U.S.-China Economic and Security Review Commission

Staff Research Report

July 19, 2018

Trends in Trade: U.S.-China Goods Trade 2012–2017

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Executive Summary

China is one of the United States' most important trading partners. In 2017, China was the United States' largest goods trading partner, third-largest export market, and biggest supplier of imports.[1] Since joining the World Trade Organization (WTO) in 2001, China has leveraged relatively cheap labor, large economies of scale, industrial policies, and the manufacturing capabilities of neighboring countries to become an export powerhouse in an increasing range of industries, while often limiting market access for foreign products. China's scale as a trading power, coupled with its protectionist policies, has contributed to rising tensions in bilateral trade relations.

This report describes and analyzes patterns in the U.S.-China trade relationship and is an update to a staff research report published by the Commission in November 2012 which covered trends in trade from 2000 through 2011.* The 2012 report found that China exported hundreds of billions of dollars' worth of manufactured goods, but imported a much smaller amount of nonmanufactured goods from the United States. The majority of growth in U.S. exports to China in the 2000 to 2011 period came from exports of nonmanufactured products like soybeans and scrap metal, while the largest source of the bilateral trade deficit was increased U.S. imports of computer and electronic products.[2]

Since 2011, the bilateral trade deficit has increased, and the composition of U.S. goods exports to China has changed dramatically. Nonmanufactured exports remained strong from 2012 to 2017, but the majority of growth occurred in a few select manufacturing sectors, most notably aviation, semiconductor machinery, and medical devices.[3] The composition of U.S. imports remained concentrated in high-tech and industrial sectors, including computers and electronics and machinery. The nature of U.S.-China trade over the past six years points to crucial dynamics in the bilateral relationship with important implications for the U.S. economy and future competitiveness.

- *China is moving up the value-added chain:* In the initial period of its export boom (2002–2011), China relied on imported inputs. In other words, a large portion of the value of Chinese exports to the United States and elsewhere was added outside of China, specifically in South Korea, Taiwan, and Japan. China's leaders want to change this situation and are implementing a wide array of policy measures to ensure Chinese companies become more competitive in high-tech industries, first at home, and then in international markets. The "Made in China 2025"† initiative is the latest in a series of plans identifying key industries for government support and promotion. This support can take many forms, from low-cost and no-cost capital to localization requirements that compel foreign companies to manufacture a share of their inputs in China or source locally.
- *U.S. export growth is limited by China's protectionist measures:* The policies implemented by the Chinese government to help domestic industries move up the value chain often unfairly restrict U.S. exports. For instance, Chinese authorities continue to use their regulatory power to the advantage of domestic firms over U.S. exporters. These regulatory measures also allow Chinese high-value-added information technology and services providers better access to China's growing consumer base, which in turn makes them more competitive internationally. The Chinese government's drive to create and acquire more intellectual property and to claim domestic and global market share for Chinese companies in cutting-edge industries means more unfair competition for U.S. importers and exporters over a larger portion of value-added industries.
- *Rising imports of manufactured goods from China had a negative impact on certain segments of U.S. manufacturing employment:* Several recent economic studies have found that while increased U.S. exports were a boon for agriculture and other nonmanufactured commodity industries, the large influx of cheap manufactured goods from China displaced millions of U.S. jobs. Moreover, job creation in the industries that benefited from increased exports did not make up for the millions of jobs lost due to large

* For more information about this period in U.S.-China trade, see Joseph Casey, "Patterns in U.S.-China Trade since China's Accession to the World Trade Organization," *U.S.-China Economic and Security Review Commission*, November 2012. *https://www.uscc.gov/sites/default/files/Research/US-China_TradePatternsSinceChinasAccessiontotheWTO.pdf.*

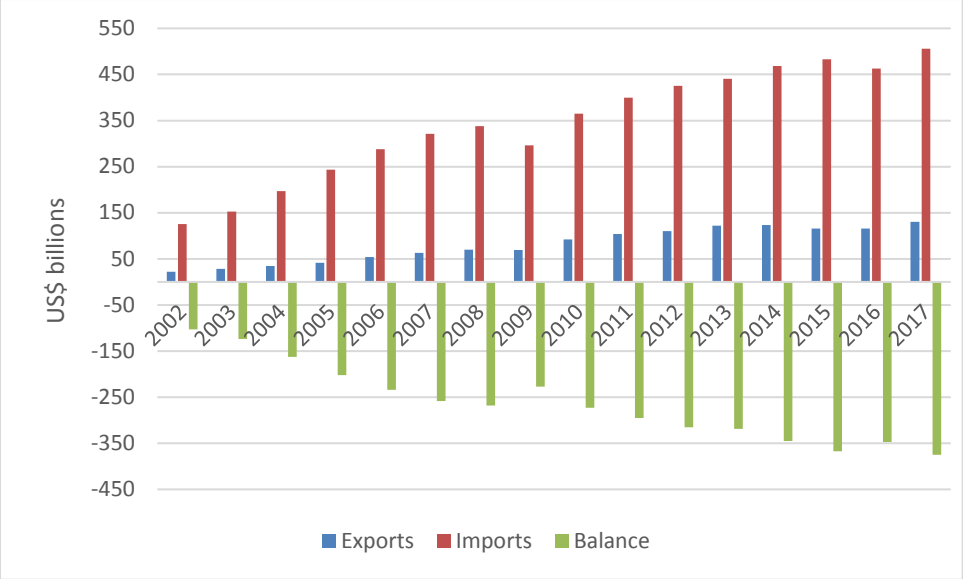
† For more information on Made in China 2025 and a broader look at China's industrial plans, see Katherine Koleski, "The 13th Five-Year Plan," *U.S.-China Economic and Security Review Commission*, February 14, 2017. *https://www.uscc.gov/sites/default/files/Research/The%2013th%20Five-Year%20Plan.pdf.*

inflows of cheap manufactured goods. A review of bilateral trade data makes clear that the overall deficit in manufactured products has only increased, despite substantial improvements in U.S. exports of several manufacturing product types.

Trade Balance at a Glance

Total goods trade between the United States and China reached $636 billion in 2017, an increase of $132 billion from 2011 (see Figure 1).[4] U.S. exports to China increased from $104 billion in 2011 to about $130 billion in 2017.[5] However, U.S. imports from China rose faster, increasing from $400 billion to about $506 billion over the same period.[6] The trade deficit has increased quickly, and in 2017 it reached an all-time high of $375 billion.[7]

Figure 1: U.S.-China Balance of Trade, 2002–2017



Source: U.S. Census Bureau, HS database (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *http://www.census.gov/foreign-trade/balance/c5700.html.*

Several trends in the composition of bilateral trade stand out. Although U.S. exports to China continue to be lackluster, there were substantial increases in U.S. exports of several manufactured product types.

- **Transportation equipment was the largest and the fastest-growing export sector.** The United States exported $16.4 billion more transportation equipment to China in 2017 than it did in 2011, an increase of about 124 percent to a total of $29.5 billion.[8] This increase was mostly due to the growth in commercial aviation exports, which replaced soybeans as the fastest-growing subcategory over the last six years.
- **The export of computers and electronic products also grew quickly**, increasing from $13.8 billion in 2011 to $17.1 billion a year in 2017.[9]
- **Nonmanufactured goods comprised a smaller portion of U.S. exports** from 2012 to 2016 than in the decade after 2001. The two fastest-growing export products from the 2002 to 2011 period were soybeans and waste and scrap; over this period, soybean exports increased from $1 billion to $10.5 billion, and waste and scrap exports burgeoned from $1.2 billion to $11.6 billion.[10] While soybean exports continued to be impressive, reaching $12.4 billion in 2017, they fell by $1.8 billion year-on-year. U.S. exports of waste and scrap decreased by 51 percent to $5.6 billion from 2011 to 2017.[11] This drop was largely attributable to Chinese concerns over contamination in waste and scrap imports, which culminated in an inspection crackdown by Chinese environmental and customs officials in 2013.[12]
- **Agricultural products continued to represent a large portion of total U.S. exports to China.** Exports of agricultural goods totaled almost $16 billion in 2017, an 8 percent increase compared to 2011.[13]

The mix of top U.S. imports from China from 2012 through 2017 remained largely consistent, although some subcategories underwent significant shifts.

- **Computer and electronics products remain the United States' largest import from China.** China exported a total of $184.4 billion in computer and electronics products to the United States in 2017, a $38.6 billion increase from 2011.[14]
- **The second-largest import category was electrical equipment and appliances.** China sold $43.3 billion of electrical equipment and appliances to the United States in 2017, an increase of $14.4 billion compared to 2011.[15]
- **U.S. imports of transportation equipment and machinery products from China also grew considerably**, increasing $8.2 billion and $14.5 billion from 2011, respectively, to reach $19.1 billion and $35 billion in 2017.[16]

China's Exchange Rate Policies

China's exchange rate policies have long been a major point of contention in the U.S.-China economic relationship. China has previously endeavored to weaken the RMB to maintain a competitive advantage for its exports, but since 2015—with economic growth slowing—the country has shifted to propping up the currency instead.[17]

From 2000 to 2014, China suppressed RMB appreciation by selling the currency for U.S. dollars, adding nearly $4 trillion to its foreign exchange reserves over the period.[18] The People's Bank of China (PBOC) allowed the RMB to gradually appreciate when it eliminated the RMB's peg to the dollar in 2005, but the central bank continued to intervene in foreign exchange markets to suppress its value.[19] While most Western economists agree the RMB was undervalued, there is a lack of consensus about the degree to which the RMB was undervalued. For instance, Arvind Subramanian, senior fellow at the Peterson Institute for International Economics, estimated the RMB was undervalued by 30 percent in 2010 while Helmut Reisen, the former head of research of the OECD Development Center, estimated the RMB was undervalued by 12 percent in 2008.[20] Moreover, as a 2014 report from the Economic Policy Institute argued, by undervaluing its currency, China pushed other countries in the region to follow "[its] lead in engaging in currency manipulation [to protect their own competitiveness and promote their exports], resulting in the region's large and growing trade surpluses with the United States."[21]

Over time, Beijing increased the flexibility of the RMB's exchange rate,* driven in part by its goal of expanding the international use of the RMB. It scored an important victory in November 2015 when the IMF executive board voted to include the RMB in the Special Drawing Rights basket—the IMF's international reserve asset—which became effective in October 2016.[22] Despite this progress, the PBOC still carefully manages the value of the RMB to keep the currency stable. Since 2015, as China's economic growth moderated and pressure rose on the RMB to depreciate, the Chinese government has intervened repeatedly to support the value of the currency.[23] Instead of buying U.S. dollars, the PBOC sold them, shrinking China's foreign exchange reserves, while also tightening capital controls.† [24] With the RMB stabilizing, the U.S. Department of Treasury's latest semi-annual report on foreign-exchange policy noted that "Chinese authorities significantly curtailed intervention in the second half of 2017 that they had been undertaking to support the value of the RMB."[25] The RMB strengthened 6.8 percent against the U.S. dollar in 2017, its first annual gain in four years.[26]

* Notably, the PBOC revised its method for setting the daily reference rate for the RMB in the onshore currency market in August 2015; the PBOC said it would take into account the previous day's closing exchange rate—which could rise or fall up to 2 percent under the currency's trading band—as well as the exchange rate movements of other major currencies. Additionally, the PBOC introduced a new trade-weighted basket of currencies—the China Foreign Exchange Trade System RMB index—for setting the RMB daily rate in December 2015. Fion Li, "China's New Yuan Index: Here's What the Market Needs to Know," *Bloomberg*, December 14, 2015. *https://www.bloomberg.com/news/articles/2015-12-14/china-s-new-yuan-index-here-s-what-the-market-needs-to-know*.

† China's foreign reserves fell from their $3.99 trillion peak in June 2014 to $3.14 trillion at the end of 2017. People's Bank of China via CEIC database.

