as chairman for the 2016 calendar year. See 3GPP, "3GPP history of Officials for group: 3GPP PCG ("PCG")."
- 60 Open letter from Chairman of Legend Holdings and Founder of Legend Group Liu Chuanzhi, Chairman and CEO of Lenovo Group Yang Yuanqing, and President of Legend Holdings Zhu Linan. Published in Chinese on the Lenovo China WeChat page, May 16, 2018, available in Chinese at [https://mp.weixin.qq.com/s/JDImQbGFkxu\\_D2jsqNz3w](https://mp.weixin.qq.com/s/JDImQbGFkxu_D2jsqNz3w).
- 61 Authors' interviews. The China Communications Standards Association is China's 3GPP organizational partner. Chinese firms participate in 3GPP through CCSA. For a list of all 3GPP organizational partners, see 3rd Generation Partnership Project, "Partners."
- 62 Tim Pohlmann and Knut Blind, "Fact finding study on patents declared to the 5G standard," IPlytics study commissioned by the German Federal Ministry for Economic and Energy, January 2020, available at <https://www.iplytics.com/report/5g-patent-study-2020/>.
- 63 Ibid.
- 64 National Standardization Management Committee, "Guojia biao zhun hua guan li wei yuan hui guan yu yin fa '2020 nian quan guo biao zhun hua gong zuo yaodian' de tong zhi" ("Notice of the National Standardization Administration on Printing and Distributing the Essentials of National Standardization Work in 2020"), March 24, 2020, available in Chinese at [http://www.gov.cn/zhengce/zhengceku/2020-03/24/content\\_5494968.htm](http://www.gov.cn/zhengce/zhengceku/2020-03/24/content_5494968.htm). See also Rebecca Arcesati, "Chinese tech standards put the screws on European companies," *MERICs*, January 29, 2019, available at [www.gov.cn/zhengce/zhengceku/2020-03/24/content\\_5494968.htm](http://www.gov.cn/zhengce/zhengceku/2020-03/24/content_5494968.htm).
- 65 State Administration for Market Regulation, "Shichang jianguan zongju guan yu yin fa guanche shishi 'shenhua biao zhun hua gong zuo gaige fang'an' zhong dian renwu fengong (2019-2020 nian) de tong zhi" ("Notice of the State Administration for Market Regulation on Issuing and Implementing the Division of Key Tasks (2019-2020) of the 'Deepening Standardization Work Reform Plan'"), April 19, 2019, available in Chinese at [http://gkml.samr.gov.cn/nsjg/bzjss/201904/t20190419\\_293018.html](http://gkml.samr.gov.cn/nsjg/bzjss/201904/t20190419_293018.html).
- 66 Nakashima, "U.S. pushes hard for a ban on Huawei in Europe, but the firm's 5G prices are nearly irresistible."
- 67 Export-Import Bank of the United States, "The Charter of the Export-Import Bank of the United States," (Washington: 2020), pp. 41–42, available at <https://www.exim.gov/sites/default/files/exim-bank-2019-charter-as-amended.pdf>.



68 Lin, Woo, and Wei, "China May Retaliate Against Nokia and Ericsson if EU Countries Move to Ban Huawei."

69 3GPP, "Membership," available at <https://www.3gpp.org/about-3gpp/membership> (last accessed October 2020).

70 For an overview, see O-RAN Alliance, "Homepage," available at <https://www.o-ran.org/> (last accessed October 2020).

---

## Our Mission

The Center for American Progress is an independent, nonpartisan policy institute that is dedicated to improving the lives of all Americans, through bold, progressive ideas, as well as strong leadership and concerted action. Our aim is not just to change the conversation, but to change the country.

## Our Values

As progressives, we believe America should be a land of boundless opportunity, where people can climb the ladder of economic mobility. We believe we owe it to future generations to protect the planet and promote peace and shared global prosperity.

And we believe an effective government can earn the trust of the American people, champion the common good over narrow self-interest, and harness the strength of our diversity.

## Our Approach

We develop new policy ideas, challenge the media to cover the issues that truly matter, and shape the national debate. With policy teams in major issue areas, American Progress can think creatively at the cross-section of traditional boundaries to develop ideas for policymakers that lead to real change. By employing an extensive communications and outreach effort that we adapt to a rapidly changing media landscape, we move our ideas aggressively in the national policy debate.