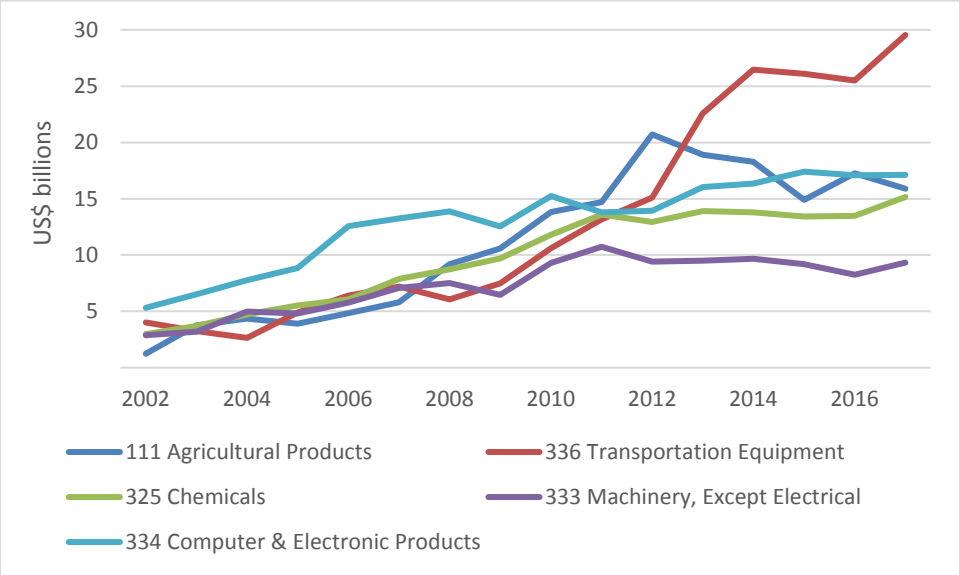
Exports

The trends in U.S. exports to China changed dramatically in the last six years when compared to the 2002 to 2011 period. During the first ten years following China's accession to the WTO, U.S. exports of nonmanufactured goods increased an average of $3 billion a year.[27] At its peak in 2012, the nonmanufactured goods category comprised 31 percent of total U.S. exports to China; in 2017, it had fallen to 24 percent.[28] Meanwhile, manufactured goods increased from 69 percent of total exports in 2011 to about 73 percent in 2017.[29]

U.S. exports to China during the 2012 to 2017 period experienced weaker growth compared to that during the first decade after China joined the WTO. Overall exports increased by an average of $3.3 billion a year during the last six years, which was much slower than the average export growth of $8.2 billion a year from 2002 through 2011.[30] Imports from China, by contrast, grew much faster, averaging a yearly increase of $13.3 billion during the 2012 to 2017 period.[31]

Figure 2 presents the top five U.S. exports to China, which together comprised about 70 percent of total exports in 2017.[32] Exports of transportation equipment, computer and electronics, and chemicals grew robustly from 2012 through 2017.[33] Notably, exports of transportation equipment grew by an average of $2.4 billion a year, while computers and electronics and chemicals exports increased by an average of $531 million and $370 million per year, respectively.[34] This rate was slower than the previous period's annual growth for computer and electronic and chemicals exports. From 2002 through 2011, the average yearly increase in computer and electronic exports was about $847 million, while chemicals exports grew by an average of $1.1 billion a year.[35] Meanwhile, agricultural and machinery exports turned in disappointing performances. Agricultural exports dropped 23 percent—about $802 million less a year—from 2012 through 2017.[36] Machinery exports fell by an average of $16.6 million a year over the same period.[37]

Figure 2: Top Five U.S. Exports to China, 2002–2017 (NAICS 3-Digit)



Source: U.S. Census Bureau, NAICS database (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *http://www.census.gov/foreign-trade/balance/c5700.html.*

Nonmanufactured Goods

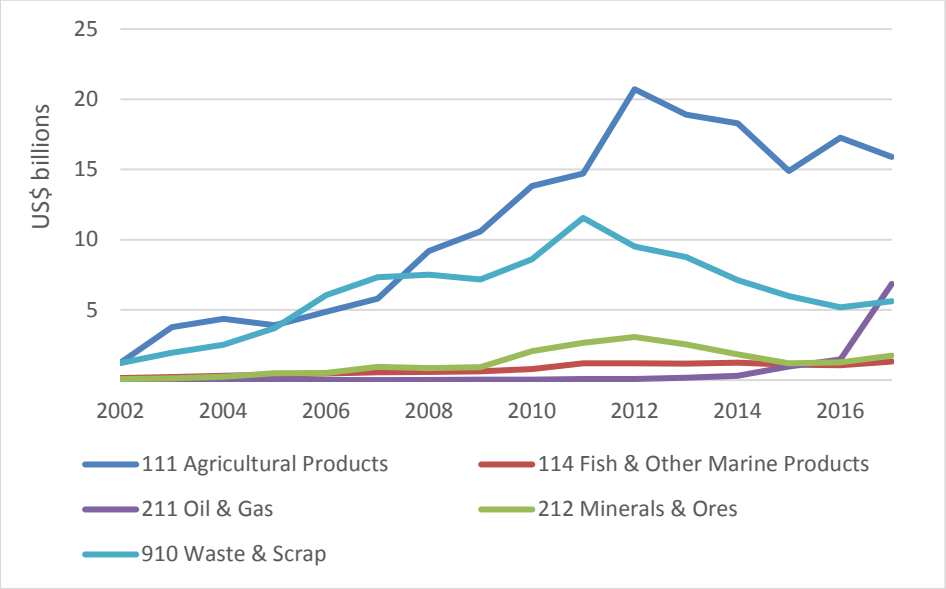
Nonmanufactured goods* have become less important in the overall mix of U.S. exports to China over the last six years, although this sector still comprised about a quarter of total U.S. exports to China in 2017.[38] Nonetheless,

* Nonmanufactured goods are goods that do not involve mechanical, physical, or chemical transformation of materials, substances, or components to create new products. U.S. Census Bureau, *What Is Manufacturing?*, October 5, 2012. *https://www.census.gov/newsroom/cspan/20121005_manufact/20121005_cspan_slides.pdf.*

total exports of nonmanufactured goods increased by $1.3 billion from $30.2 billion in 2011 to about $31.5 billion in 2017, primarily due to a sharp increase in oil and gas exports from 2016 to 2017.[39]

Figure 3 shows the top five nonmanufactured exports to China. The imbalance in the export mix has been driven primarily by agriculture. At its peak in 2012, agricultural products comprised 18.7 percent of total U.S. exports to China.[40] From 2002 to 2011, China also ramped up imports of waste and scrap—which included used or leftover paper, ferrous, aluminum, and copper waste—to fuel the country's export-driven manufacturing boom.[41] Since the end of 2011, however, China's imports of agricultural and waste and scrap products have declined both in proportional and absolute terms. The decline in waste and scrap exports was largely due to the Chinese government's concerns over contamination in waste and scrap imports, culminating in an inspection crackdown by environmental and customs officials in 2013.* [42] On the agricultural side, China sharply reduced its imports of corn and wheat around 2014, the causes of which are discussed in the following section.

Figure 3: U.S. Nonmanufacturing Exports to China, 2002–2017 (NAICS 3-Digit)



Source: U.S. Census Bureau, NAICS database (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *http://www.census.gov/foreign-trade/balance/c5700.html*.

Agriculture

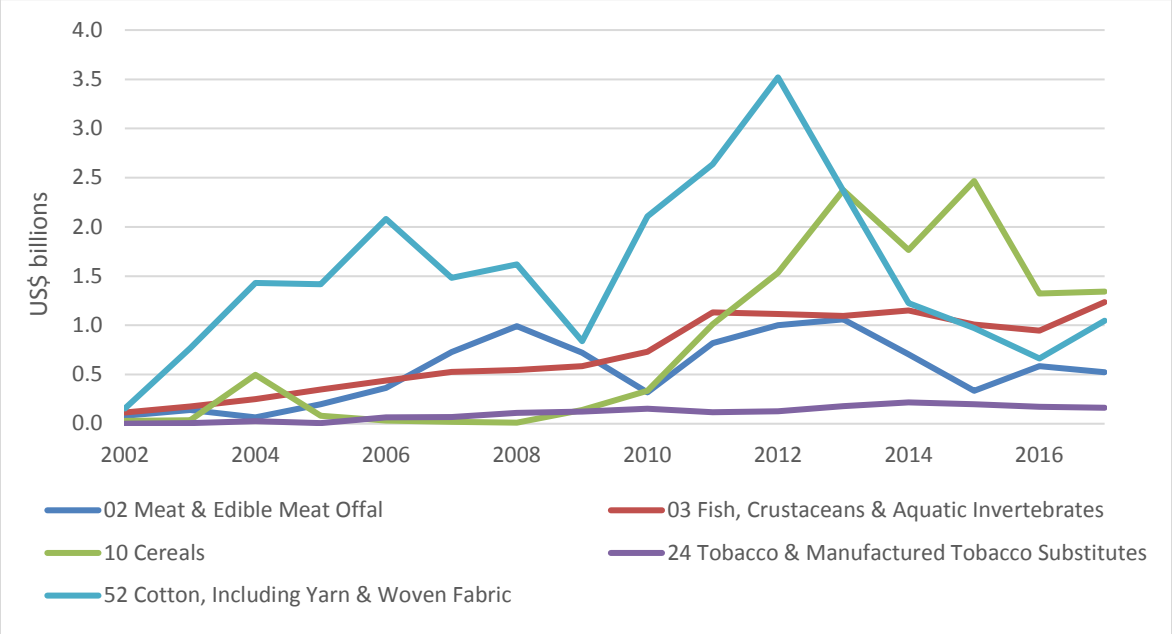
Agriculture is a mainstay of U.S. exports to China. As the U.S. Department of Agriculture explains, "Due to China's severe cropland shortage and inexpensive labor force, U.S. exports to the country have traditionally been dominated by land-intensive bulk commodities that China then processes for domestic consumption or export."[43] After 2001, China opened its doors to U.S. agricultural products and began rapidly increasing its imports of meat, fish, wheat, corn, soybeans, and cotton. The best-performing U.S. agricultural export from 2002 to 2011, by a wide margin, was soybeans. During this period, soybean exports increased from almost $1 billion to $10.5 billion a year.[44] Soybean exports peaked in 2012 when Chinese imports jumped 40 percent year-on-year to $14.9 billion.[45] Slowing economic growth in China, lower global commodity prices, and a strong dollar led soybean export growth to stall after 2012, although soybeans remain the top U.S. agricultural export to China, at $12.4 billion in 2017.[46]

China's demand for other agricultural commodities has been volatile (see Figure 4). U.S. agricultural exports are subject to Chinese policies that encourage agricultural self-sufficiency and protect domestic industries.[47] In addition, China lacks regulatory transparency, has inconsistent product review and approval processes, and

* In July 2017, China announced it would no longer accept imports of 24 waste products by the end of the year and that it would ban all waste and scrap imports by 2019. Reuters, "China Bans Imports of 15 More Scrap, Waste Products from End-2018," April 18, 2018. *https://www.reuters.com/article/china-waste-imports/update-1-china-bans-imports-of-16-more-scrap-waste-products-from-end-2018-ministry-idUSL3N1RW1UK*; U.S.-China Economic and Security Review Commission, *Economics and Trade Bulletin*, October 5, 2017, 8–12.

distributes import quotas in an opaque and unpredictable manner, all of which distort trade and create uncertainty for U.S. exporters.[48]

Figure 4: Agriculture Exports to China, Excluding Soybeans, 2002–2017 (HS 2-Digit)



Source: U.S. Census Bureau, HS database (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *http://www.census.gov/foreign-trade/balance/c5700.html.*

Cotton

Movements in cotton exports over the last five years are a good illustration of the distortive effects of China's agricultural policies. Between 2011 and 2013, China maintained a formal price support system for cotton through a reserve purchase program managed by the China National Cotton Reserve Corporation.[49] The program offered cotton farmers a minimum guaranteed price of $2,950 to $3,200 per metric ton (MT); at the time, the median monthly world price was $2,000 per MT.[50] This artificial margin made the out-of-quota price of U.S. cotton more competitive, even when adding the 27 percent average out-of-quota tariff.[*] Competitive prices, in turn, made foreign cotton more attractive to Chinese end users. As Figure 4 shows, U.S. cotton exports to China experienced rapid growth from 2009 to a peak of about $3.5 billion a year in 2012.[51]

Higher domestic cotton prices dampened demand from China's textile industry, and its consumption of raw cotton fell 29 percent between 2009 and 2013.[52] Meanwhile, the government's price support policies contributed to a rapid buildup in cotton reserve stocks, which reached a record high of 67 million bales in 2014.[53] The rapid buildup in cotton stocks and decreased domestic demand put enormous pressure on authorities to reduce the stocks, leading the government to transition away from the price support model to a target price-based subsidy system in 2014.[54] The target price policy provides subsidies directly to farmers when the market price is lower than the target price and has led to a sustained decline in China's cotton stocks.[†] [55] Due to this change and weaker cotton consumption

[*] Under China's WTO commitments, cotton imports under tariff rate quota are subject to a 1 percent tariff rate. After the quota is reached, Chinese authorities may set duties on cotton imports as high as 40 percent, although most cotton imports are charged a tariff of about 13 percent. When added to a value-added tariff, the average total tariff on imported cotton is about 27 percent. U.S. Department of Agriculture Economic Research Service, *Cotton Policy in China*, March 2015, 17–18. *https://www.ers.usda.gov/webdocs/publications/36244/52550_cws-15c-01.pdf?v=42094*.

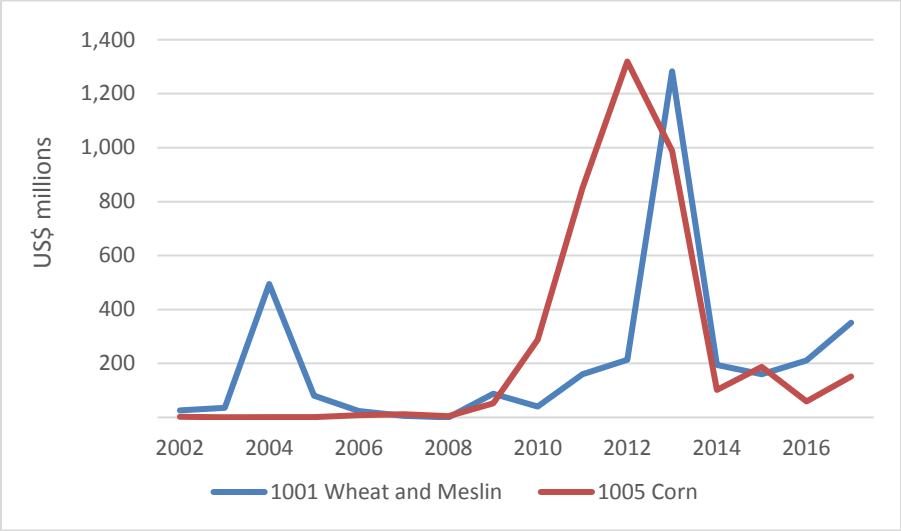
[†] China has and will likely continue to subsidize cotton production for political reasons. The majority of China's cotton crop is grown in Xinjiang, where Beijing views employment as key to maintaining social stability. Cotton is an important part of Xinjiang's economy, accounting for more than half of the province's agricultural output value. Moreover, cotton is the Xinjiang Production and Construction Corps' (a key economic development and internal security organization) main source of income. As a result, even as the Chinese government has reduced cotton subsidies in inland provinces, it has not done so in Xinjiang. U.S. Department of Agriculture Foreign Agricultural Service, "China: 2017/18 Cotton Production Outlook," August 11, 2017.

in China, U.S. cotton exports to China tumbled from $2.4 billion in 2013 to $660 million in 2016.* [56] However, with Chinese cotton consumption beginning to recover and domestic stocks continuing to fall, U.S. cotton exports increased 58 percent year-on-year to $1 billion in 2017.[57]

Grains

The volatility of wheat and corn export flows since 2010 also demonstrates the dramatic effect of Chinese agricultural policies on U.S. exports (see Figure 5). The United States exported almost no wheat and corn to China until 2009.[58] Chinese government price supports for grains rose significantly between 2008 and 2013,† artificially elevating domestic grain prices up to 30 percent above the CIF‡ price of imported grain, which incentivized buyers to turn to cheap imports.[59] The boom in U.S. grain exports to China roughly coincided with the expansion of Chinese price supports for grains.[60] Corn exports surged from $52 million in 2009 to $1.3 billion in 2012 and wheat exports jumped from $87 million in 2009 to almost $1.3 billion in 2013.[61]

Figure 5: Exports of Wheat and Corn, 2002–2017 (HS 4-Digit)



Source: U.S. Census Bureau, HS database (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *http://www.census.gov/foreign-trade/balance/c5700.html.*

The precipitous drop in U.S. corn exports after 2012 resulted not from a relaxation of domestic price support§ but from Chinese government policies aimed at reducing enormous domestic reserves through incentivizing

https://ipad.fas.usda.gov/highlights/2017/08/china/index.htm; Zi Yang, "China Shielding Cotton Growers to Ensure National Stability," *Asia Times*, July 18, 2017. *http://www.atimes.com/article/china-shielding-cotton-growers-ensure-national-stability/*; Reuters, "China Rejigs Cotton Policy for Top Grower Xinjiang," March 17, 2017. *https://www.reuters.com/article/us-china-cotton-prices/china-rejigs-cotton-policy-for-top-grower-xinjiang-idUSKBN16O0G0*.

* Other factors also contributed to the drop in U.S. cotton exports to China after 2012. A severe drought in the United States in 2013 reduced annual cotton production by about 25 percent. While U.S. cotton exports to China decreased in 2013 and 2014, Indian exports increased to 1.1 million MT. As a result, India's share of cotton exports to China increased to 40 percent in 2014 from about 20 percent in 2012, or double the U.S. share for that year. Although the quality of U.S. cotton appeals to China's textile industry, Indian cotton offers serious price and transportation advantages. U.S. Department of Agriculture Foreign Agricultural Service, *People's Republic of China, Cotton and Products Annual*, April 2, 2015, 10. *https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Cotton%20and%20Products%20Annual_Beijing_China%20-%20Peoples%20Republic%20of_4-2-2015.pdf*; Dollar Business, "India Gains USA's Share in Cotton Exports to China," September 9, 2014. *https://www.thedollarbusiness.com/news/india-gains-usas-share-in-cotton-exports-to-china/5084*.

† According to a U.S. Department of Agriculture report, from 2008 to 2013 Chinese government price supports were increased 63 percent for wheat and 66 to 69 percent for corn. Fred Gale, "Growth and Evolution in China's Agricultural Support Policies," *U.S. Department of Agriculture Economic Research Service*, August 2013, 17. *https://ageconsearch.umn.edu/bitstream/155385/2/err153.pdf*.

‡ CIF, or "cost, insurance, and freight," is the cost of a commodity, including the insurance and shipping costs.

§ Chinese corn prices continued to increase until March 2016, when China ended its price support policy for corn in an attempt to reduce the country's mounting stockpile. Andrew Anderson-Sprecher and James Ji, "China's Decision to End Corn Floor Price Shakes Grain and Feed Market," *U.S. Department of Agriculture Foreign Agricultural Service*, April 8, 2016, 1. *https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Grain%20and%20Feed%20Annual_Beijing_China%20-%20Peoples%20Republic%20of_4-8-2016.pdf*.

consumption of domestic supplies and increased regulatory scrutiny on grain imports. China's price supports for corn have led to massive stockpiles of corn.* To sell these stocks—which are expensive to store and subject to rot—without putting too much downward pressure on domestic corn prices, the government offered incentives to buyers for purchasing domestic corn over cheaper imports.[62] In marketing years 2013/2014, the Chinese government provided end users of corn in China's southern coastal provinces a subsidy of $22 (RMB 140) per MT to purchase corn from producers in the northeast.[63]

At the same time, the government sought to discourage imports by increasing scrutiny of genetically modified corn imports.[64] In 2014, China rejected more than one million MT of U.S. corn and more than 90,000 MT of U.S. dried distillers grains† exports after finding MIR 162‡, a biotech variety of corn not yet approved by the Chinese government, among imported shipments.[65] Regulatory scrutiny had a significant chilling effect on agricultural traders on both sides: According to a 2015 U.S. Department of Agriculture report, "very few exporters or importers are willing to accept the financial risk of a corn shipment being rejected due to unapproved biotech traits."[66] U.S. corn exports plummeted from about $1 billion in 2013 to $100 million in 2014.[67] Although MIR 162 has since been approved by Chinese authorities, Chinese buyers have been slow to purchase U.S. corn (which is mostly genetically modified), opting instead for corn from Ukraine.[68] In 2016, the United States accounted for less than 10 percent of China's corn imports, compared to over 70 percent in 2013.[69]

China also maintains pricing supports for wheat, which has—as with the case of corn—resulted in large stockpiles.[70] Domestic prices for wheat were set at about $10.35 per bushel for marketing years 2014/2015, compared to a season-average farm price of $6 to $6.10 per bushel in the United States during the same period.[71] Despite this price advantage, U.S. exports collapsed from over $1.3 billion in 2013 to less than $200 million in 2014.[72] This was due in part to tightened government restrictions on wheat imports amid high domestic production and large state reserves.[73] China's strict sanitary and phytosanitary standards for U.S. winter wheat varieties§ have also impeded exports.[74]

* In marketing years 2015/2016, Chinese corn stocks grew to an estimated 114 million MT, or about 50 percent of annual domestic consumption. Andrew Anderson-Sprecher and James Ji, "Huge Stocks Challenge Grain Policy," *U.S. Department of Agriculture, Foreign Agricultural Service*, February 5, 2016, 2. *https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Grain%20and%20Feed%20Update_Beijing_China%20-%20Peoples%20Republic%20of_2-5-2016.pdf*.

† Dried distillers grains are a byproduct of ethanol production and a primary ingredient in animal feed. These grains have been an important contributor to profits of U.S. biofuel companies. Holly Demaree, "China Raises DDGS Import Tariffs," *World-Grain.com*, January 12, 2017. *http://www.world-grain.com/articles/news_home/World_Grain_News/2017/01/China_raises_DDGS_import_tarif.aspx?ID=%7B9F8B89FD-F286-4792-9CB7-FAD72BBEEA3D%7D*.

‡ MIR 162 is a genetically modified hybrid corn with insect resistance. Beijing began turning away or seizing shipments containing MIR 162 corn in November 2013. China's Ministry of Agriculture finally approved MIR 162 for import into China in December 2014. Tom Polansek, "Update 2-China Approves Imports of Viptera Corn, Two Types of Soybeans–Vilsack," Reuters, December 17, 2014. *http://www.reuters.com/article/us-china-trade-agriculture-idUSL1N0U123220141217*.

§ Strict inspection and quarantine measures for Tilletia controversa, a harmful fungus, continue to discourage imports of U.S. winter wheat varieties. In 2004, China's Ministry of Health put in place a standard limiting levels of mycotoxin deoxynivalenol—the toxic byproduct of the fungus—in wheat to 1.0 part per million; this is one of the strictest standards in the world. In addition, China continues to disregard a bilateral agreement that allows wheat with low levels of this fungus to be imported through any port in China, as long as it is inspected and certified by the U.S. Department of Agriculture. Andrew Anderson-Sprecher, Ji Wei, and Chu Liwen, "China Grain and Feed Annual—2015," *U.S. Department of Agriculture Foreign Agricultural Service*, May 8, 2015, 4; U.S. Wheat Associates, "Comments Regarding Foreign Trade Barriers to U.S. Exports for 2017 Reporting," October 27, 2016, 10.

Tariff Rate Quotas

Another problem impeding U.S. exports of rice, wheat, and corn to China is Beijing's underutilization of tariff rate quotas (TRQs).* Table 1 lists China's fill rates for four different cereal grains from 2011 to 2015.[75] During China's accession to the WTO, it agreed to allow 9.6 million MT of wheat and 7.2 million MT of corn to enter China at lower "in quota" duty rates through its TRQs.[76] Under its WTO commitments, China is allowed to allocate 90 percent of its TRQ for imports by state trading enterprises, with 10 percent of the quota reserved for private sector importers.[77] The private sector has consistently filled its TRQ because Chinese millers are responding to growing demand for foreign wheat, which is usually cheaper and of better quality.[78] However, state-owned traders have consistently underused their allocated quotas, and Chinese authorities have done little to reallocate unused TRQ to private importers despite China's commitment to do so in its WTO accession protocol.[79]

Table 1: China's Tariff Quota Fill Rate (MT), 2011–2015

	TRQ	2011	2012	2013	2014	2015
Corn	7,200,000	24%	72%	45%	36%	65%
Wheat	9,636,000	13%	38%	57%	31%	30%
Rice (long-grain)	2,660,000	21%	83%	65%	59%	92%
Rice (short-grain)	2,660,000	1%	6%	21%	38%	35%

Source: Office of the U.S. Trade Representative, *United States Challenges Chinese Grain Tariff Rate Quotas for Rice, Wheat, and Corn*, December 2016. *https://ustr.gov/about-us/policy-offices/press-office/press-releases/2016/december/united-states-challenges-chinese*.

The fact that these quotas are not being filled by companies—even during periods when domestic grain prices are significantly higher than international levels—indicates that China's TRQ regime is de facto protectionist. For perspective, China would have imported an additional $3.5 billion worth of these grains had it filled its TRQ in 2015.[80] In December 2016, the Office of the U.S. Trade Representative (USTR) requested a dispute settlement panel at the WTO to contest China's lack of transparency in administration of its TRQs for rice, wheat, and corn.[81] The USTR also challenged China's domestic support for these commodities, estimating that its price support was $100 billion greater than the maximum levels allowed under its WTO commitments.† [82]

Overall, China has subjected sectors of its agricultural system to enormous distortions since its accession to the WTO. China's agricultural policies were designed to support domestic farmers by limiting cheaper, higher-quality competition; to create strategic reserves of crops; and to prevent overreliance on one country for food imports. Although these policies were designed to achieve domestic goals, they have had enormous repercussions for U.S. farmers. The pressure to continue to restrict imports is likely to increase as China's government sells off a large portion of its enormous stockpiles of cotton, wheat, and corn.

Manufactured Goods

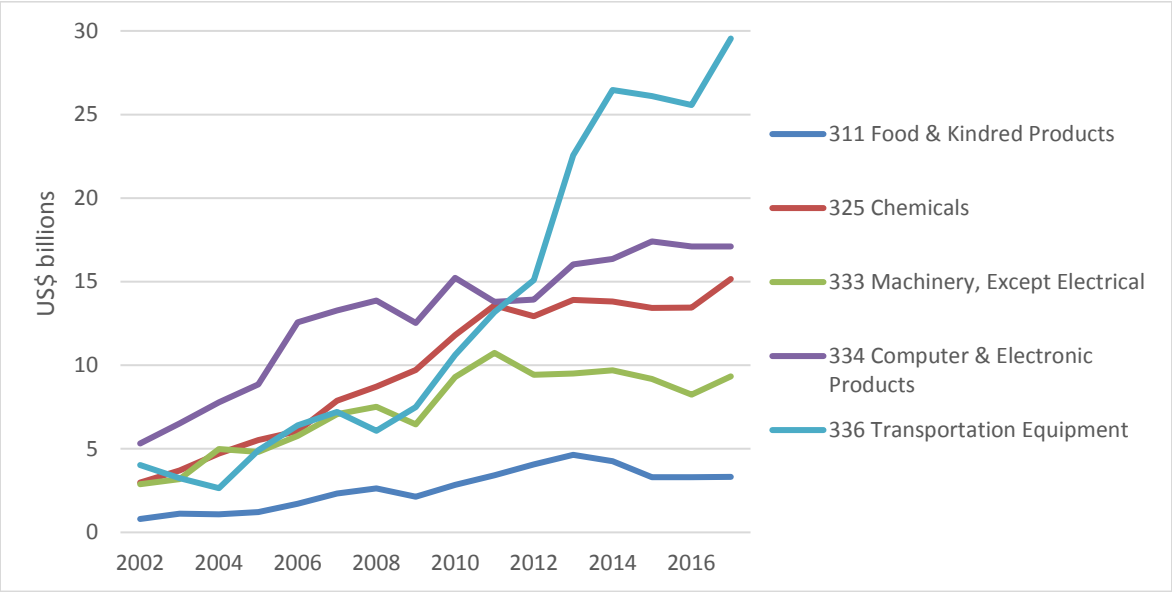
The United States continued to export more manufactured goods to China from 2012 to 2017, but at a much slower rate than during the first decade after China joined the WTO. Annual manufactured exports totaled $95.5 billion in 2017, up from $71.4 billion in 2011.[83] This marked an average increase of $3.7 billion a year compared to an average $5.2 billion yearly increase from 2002 to 2011.[84] Furthermore, the bilateral manufacturing trade deficit totaled $400 billion in 2017, an $81 billion increase from 2011.[85]

* Tariff rate quotas are specified quantities of a good a country has committed to import under lower tariffs. Office of the U.S. Trade Representative, *United States Challenges Chinese Grain Tariff Rate Quotas for Rice, Wheat, and Corn*, December 2016. *https://ustr.gov/about-us/policy-offices/press-office/press-releases/2016/december/united-states-challenges-chinese*.

† The WTO's Dispute Settlement Body (DSB) established a panel for the dispute over Chinese agricultural subsidies in January 2017, and in September 2017, the WTO DSB established a panel for the dispute over China's TRQs for rice, wheat, and corn. World Trade Organization, *China—Tariff Rate Quotas for Certain Agricultural Products*, March 6, 2018. *https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds517_e.htm*; World Trade Organization, *China—Domestic Support for Agricultural Producers*, March 6, 2018. *https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds511_e.htm*.

Figure 6 charts the United States' top five manufactured exports to China.[86] Of these exports, only transportation equipment products made significant gains from 2011 to 2017.[87] Transportation exports have boomed as Chinese airlines and car dealers attempt to meet the demands of a growing middle class. Computer exports have grown steadily as China continues to demand semiconductors and advanced measuring and control instruments from the United States. Slower manufacturing export growth is due to the stagnant or declining performance of machinery and food and kindred products.[88] U.S. machinery exports used as inputs in China's heavy industry suffered the most as capital-dependent firms have struggled to deal with high debt-to-equity ratios, lower commodity prices, and tepid international demand for their products.

Figure 6: Top Five Manufacturing Exports, 2002–2017 (NAICS 3-Digit)



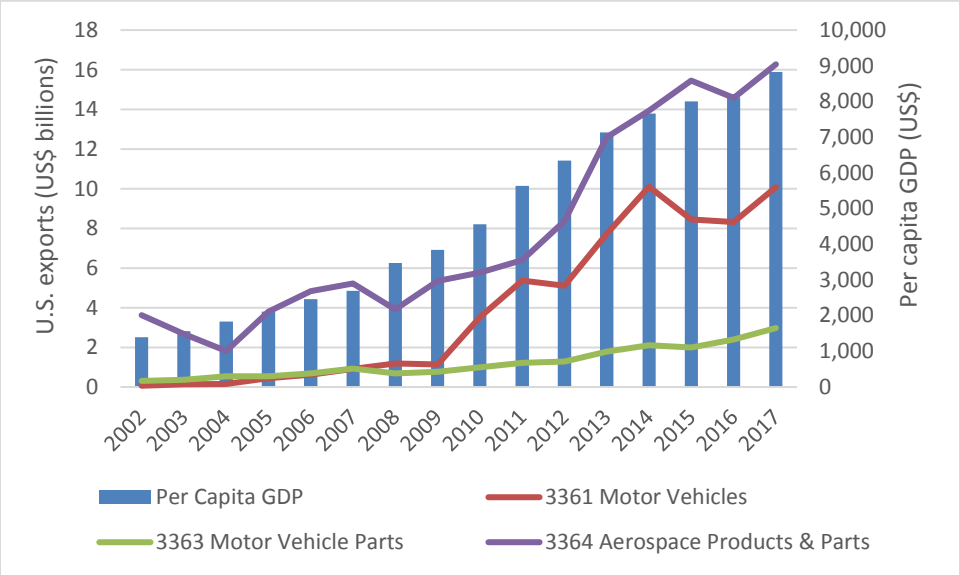
Source: U.S. Census Bureau, NAICS database (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *http://www.census.gov/foreign-trade/balance/c5700.html.*

Transportation

Transportation is by far the largest and fastest-growing sector within U.S. exports to China. Exports more than doubled from $13.2 billion in 2011 to $29.5 billion in 2017, dwarfing even exports of agricultural products ($16 billion).[89] Transportation is also the manufacturing sector in which the United States has the largest surplus over Chinese imports, amounting to $10.5 billion in 2017.[90] China's per capita gross domestic product (GDP) reached almost $9,000 in 2017, below the global average per capita GDP of $10,190.[91] As more Chinese consumers enter the middle class, they are increasingly spending their disposable income on personal automobiles and air travel.

Passenger vehicle sales increased at an annual compound rate of 10 percent, from 14.5 million units in 2011 to 24.2 million units in 2017.[92] During the same period, the annual number of Chinese air passengers increased from 292 million to 549 million.[93] Figure 11 charts the three largest transportation subcategories as well as China's per capita GDP. Since 2009, exports of the two leading categories—aerospace products and motor vehicles—have increased rapidly while motor vehicle parts exports experienced moderate growth.[94] Chinese consumption of transportation goods and services is expected to increase steadily, fueled by growth in new consumer segments—such as electric vehicles and shared vehicles used by mobility services—and increased demand for after-sales services.[95]

Figure 11: Transportation Exports and China's Per Capita GDP, 2002–2017 (NAICS 4-Digit)



Source: U.S. Census Bureau, NAICS database (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *http://www.census.gov/foreign-trade/balance/c5700.html*; China's National Bureau of Statistics via CEIC database.

Aviation

U.S. aerospace products are attractive to foreign customers due to functionality, branding, competitiveness, and pricing.[96] China's aviation industry, in particular, has been an eager customer. Three state-owned, low-fare airlines in China—Air China Ltd., China Southern Airlines Co., and China Eastern Airlines Corporation—have been systematically expanding their fleets over the last five years.[97] The United States sold about $16.3 billion in civilian aircraft, engines, and parts[*] to China in 2017, a 154 percent increase from 2011.[98] China's rapid purchase of foreign aircraft is part of an attempt to improve domestic aviation infrastructure. The number of commercial aircraft in China is low for the country's size and population. According to a 2016 International Trade Administration report, China had about 2,570 commercial jets compared to 7,000 in the United States.[99] This underdevelopment is due to enduring, burdensome restrictions on low-altitude airspace[†] as well as a dearth of airports.[100] For example, in 2016 the United States had 5,136 public-use airports compared to 218 civil aviation airports in China.[101] Adding to China's underdeveloped civil aviation infrastructure is the fact that many recently finished local airports were financed and built using stimulus funds without due consideration of commercial viability.[‡]

The growth in U.S. aerospace exports to China was largely due to deliveries of commercial aircraft and spare parts for Boeing aircraft.[102] Boeing delivered an average of 60 aircraft a year to China between 2007 and 2011.[103] That number has climbed to over 140 planes per year since 2013.[104] In 2017, China bought a record 202 planes from

[*] The civilian aircraft, engines, equipment and parts subcategory (NAICS 33641X) makes up virtually all U.S. aerospace exports to China. U.S. Census Bureau, NAICS database (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *http://www.census.gov/foreign-trade/balance/c5700.html*.

[†] Eighty percent of China's national airspace is devoted to military use and 20 percent is left for civil aviation. When seeking takeoff and landing permissions for civil aviation, Civil Aviation Administration of China officials can be subject to the People's Liberation Army's (PLA) extensive airspace restrictions. PLA drills and activities also routinely close off civilian airspace on short notice. For more information on China's airspace management, see Kimberly Hsu, "China's Airspace Management Challenge," *U.S.-China Economic and Security Review Commission*, November 12, 2014, 2. *https://www.uscc.gov/sites/default/files/Research/China%27s%20Airspace%20Management%20Challenge.pdf*.

[‡] For example, the local government of Dachangshan Island in northeast China spent $6 million refurbishing an airport to accommodate 42,000 passengers in 2010 and 78,000 in 2015. Yet in 2013, fewer than 4,000 passengers used the airport. Another airport in Libo, Guizhou, was completed in 2007 at a cost of $57 million. The airport was built to accommodate 220,000 passengers annually but received only 151 passengers in all of 2009. Brenda Goh, "Lovely Airport, Where Are the Planes? China's White Elephants Emerge," Reuters, April 10, 2015. *http://www.reuters.com/article/us-china-infrastructure-insight-idUSKBN0N02AT20150410*; David Pierson, "Plenty of New Airports but Few Passengers in China," *Los Angeles Times*, March 13, 2010. *http://articles.latimes.com/2010/mar/13/business/la-fi-china-airport13-2010mar13*.

Boeing which comprised about $12 billion of the total $16.3 billion in U.S. aerospace exports to China that year, underscoring the company's role as the United States' flagship producer and exporter of aerospace products.[105]

To help increase its market share in China and meet a planned increase in aircraft production, Boeing signed an agreement in 2016 to establish its first overseas completion and delivery center in Zhoushan, a city in eastern China.[106] The completion center, a joint venture with Chinese state-owned aerospace manufacturer Commercial Aircraft Corporation of China, will paint aircraft and fit their cabins before passing the aircraft to the wholly Boeing-owned delivery center.[107] Construction of the center began in May 2017 and is expected to go into operation in May 2018.[108] Chinese aviation industry analysts contend the decision of Boeing's chief rival Airbus to set up a final assembly line in the Chinese city of Tianjin, which became operational in 2008, helped the company boost its market share in China from 34 to 47 percent over the past decade.[109]

General aviation* products make up a large portion of aerospace exports not sold by Boeing. China has a rapidly expanding market for business aircraft, helicopters, and other general aviation aircraft. According to estimates from Canadian aerospace company Bombardier, greater China will account for 875 business jet deliveries worth $33 billion from 2015 to 2024.[110] Gulfstream, a U.S. general aviation firm owned by General Dynamics, has been a market leader in China's business jet market; at the end of 2016, 102 of the 318 business jets in China's business jet fleet were made by Gulfstream.† Though comprehensive data on U.S. exports of general aviation aircraft to China are unavailable, in 2016 China's business jet fleet saw a net addition of just 13 jets, less than half of the net additions in 2014.[111] This slowdown was due in part to Chinese President and General Secretary of the Chinese Communist Party (CCP) Xi Jinping's anticorruption campaign, which has led some wealthy Chinese to buy used private jets or charter them instead.‡ [112] Despite this setback, China plans to have 500 general aviation airports by 2020, compared to 300 in 2015, and to gradually increase access to low-altitude airspace.[113]

The prospects for U.S. aerospace exports to China are positive because of rising demand and the high market entry barriers domestic Chinese competitors face in commercial aviation markets.[114] According to RAND Corporation estimates, Chinese airlines are likely to purchase an average of 300 commercial aircraft annually over the next 20 years, tripling China's fleet size to 7,200 aircraft worth $1.025 trillion.§ [115] Despite China's extensive efforts to develop a viable indigenous answer to foreign competition, the two largest suppliers, Boeing and Airbus, are likely to continue their dominance of the commercial aircraft industry within and outside China for the foreseeable future.**

* General aviation is unscheduled civil aviation such as private pilots, business jets, air ambulances, forest firefighting, crop dusting, sky cranes, and tourism. Chad J. R. Ohlandt et al., "Chinese Investment in U.S. Aviation," *RAND Corporation* (prepared for U.S.-China Economic Security Review Commission), 2017, 13. *https://www.rand.org/pubs/research_reports/RR1755.html*.

† In comparison, Bombardier, Gulfstream's main competitor in China, made 80 of the 318 business jets in China's fleet. Allison Lampert and Jamie Freed, "China Tariffs on U.S. Business Jets Seen as a Boon for Canada's Bombardier, Others," *Reuters*, April 5, 2018. *https://www.reuters.com/article/us-usa-trade-china-jets/china-tariffs-on-u-s-business-jets-seen-a-boon-for-canadas-bombardier-others-idUSKCN1HC1CC*.

‡ President Xi began his anticorruption campaign in 2012, soon after becoming General Secretary of the CCP. The campaign represents the most far-reaching effort aimed at fighting graft within the CCP since Mao Zedong's death in 1976. The campaign has targeted ostentatious displays of wealth, including purchases of expensive teas, liquors, artifacts, and cars by CCP members. Jerry Hirsch, "Carmakers Fret over China's Slowing Auto Market," *Los Angeles Times*, September 2, 2015. *http://www.latimes.com/business/autos/la-fi-0902-automakers-china-20150903-story.html*; Hudson Lockett, "China Anti-Corruption Campaign Backfires," *Financial Times*, October 9, 2016. *https://www.ft.com/content/02f712b4-8ab8-11e6-8aa5-f79f5696c731*.

§ For more information on the future and prospects of China's aviation market as well as the Chinese government's efforts to build indigenous aircraft manufacturing capacity, see Chad J. R. Ohlandt et al., "Chinese Investment in U.S. Aviation," *RAND Corporation* (prepared for U.S.-China Economic Security Review Commission), 2017. *https://www.rand.org/pubs/research_reports/RR1755.html*.

** There are three main reasons for the enduring duopoly of Boeing and Airbus, according to a RAND Corporation report. Annual purchases of these aircraft are low compared to other manufactured goods, making it difficult for newcomers to claim market share from cost-efficient established firms. Second, the requirements for bringing new commercial aircraft to market are prohibitive, often taking ten years and billions of dollars of upfront investment. Finally, the greater fuel efficiency of Boeing and Airbus-produced aircraft makes their operational costs significantly lower than that of other competitors. Chad J. R. Ohlandt et al., "Chinese Investment in U.S. Aviation," *RAND Corporation* (prepared for U.S.-China Economic Security Review Commission), 2017, 9–12. *https://www.rand.org/pubs/research_reports/RR1755.html*.

Motor Vehicles

China has emerged as the world's largest producer of and market for motor vehicles, a category that includes passenger automobiles, tractors, trucks, and motorcycles.[116] China's motor vehicle market has been largely supplied by domestic production; in 2017, 24 million passenger vehicles were sold in China while China imported just 267,473 vehicles from the United States.[117] U.S. manufacturers' competitive cost structures have enabled them to export an increasing number of motor vehicles to China from their U.S. operations.[118] Much of the increase in U.S. motor vehicle exports has been driven by passenger automobile exports. Since 2010, China has become the largest export market for U.S. passenger cars; exports of these automobiles jumped from $5.3 billion in 2011 to $10 billion in 2017, an average annual increase of about $664 million.[119]

Although U.S. motor vehicle exports are sizeable, China's central and local governments have enacted discriminatory policies to encourage domestic production over foreign-based production. For example, China subsidizes buyers of domestic brands through direct monetary transfer, tax and fee waivers, and low-interest loans and requires government agencies to purchase locally manufactured cars.[120] China also imposed a prohibitive 25 percent tariff on foreign automobile imports, which was reduced to 15 percent in July 2018, compared to 2.5 percent in the United States.[121] In 2011, China retaliated against U.S. antidumping duties on its solar panels by levying even higher duties on large engine cars made by several U.S. car manufacturers,* affecting about two-thirds of U.S. auto exports to China.[122] China removed the duties in 2013 after the United States launched a legal challenge at the WTO; in 2014 a WTO dispute settlement panel ruled against China finding that China had failed to establish the imports were causing injury to its domestic industry.[123]

China's preferential policies and tariffs incentivize foreign companies to outsource production to joint ventures with Chinese manufacturers, which are often inefficient state-owned enterprises.[124] In 2017, for example, the United States exported a total of 267,473 vehicles to China while General Motors (GM) and its joint venture partners sold over 4 million vehicles in China.[125] These numbers demonstrate Chinese demand for U.S.-branded passenger cars is overwhelmingly being met by domestic production rather than by imports from U.S. manufacturing plants.

Since 2013, officials from China's Ministry of Commerce and National Development and Reform Commission have suggested China will loosen joint venture restrictions, which currently forbid foreign auto companies from owning more than half of any such partnership.[126] The goal of this relaxation would be to encourage competition and efficiency in China's car market, but the China Association of Automobile Manufacturers—the country's main auto industry group—has expressed concerns that local brands would be "killed in the cradle" if the cap on foreign ownership was removed.† Nonetheless, in April 2018 the Chinese government announced that by 2022 it will end joint venture requirements for foreign automakers.[127]

China's auto parts market is booming as consumers increase vehicle purchases and the average car age rises to five years in 2017.[128] Exports of U.S. auto parts have almost tripled from $1.2 billion to $3 billion from 2011 to 2017.[129] Unfortunately, discriminatory regulations continue to substantially limit the potential for further expansion. Chinese auto parts producers benefit from government policies targeting batteries, electric motors, electronic control systems, and fuel cells, including caps on majority foreign ownership, import restraints, domestic content rules, export requirements, and domestic and export subsidies.[130]

Computer and Electronics

China boasts the largest population of internet users of any country, numbering about 770 million in January 2018.[131] As China expands its digital infrastructure to facilitate growing internet traffic and mobile services, U.S. exports of computer and electronics products, which are largely high-value-added inputs, have steadily increased. From 2012 to 2017, total computer and electronics exports increased at an average rate of $531 million a year,

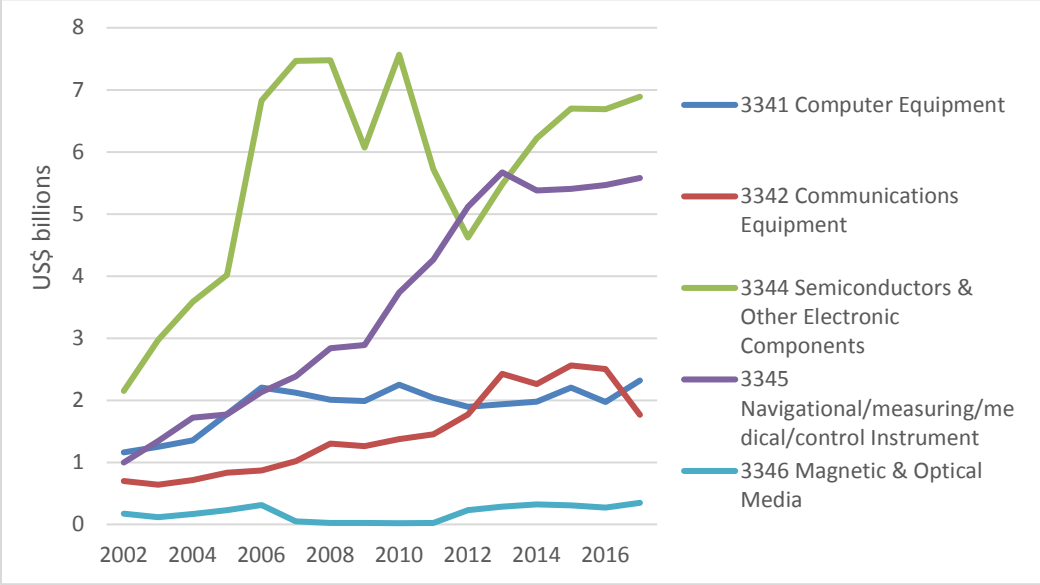
* General Motors faced a 22 percent higher tariff on some sport-utility vehicles (SUVs) and other cars with engine capacities above 2.5 liters. Chrysler vehicles assembled in the United States received a 15 percent penalty, while a 2 percent levy was imposed on BMW. Graeme Wearden, "China Imposes Tariff on U.S. Car Imports," *Guardian*, December 14, 2011. *https://www.theguardian.com/business/2011/dec/15/china-taxes-us-car-imports*.

† China's three biggest automakers earned a combined $7.7 billion in net income in 2016, mostly from sales of foreign brands. Bloomberg, "China Carmakers May Be 'Destroyed' if Foreign Venture Cap Lifted," April 18, 2017. *https://www.bloomberg.com/politics/articles/2017-04-18/china-carmakers-may-be-destroyed-if-foreign-venture-cap-lifted*.

reaching about $17.1 billion in 2017.[132] Although this is a significant increase, it is about two-thirds the rate of growth between 2002 and 2011.[133] The main cause of slower growth was a general economic slowdown, which decreased demand for navigation, measuring, and controlling instruments among distressed end-use industries like oil, gas, steel, and coal power.[134] Still, overall growth in the computer sector over the last six years was buttressed by a steady recovery in semiconductor exports from a precipitous drop from 2010 to 2012.[135]

China has come to dominate the world's computer and electronics markets through access to cheap labor, regional supply chains, large economies of scale, and a huge domestic market. While China sources most of its inputs domestically or from countries in the Asia-Pacific region, China's computer manufacturing industry relies on imports of higher-value, advanced electronics from the United States.[136] The United States continues to have a competitive edge in the production of higher-end products like semiconductors and navigational equipment, which were the first- and second-largest electronics exports, respectively. Figure 9 graphs trends in U.S. exports of computer and electronics products to China since 2002. Semiconductor exports reached $6.9 billion in 2017, a 20 percent increase from 2011.[137] Navigation, measuring, medical, and control instruments was the fastest-growing subcategory, increasing 30 percent from 2011 to $5.6 billion a year in 2017.[138] Communications and computer equipment exports continued to hover around $2 billion a year from 2012 to 2017 while magnetic and optical media exports remained steady at about $300 million a year.[139]

Figure 9: U.S. Computer and Electronics Exports, 2002–2017 (NAICS 4-digit)



Source: U.S. Census Bureau, NAICS database (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *http://www.census.gov/foreign-trade/balance/c5700.html.*

Semiconductors

China is the world's largest and fastest-growing market for semiconductors, comprising 29 percent of the global market in 2015.[140] It is also heavily dependent on imports, with domestic production accounting for just 9 percent of consumption in 2015.[141] China received 56 percent of its imports from the United States, about $6.7 billion in 2015.[142] U.S. semiconductor exports to China, though sizeable, have vacillated since 2010. Exports plummeted from $7.6 billion in 2010 to $4.6 billion in 2012.[143] This drop was partially caused by reduced demand for finished

products—such as personal computers and laptops—containing advanced DRAM chips.* [144] Chip suppliers' large inventories,† which reduced demand for additional semiconductor products, also contributed to the decline.[145]

Since 2013, U.S. semiconductor exports have rebounded, increasing about $1.4 billion from $5.5 billion in 2013 to $6.9 billion in 2017.[146] Chinese demand for semiconductors has been driven by increasing global demand for consumer electronics, telecommunications equipment, and other information and communications technology (ICT) products.[147] In a 2016 report, the U.S. Department of Commerce's International Trade Administration forecasts China's semiconductor consumption to continue double-digit growth for years to come, making for positive near-term prospects for U.S. exports.[148] However, the report also notes that "China has accelerated implementation of its strategy to develop a completely domestic [ICT] supply chain"; this strategy and the market access barriers it entails for foreign firms cast doubt on the long-term prospects for U.S. semiconductor exports to China.‡ [149]

Navigation, Control, Measuring, and Medical Instrument

The fastest-growing electronics export category by value was navigation, control, measuring, and medical instruments.[150] U.S. exports increased from $4.3 billion in 2011 to $5.6 billion a year in 2017.[151] Exports of the largest subcategories, measuring and control instruments, grew quickly after 2010. Between 2010 and 2013, annual Chinese purchases of these products increased about $1.4 billion, reaching $4 billion in 2013.[152] This growth was driven by burgeoning demand from end-use industries, such as manufacturing and oil and gas sectors, for more precision and computer-embedded systems that are used in mechanical or electrical systems.[153] After 2013, a strong U.S. dollar, a slump in commodity prices, and slowing Chinese GDP halted the export growth of control and measuring tools.[154] The global drop in energy commodity prices led Chinese oil and gas corporations to cut capital expenditures.[155] These cuts contributed to a $400 million decline in control and measuring instrument exports from 2013 to 2014, and exports of these products have stayed flat since 2014.[156]

While other categories of electronics exports have been relatively volatile over the last six years, U.S. medical device§ exports to China have consistently increased since China's 2001 accession to the WTO. China's aging population, increasing urbanization, and rising incidence of lifestyle-related diseases like diabetes and cancer have necessitated increased expenditures on healthcare in China.[157] In 2002, China imported $235 million in medical devices from the United States; by 2017, yearly imports reached $1.8 billion.[158] Unlike measuring and control instruments, medical instrument exports have grown steadily through China's economic slowdown and are likely to continue to grow as China's population ages; according to UN estimates, the proportion of Chinese 65 and older will triple from 8 percent in 2010 to 24 percent in 2050.[159]

Machinery

Although machinery is the United States' fourth-largest manufacturing export to China, it is also the worst performing category among U.S. manufacturing exports, shrinking $1.4 billion from 2011 to 2017.[160] Annual exports of machinery products increased from $2.9 billion in 2002 to $10.7 billion in 2011, but from 2011 to 2017, overall machinery exports fell by 13 percent from $10.7 billion to $9.3 billion.[161] Figure 7 charts the top six U.S. machinery exports to China.

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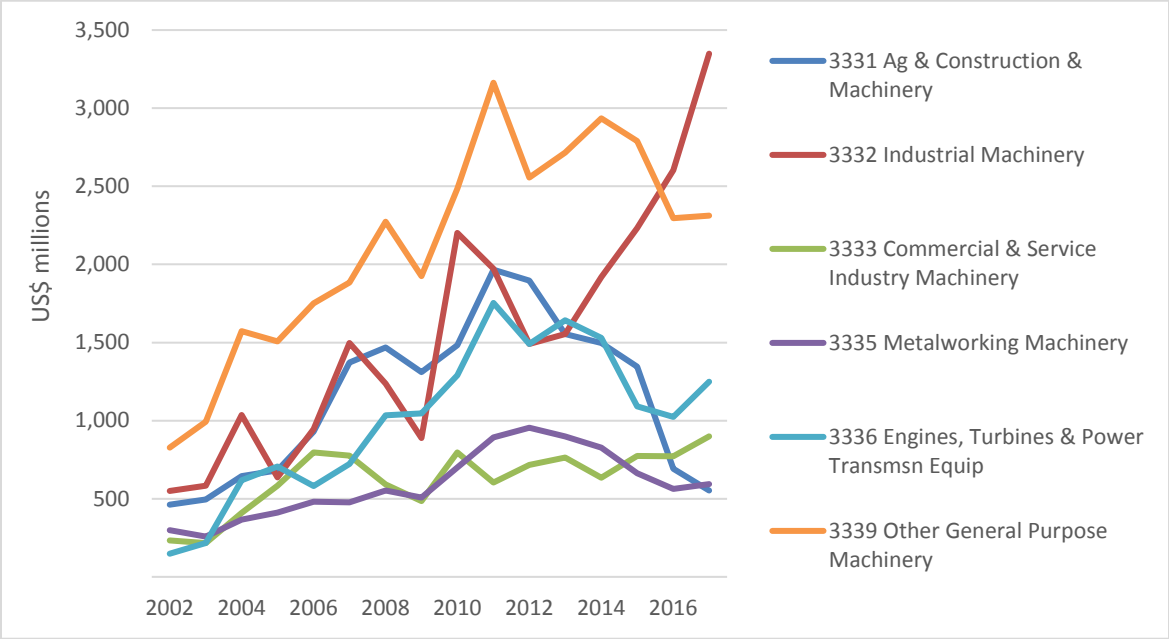
* DRAM stands for dynamic random access memory, a type of high-performance memory chip that is the most common type of RAM found in personal computers and workstations. Future Electronics, "What Is DRAM?" *http://www.futureelectronics.com/en/memory/dram.aspx*.

† Global inventories held by semiconductor suppliers surged to their highest level in more than two years at the end of 2010. Suppliers had a total 83.6 days of inventory (DOI) during the fourth quarter of 2010, a 7 percent increase over the previous quarter. DOI measures the number of days a company holds inventory before selling it. IHS Markit, "Semiconductor Inventories Swell to Alarming Level," February 16, 2011. *https://technology.ihs.com/388789/semiconductor-inventories-swell-to-alarming-level*.

‡ For more on China's efforts to develop globally competitive domestic semiconductor firms, see U.S. China Economic and Security Review Commission, Chapter 1, Section 3, "13th Five-Year Plan," in *2016 Annual Report to Congress*, November 2016, 155–160.

§ Medical devices include medical, surgical, veterinarian instruments, X-ray apparatuses and parts, and orthopedics and artificial body parts. U.S. Census Bureau, HS database (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *http://www.census.gov/foreign-trade/balance/c5700.html*.

Figure 7: Machinery Exports, 2002–2017 (NAICS 4-Digit)



Source: U.S. Census Bureau, NAICS database (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *http://www.census.gov/foreign-trade/balance/c5700.html.*

The underlying weakness in the machinery sector is tied to larger trends in China's capital-intensive heavy industries. Overinvestment[*] and a slowing domestic economy have led to low commodity prices, enduring overcapacity, and excessive corporate debt. This has led to distress in traditional manufacturing industries, which had to cut back their fixed asset investment (FAI).[†]

The slowdown in FAI in construction, metal, and mining sectors helps explain the decline in overall machinery exports since 2011, but the acceleration of FAI in farming should have helped buoy exports of agricultural machinery. China's investment in farming and forestry has skyrocketed from an annual FAI of $108 billion (RMB 679 billion) in 2011 to about $391 billion (RMB 2.5 trillion) in 2017, as part of the country's campaign to upgrade and industrialize its agricultural sector.[162] However, during the same period, U.S. agricultural machinery exports to China shrank from $331 million to $166 million.[163] The decline in agricultural machinery exports is in large part a result of China's industrial policies and farm machinery subsidies.[164] Made in China 2025—the country's industrial blueprint—dictates that at least 90 percent of agricultural equipment will be produced in China by 2020 and more than 95 percent by 2025.[165] In addition, the Chinese government maintains an extensive system of subsidies for farmers to purchase domestically produced machinery and equipment.[166]

By contrast, some subcategories of machines have experienced positive growth. Exports of industrial machines have grown strongly mainly due to increased sales of semiconductor machinery.[167] From 2011 to 2017, exports of these machines grew from $1.4 billion to about $2.6 billion a year.[168] The semiconductor industry in China continues to grow rapidly, driven by booming domestic consumption, increasingly competitive Chinese semiconductor companies, and government policies that encourage indigenous production.[169]

[*] China's $586 billion stimulus program, implemented in 2008 during the global financial crisis, was designed to develop infrastructure projects and protect heavy industry through subsidies and other fiscal support measures. The stimulus pumped about $220 billion into transport infrastructure projects, which generated a rapid recovery and expansion in upstream sectors such as steel, machinery, and metals. However, the extent of overinvestment in wasteful or insolvent projects became apparent as investment levels and economic activity declined. Wayne M. Morrison, "China and the Global Financial Crisis: Implications for the United States," *Congressional Research Service*, June 3, 2009, 5–6.

[†] FAI is a measure of capital spending that covers investment in physical assets like real estate infrastructure, machinery, and equipment. *Financial Times*, "Definition of Fixed Asset Investment." *http://lexicon.ft.com/Term?term=fixed-asset-investment*.

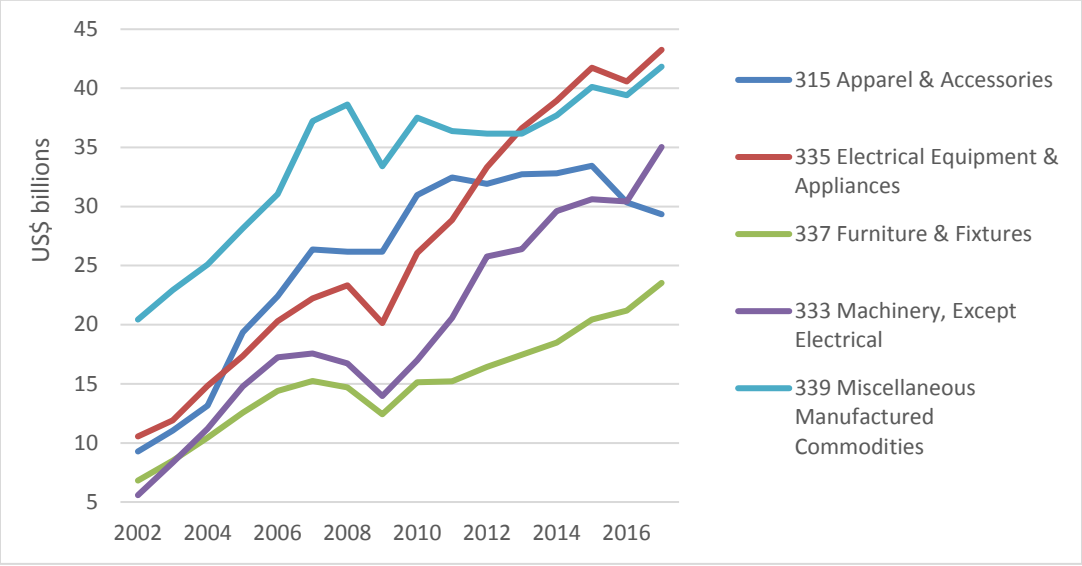
Imports

The United States is China's largest goods export market and U.S. consumers have come to rely on China to supply a host of manufactured products such as electronics, machinery, furniture, and apparel.[170] Overall, Chinese imports to the United States continued to grow faster than U.S. exports to China. The value of imported Chinese goods grew about 27 percent from $400 billion in 2011 to $506 billion in 2017.[171] U.S. exports to China increased 25 percent from a much smaller baseline from $104 billion in 2011 to $130 billion in 2017.[172]

In the decade after China joined the WTO, its exports to the United States were dominated by computer and electronics products, which accounted for 37 percent of total Chinese exports to the United States in 2011.[173] This trend has continued in the period since 2011, but growth in this category has slowed, owing to a $7 billion decline in U.S. imports of computer equipment from 2011 to 2017.[174]

Figure 12 charts the top five U.S. imports from China, excluding computer and electronics products.[175] The three fastest-growing categories were machinery, furniture, and electrical equipment. U.S. machinery imports rose 70 percent from 2011 to $35 billion in 2017, while U.S. imports of Chinese furniture and fixtures grew by 55 percent to $23.5 billion over the same period.[176] U.S. imports of electrical equipment and appliances increased 50 percent from 2011 to $43.3 billion in 2017.[177]

Figure 12: Top Five U.S. Imports from China, Excluding Computer and Electronics Products, 2002–2017 (NAICS 3-Digit)



Note: Computer and electronic products are not included in this figure because their numbers are many times higher than the other import categories presented. Computer and electronics imports are discussed in the subsequent section.
Source: U.S. Census Bureau, NAICS database (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *http://www.census.gov/foreign-trade/balance/c5700.html*.

Not all categories experienced growth, however. The biggest reversal was in apparel and accessories, with China exporting less clothing, handbags, and shoes to the United States. U.S. imports of these products increased by $23 billion from 2002 to 2011, but have decreased by $2.6 billion over the last six years.[178] Despite remaining the largest supplier of apparel to the United States, China's share of U.S. apparel imports has fallen to 34 percent in 2017 after peaking at 39 percent in 2010 as rising labor costs in China are driving apparel brands to pursue sourcing options in countries like India, Mexico, and Vietnam.[179]

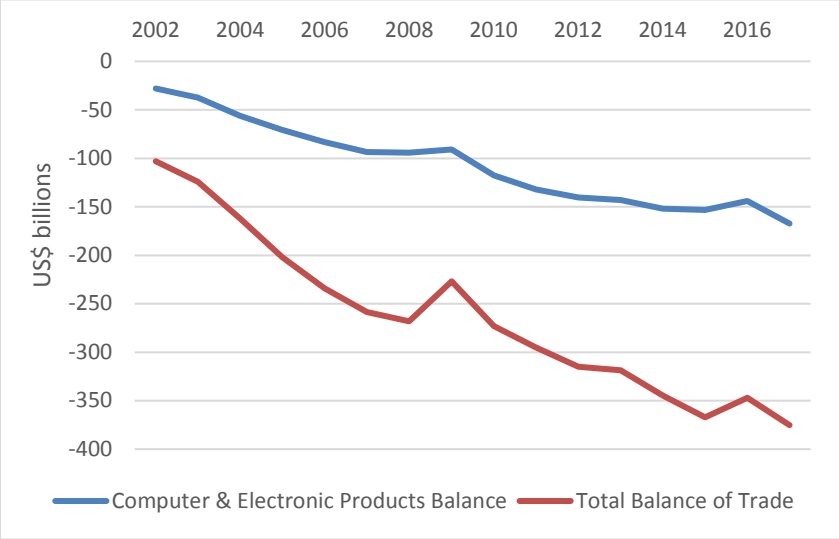
Computer and Electronics

Over the past two decades, China has become a powerhouse in the manufacture and assembly of computer and electronics products. Low labor costs, a central position in East Asia, and preferential policies in China's special

economic zones* caused a structural readjustment of global supply chains and enabled China to become the world's hub for the production of laptops, phones, and data storage devices. In 1990, 47.1 percent of U.S. manufactured imports came from countries in the Asia-Pacific region; this figure had barely moved by 2015, hovering at 46.8 percent.[180] During the same period, however, the share of U.S. imports from China rose from 3.6 percent to 26.1 percent.[181] This was partly the result of multinational electronics companies in neighboring countries like Taiwan, Japan, Hong Kong, and South Korea moving their export-oriented manufacturing facilities to China.[182]

Computer and electronics products are by far the United States' largest import from China, comprising 37 percent of total imports from China in 2017.[183] From 2002 to 2017, U.S. imports of computer and electronic products ballooned from $33 billion to $184 billion.[184] This massive influx of goods has been the primary driver of the bilateral trade deficit. Figure 13 charts the balance in computer and electronic goods compared to bilateral trade deficit as a whole.[185] The computer and electronics sector's contribution to the U.S. trade deficit with China peaked in 2013 at 44.9 percent; this ratio has remained constant at 44.6 percent in 2017.[186]

Figure 13: Computer and Electronics Deficit, 2002–2017

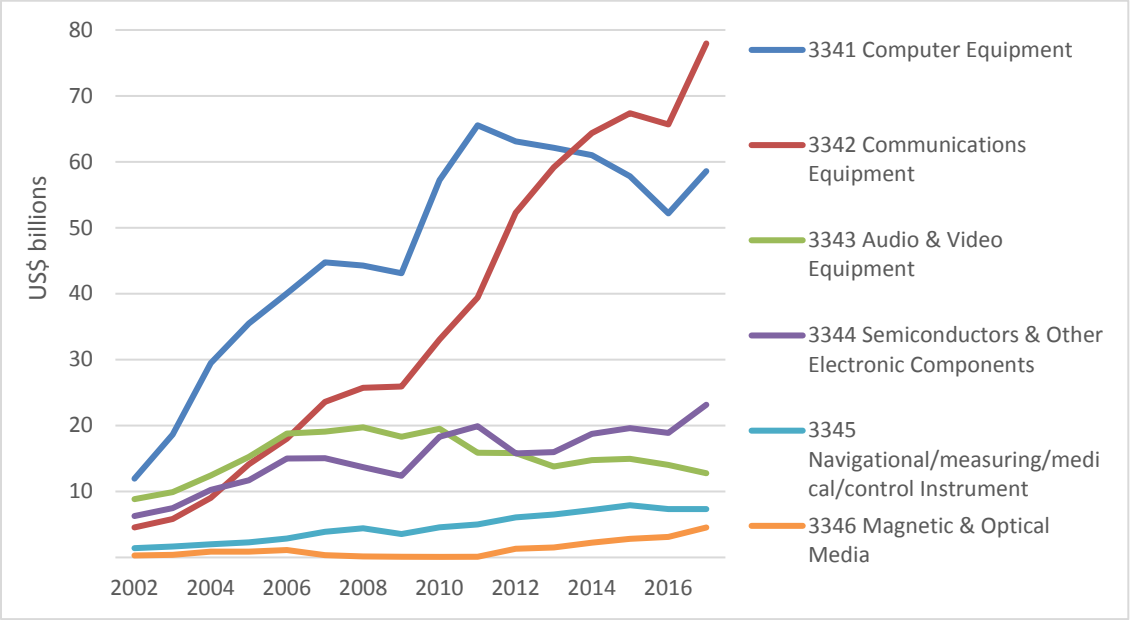


Source: U.S. Census Bureau, NAICS database (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *http://www.census.gov/foreign-trade/balance/c5700.html*.

Figure 14 charts the top six computer and electronics imports.[187] Notably, communications equipment overtook computer equipment as the largest category in 2014.[188] This inversion is due to both a steady decline in imports of computer equipment as well as rapid growth in sales of communications equipment after 2011.[189] Declines in computer equipment imports were largely driven by reduced purchases of electronic computers, with U.S. consumers buying $1.5 billion less of Chinese-made computers in 2017 than in 2011.[190] U.S. demand for personal computers and servers has been slowing as consumers shift towards mobile devices.[191] In addition, audio and video equipment imports declined by $3.1 billion over the same period, driven primarily by reduced sales of cameras, camcorders, and radios.[192]

* China's special economic zones (SEZs) are designated geographical areas subject to economic regulations that differ from other areas in the country and tend to be conducive to foreign direct investment. The first SEZs were first established in 1980 in the southeastern coastal cities of Shenzhen, Zhuhai, Shantou, and Xiamen. Governments in these zones were allowed to offer tax incentives and special licensing treatment to foreign investors without approval of the central government. The zones became re-exporting centers where goods were imported for assembly and subsequently exported. The success of the four SEZs led the Chinese government to add 14 cities and Hainan province to the list of SEZs in 1984, and new SEZs continue to be added, including border cities, provincial capitals, and autonomous regions. Investopedia, "Special Economic Zone – SEZ." *https://www.investopedia.com/terms/s/sez.asp*.

Figure 14: U.S. Computer and Electronics Imports, 2002–2017 (NAICS 4-Digit)



Source: U.S. Census Bureau, NAICS database (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *http://www.census.gov/foreign-trade/balance/c5700.html*.

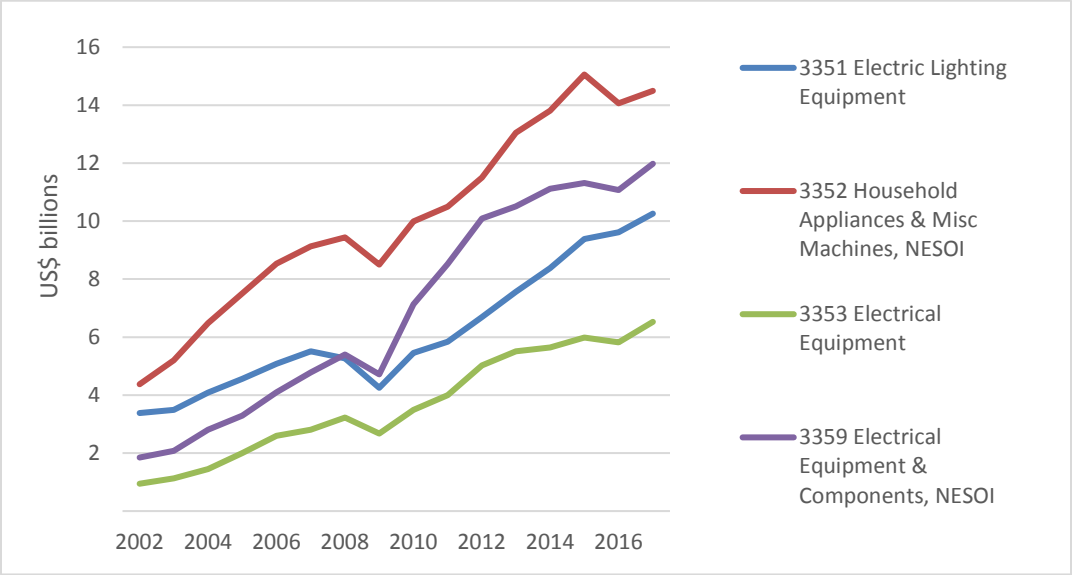
The downward trends in the computer and audio and visual equipment subcategories were offset by large gains in imports of communications equipment and magnetic and optical media. U.S. communications equipment imports from China reached $78 billion in 2017—a 98 percent increase from 2011—mainly driven by imports of wireless communications equipment.[193] The fastest-growing computer and electronics import was magnetic and optical media.* U.S. imports of these products soared 4,500 percent from $99 million in 2011 to $4.5 billion in 2017.[194] The amount of data created by consumers and businesses has been growing exponentially: according to estimates from research group International Data Corporation in 2017, the amount of data created worldwide will grow ten-fold by 2025.[195] U.S. consumers and businesses' increasing demand for data storage is likely to continue to drive strong growth in imports of hard drives and other storage devices from China.

Electrical Equipment and Appliances

China is increasingly supplying electrical equipment and consumer appliances to U.S. homes and businesses. Electrical equipment and appliances was the second-largest import category (behind computer and electronics products) over the last six years.[196] From 2011 to 2017, imports increased 50 percent from $28.8 billion to $43.3 billion a year.[197] The primary drivers of these gains were the recovery of the housing market and outsourcing of production to China by appliance manufacturing companies. Figure 16 shows that growth over the last six years was evenly distributed among the four subcategories of electrical equipment and appliances.[198]

* This category comprises different data storage devices, like hard drives, CDs and DVDs, and magnetic tape storage.

Figure 16: U.S. Electric Equipment and Appliances Imports, 2002–2017 (NAICS 4-Digit)



Note: NESOI stands for "not elsewhere specified or indicated."
Source: U.S. Census Bureau, NAICS database (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *http://www.census.gov/foreign-trade/balance/c5700.html*.

The largest subcategory was household appliances and miscellaneous machines. Imports grew from $10.5 billion to $14.5 billion from 2011 to 2017 due to growth in residential construction and home improvements in the United States, a strong driver of demand for household appliances.[199] Household cooking appliances, including products like microwaves, stovetops, and ovens, are the mainstay of U.S. appliance imports; U.S. imports of these products from China increased $2.2 billion over the last six years to reach an annual total of $3.3 billion in 2017.[200] However, growth in household appliances has moderated due to steep declines in laundry equipment imports (mainly washing machines) since 2016, which fell from a high of $1.2 billion in 2015 to $152 million in 2017.[201] An important factor underlying this trend is that until recently, South Korean companies LG and Samsung—which produce the vast majority of washing machines imported by the United States—outsourced or expanded washing machine production in China to utilize lower production costs and avoid U.S. antidumping and countervailing duties.[*] [202] As a result, U.S. imports of laundry equipment from China surged from $372 million in 2012 to $1.2 billion in 2014.[203] However, in January 2017, the U.S. Department of Commerce issued an antidumping order on washing machines from China.[204] This led to another shift in production, this time to Thailand and Vietnam, causing U.S. laundry equipment imports from China to drop to $152 million in 2017.[†] [205]

China also exported a substantial amount of lighting and electrical equipment to the United States for both residential and commercial purposes over the past six years. Together, imports of lighting and electrical equipment grew 57 percent to $28.8 billion in 2017.[206] China's domestic lighting market has been growing at an impressive speed due to rapid urbanization, energy conservation efforts, and consumer upgrading.[207] These forces have increased the efficiency, quality, and variety of Chinese lighting products, making them more competitive.[‡] Lighting fixtures—a broad subcategory including products such as ceiling lights, outdoor lighting, illuminated signs, and Christmas lights—was the best performer among electric equipment products. U.S. fixture imports from China increased 108 percent to $9.7 billion from 2011 to 2017.[208] Switchgear apparatuses[§] came in a distant second;

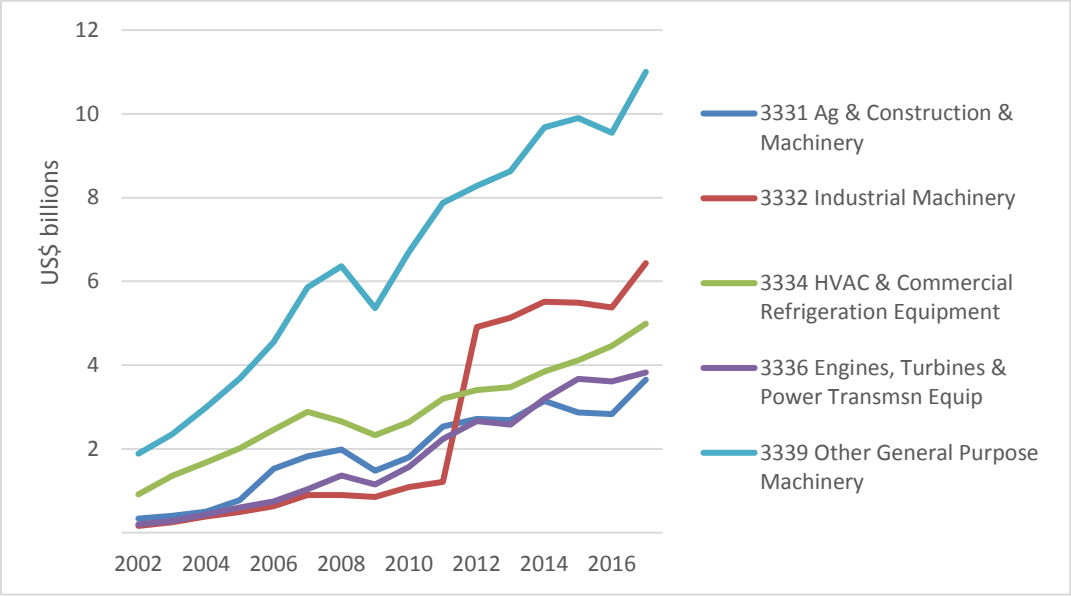
[*] In February 2013, the U.S. Department of Commerce issued antidumping and countervailing duties on washer imports from South Korea.
[†] In January 2018, President Trump approved global safeguard tariffs on washing machine imports following the U.S. International Trade Commission's determination that increased imports of these products were a "substantial cause of serious injury" to U.S. manufacturers as a result of investigations under Section 201 of the Trade Act of 1974.
[‡] Even so, foreign brands like Philips and General Electric still dominate the high-end lighting market in China. HKTDC Research, "China's Lighting Market," July 8, 2016. *http://china-trade-research.hktdc.com/business-news/article/China-Consumer-Market/China-s-Lighting-Market/ccm/en/1/1X000000/1X002MOI.htm*.
[§] This subcategory comprises equipment for controlling the flow of electricity in power production and manufacturing plants as well as households; it includes circuit breakers, control panels, fuses, and power switching equipment.

imports of these products more than quintupled from $282 million in 2011 to $1.9 billion in 2017.[209] Purchases in the wiring devices and motors and generator subcategories both increased by over $1 billion from 2011 to 2017.[210] Growth in these imports was tempered somewhat by a slowdown in the imports of lightbulbs and relays and industrial controls, which declined $638 million and $261 million, respectively, from 2011 to 2017.[211]

Machinery

U.S. machinery imports from China increased about $1.5 billion a year over the last six years, totaling $35 billion in 2017, as the housing market recovery and boom in oil and gas production drove demand for machinery imports.[212] Figure 15 shows trends in the five largest U.S. machinery import categories since China's accession to the WTO.[213]

Figure 15: U.S. Machinery Imports, 2002–2017 (NAICS 4-Digit)



Source: U.S. Census Bureau, NAICS database (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *http://www.census.gov/foreign-trade/balance/c5700.html*.

The largest category by value was general purpose machinery, which totaled $11 billion in 2017, up from $7.9 billion in 2011.[214] The fastest-growing imports by value within this sector were power-driven handtools and air and gas compressors, which increased by $1.1 billion and $822 million, respectively, from 2011 to 2017.[215] The growth in power-driven handtool imports tracked the U.S. construction market's recovery from the recession.[216] Increased demand from the U.S. crude petroleum and natural gas industry and the waste and wastewater treatment industry contributed to a $537 million increase in imports of pumps and pumping equipment from 2011 to 2014; however, reduced spending on infrastructure in the U.S. crude petroleum and natural gas industry led to a $400 million drop in imports from 2014 to 2017.[217]

Industrial machinery imports jumped from $1.2 billion in 2011 to $4.9 billion in 2012, as the North American Industry Classification System (NAICS) revised its definition of industrial machinery to include semiconductor machinery, which totaled $3.5 billion in 2012.[218] Imports of semiconductor machinery have grown steadily, totaling $4.3 billion in 2017.[219] Another industrial machinery subcategory of interest is that used in the production of wood-based products. Improvements to U.S. housing starts have supported demand for wood products as well as the machines that process them.[220] As such, sawmilling, woodworking, and paper machinery imports rose 77 percent to $700 million from 2012 to 2017.[221]

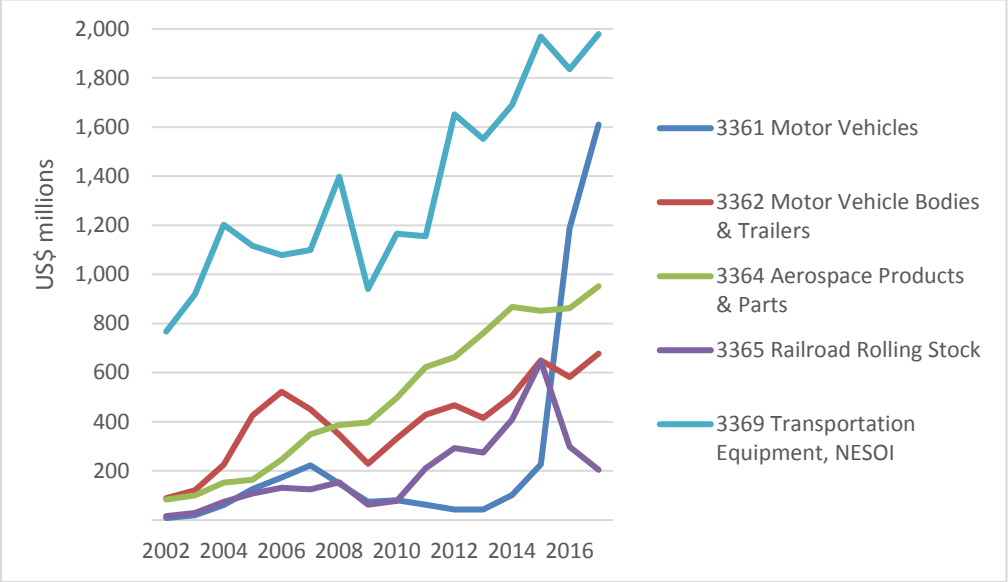
The United States' third-largest machinery import from China was heating, ventilation, and air conditioning (HVAC) equipment.[222] Air conditioning, heating, and commercial refrigeration equipment was the fastest-growing HVAC import subcategory, increasing from $2.3 billion in 2011 to $3.6 billion in 2017.[223] Growth in U.S. residential and commercial construction and home improvement spending contributed to the large increase in imports of HVAC equipment.[224]

Transportation

Although not among the top five categories of U.S. imports from China, transportation is notable for being the fastest-growing category in the top ten from 2011 to 2017. Total U.S. purchases of these goods increased 76 percent—about $8.2 billion—over this period, reaching $19.1 billion in 2017.[225] Figure 17 charts the top five transportation imports, excluding motor vehicle parts, from 2002 to 2017.[226] Transportation imports have largely been driven by imports of motor vehicles and motor vehicle parts. China has long viewed the automotive industry as a pillar of economic growth, and Chinese policymakers have shielded the sector with import restraints, domestic content rules, technology transfer policies, and domestic and export subsidies.[227] China's domestic automotive industry has boomed since the turn of the century, growing at an annual compound rate of 11.4 percent from 2004 to 2014.[228] With a protected and growing market, Chinese automotive manufacturers have developed technical sophistication and economies of scale. While Chinese vehicle parts manufacturers have made impressive gains in international markets, Chinese vehicle manufacturers have had more limited success.

The second-largest category of transportation imports is transportation equipment, a catchall category primarily composed of motorcycles, bicycles, and parts. U.S. imports of motorcycles, bicycles, and related parts increased 32 percent over the last six years, totaling $1.5 billion in 2017.* From 2003 to 2014, China accounted for about 70 percent of all U.S. bicycle imports; China is also the largest source of innertubes, seats, lighting, and other safety equipment for bikes.[229] Aerospace equipment is another category of interest. Aircraft parts and auxiliary equipment, along with aircraft engines and engine parts, are the largest subcategories. These products have been growing steadily, albeit from a relatively low baseline: China exported $490 million and $443 million worth of these goods, respectively, to the United States in 2017 compared to $361 million and $239 million in 2011.[230]

Figure 17: U.S. Transportation Imports, Excluding Motor Vehicle Parts,† 2002–2017 (NAICS 4-Digit)



Source: U.S. Census Bureau, NAICS database (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *http://www.census.gov/foreign-trade/balance/c5700.html*; China's National Bureau of Statistics via CEIC database.

Motor Vehicles

China's production of motor vehicles is large and growing. China produced 29 million vehicles in 2017 and aims to produce 35 million vehicles a year by 2025; however, gains in this sector have been propped up by generous government subsidies.[231] Financial aid for China's car industry has grown 50 percent a year from 2010 to 2015, and

* The rest of the category labeled "transportation equipment, NESOI" is grouped as "all other transportation equipment." Imports of these miscellaneous products totaled about $455 million in 2017. U.S. Census Bureau, NAICS database (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *http://www.census.gov/foreign-trade/balance/c5700.html*.

† Motor vehicle parts were excluded because they were over six times the value of the second-largest transportation subcategory. A relevant graph is included in a later section.

many of the top carmakers are dependent on government subsidies to pad their profit margins.[232] For example, nearly 20 percent of profits enjoyed by Geely Automotive, one of China's leading carmakers, came from subsidies during this five-year period.[233]

The central government has begun paring back some of this support to curb overinvestment in automotive production. In December 2016, China's Ministry of Finance announced it was reducing a tax cut on small-engine cars.* According to the China Association of Automobile Manufacturers, growth in China's car sales slowed to 3 percent in 2017 compared to 15 percent in 2016.[234] China's automotive manufacturing sector is facing not only dampened demand but also significant overcapacity. Capacity utilization rates vary broadly among Chinese motor vehicle firms, ranging from 60 to 80 percent.[235] Excess capacity accounted for 54 percent of total vehicle production in 2015.[236]

One solution to overcapacity is to export a larger volume of vehicles. However, Chinese automobile producers only exported about 4 percent of their total production in 2014.[237] The United States, by comparison, exported 18 percent of all new vehicles produced in 2014.[238] Chinese passenger vehicles mainly went to developing markets like Iran and Vietnam, which imported 14 percent and 10 percent of China's exports, respectively, in the first half of 2015.[239] China has had a much more difficult time breaking into higher-income countries. As Figure 17 demonstrates, U.S. car imports from China have been negligible for most of the past six years.[240] U.S. consumers are concerned about the quality of Chinese-made vehicles, and there is a broader lack of awareness of Chinese brands.† Chinese automakers have showcased their models in U.S. auto shows for years, but many have been marred by poor construction and outdated components.[241]

Considering these limitations, the jump in U.S. imports of Chinese motor vehicles from $226 million in 2015 to almost $1.6 billion in 2017 is noteworthy.[242] During this time, U.S.-Chinese joint ventures began to market several of the first Chinese-made car models in the United States. In May 2016, GM debuted in the United States the Buick Envision, a compact SUV vehicle manufactured in China primarily for the Chinese market.[243] GM sold 14,193 Buick Envisions in the United States in 2016 and 41,040 in 2017.[244] GM began importing a plug-in hybrid variant of its Cadillac CT6 luxury sedan—also manufactured in China primarily for the domestic market—to the United States in March 2017.[245] In June 2017, Ford announced its next-generation Focus will be imported to the United States from China.[246] The current Focus produced for the North American market is manufactured at Ford's plant in Michigan.[247] The decision highlights the potential for China to export more vehicles to the U.S. market.[248]

Despite the rapid uptick in automobile imports from China since 2016, it is unlikely Chinese-made cars will become a prominent Chinese export to the United States. To date, the Buick Envision is the only model originally designed and produced for the Chinese market that found success in the United States and its success may be difficult to replicate. Two factors had to coincide to make export to the U.S. feasible: GM's Shandong factory had excess capacity to produce the Envision model, and the Envision—a small SUV—plugged an existing gap in GM's product lineup.‡ [249] At the same time, indigenous Chinese brands like GAC or Baojun continue to face formidable market entry hurdles in developed markets.

Motor Vehicle Parts

China's car sales to the United States are limited by geographic and reputational barriers, but Chinese parts producers have been extremely successful in supplying components to U.S. automakers. From 2002 to 2011, Chinese exports of motor vehicle parts to the United States increased 545 percent from $1.3 billion to $8.3 billion.[250]

* In September 2015, the central government reduced the sales tax on cars with engines of 1.6 liters or smaller from 10 percent to 5 percent. The cuts were set to expire at the end of 2016; however, in December 2016, the tax was only raised to 7.5 percent in order to prevent a sharper slowdown in car purchases. Jake Spring and Fang Cheng, "China Vehicle Sales to Grow 5 Percent in 2017 as Tax Cut Reduced," Reuters, January 12, 2017. *http://www.reuters.com/article/us-china-autos-sales-idUSKBN14W0T6.*

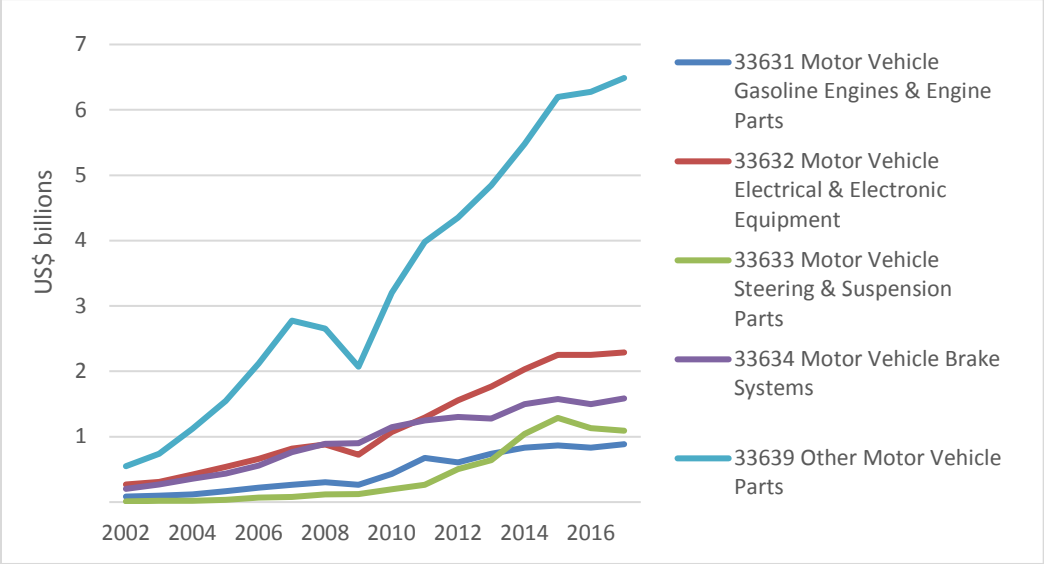
† Global brand consultancy Interbrand's 2016 list of the 100 Best Global Brands, which ranks companies according to value and how they shape consumer choice, includes just two Chinese companies: Huawei (ranked 72th) and Lenovo (ranked 99th). Adam Minter, "Why Americans Won't Buy Chinese Cars," Bloomberg, January 11, 2017. *https://www.bloomberg.com/view/articles/2017-01-12/why-americans-won-t-buy-chinese-cars*.

‡ Low gasoline prices in the United States in the last two years have revived demand for SUVs and GM did not offer many small-sized SUV models. Mike Colias, "Americans Embrace a Made-in-China Buick SUV," *Wall Street Journal*, October 6, 2016. *https://www.wsj.com/articles/americans-embrace-a-made-in-china-buick-suv-1475771438*.

Chinese auto parts manufacturers have only increased their penetration of the U.S. market over the last six years. U.S. imports of auto parts from China reached $13.5 billion in 2017, an increase of $5.3 billion from 2011.[251] This ongoing trend is mainly due to outsourcing. After China joined the WTO, the big three U.S. automakers Chrysler, GM, and Ford began demanding domestic auto parts producers match lower international prices, particularly those quoted by Chinese firms.[252] Around 2004, Chinese auto parts suppliers began effectively setting global benchmark prices on several components, such as radios, speakers, smaller motors, brakes, suspensions, and aluminum wheels.[253] U.S. parts suppliers like Superior, Delphi, and Johnson Controls responded to price pressures by investing heavily in Chinese firms.[*] [254] U.S. auto manufacturers have also begun to source parts directly from Chinese firms. Chrysler, for example, had 140 suppliers in China from which they purchased $640 million worth of auto equipment as of 2015.[255]

Figure 18 shows the top five subcategories of motor vehicle parts imports.[256] Over the last six years, the largest subcategory was other motor vehicle parts, which includes air conditioners, catalytic converters, radiators, and wheels.[257] China exported $2.5 billion more of these products in 2017 than it did in 2011.[258] The second largest subcategory was electrical and electronic equipment. This category includes alternators and generators, ignition components, and instrument control panels; imports increased by nearly $1 billion over the last six years.[259] The last noteworthy subcategory is steering and suspension parts. China sold $265 million to U.S. auto companies in 2011, but by 2017 that amount had increased 312 percent to a total of $1.1 billion.[260]

Figure 18: U.S. Imports of Motor Vehicle Parts, 2002–2017 (NAIC 5-Digit)



Source: U.S. Census Bureau, NAICS database (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *http://www.census.gov/foreign-trade/balance/c5700.html*.

Auto Parts Subsidies

The growing U.S. deficit in auto parts is not only due to the cost competitiveness of Chinese manufacturers, but is also a result of China's discriminatory and trade-distorting policies. In 2006, the United States, the EU, and Canada requested the establishment of a WTO dispute settlement panel to contest China's local content requirements for

[*] In 2012, Delphi announced it would invest about $100 million in a plant in China that manufactures high-precision fuel injection systems for cars and light commercial vehicles. In 2016, Johnson Controls announced it was spending $200 million on its fourth automotive battery manufacturing plant in tandem with its joint venture partner, Binzhou Bohai Piston Co. Jeff Bennet, "Auto-Parts Makers Invest in Mexico, China on Production Strength," *Wall Street Journal*, June 9, 2016. *https://www.wsj.com/articles/auto-parts-makers-invest-in-mexico-china-on-production-strength-1465502842*; Li Fangfang, "Auto Parts Maker to Invest $100m," *China Daily*, October 12, 2012. *http://www.chinadaily.com.cn/bizchina/motoring/2012-10/12/content_16114466.htm*.

auto parts,* which had been in place since 2004.[261] In 2008, the WTO appellate body ruled in favor of the complainants, finding that China's requirements discriminated against products on the basis of national origin.[262]

In 2007, the United States requested a dispute settlement panel at the WTO to contest China's subsidy programs targeting exporters of auto parts, steel, wood, information technology, and many other products.[263] Later that year, China signed a Memorandum of Understanding (MOU) with the United States in which China promised to eliminate these subsidies; however, Chinese planners then implemented a more sophisticated subsidy regime involving export demonstration bases.[264] Under the program, the Chinese government provided companies with subsidies contingent on meeting certain export targets.[265] Some subsidies took the form of cash grants while other subsidies took the form of free or discounted services provided by designated suppliers known as "common service platforms."[266] While the original subsidies for auto parts and other products came in the form of explicit tax breaks and requirements to purchase domestic content, the benefits under the demonstration bases program were more difficult to quantify.[267]

In September 2012, the United States filed a request for consultations with China at the WTO concerning its provision of subsidies to auto and auto parts manufacturers on the basis of their export performance.† [268] The USTR estimated that between 2009 and 2011, the value of these subsidies was at least $1 billion.[269] The United States did not subsequently request establishment of a dispute settlement panel because the USTR discovered China's export base program extended far beyond the automobile industry to seven other sectors, including textiles, agriculture, chemicals, and advanced materials and metals.[270] In February 2015, the USTR launched new consultations with China at the WTO, complaining that the demonstration bases program provided unfair and opaque subsidies to Chinese exporters.[271] In April 2016, the United States and China signed an MOU in which China agreed to end the export subsidy program.[272] By the time the MOU was signed, however, the subsidy regime had been in effect for at least seven years, and, in several respects, it was merely a more sophisticated version of the export subsidy program implemented in the mid-2000s. Trade disputes over China's auto parts subsidies demonstrate the protean nature of many of China's protectionist policies and the difficulties inherent in addressing these policies promptly.

James Lewis, a senior fellow at the Center for Strategic and International Studies, suspects that China's willingness to scrap the demonstration bases program signals not a movement toward free trade but rather a shift in priorities toward more advanced production.[273] Previous subsidies targeted auto parts, wood, metals, textiles, and agricultural products, and in the years since China joined the WTO, Chinese producers have gained considerable market share domestically and abroad. Now that these industries are globally competitive, there is less need to protect them.

Advanced Technology Products

The advanced technology products (ATP) category provides another angle from which to assess the bilateral trade relationship. Most of these products have been discussed individually or as part of another grouping, but arranging them according to technological application can be a useful tool to observe the extent to which the United States relies on China for its supply of products crucial to long-term economic growth and productivity. Trade in ATP can also demonstrate how the United States' comparative advantage in advanced technology has translated into increased exports to its largest trading partner.

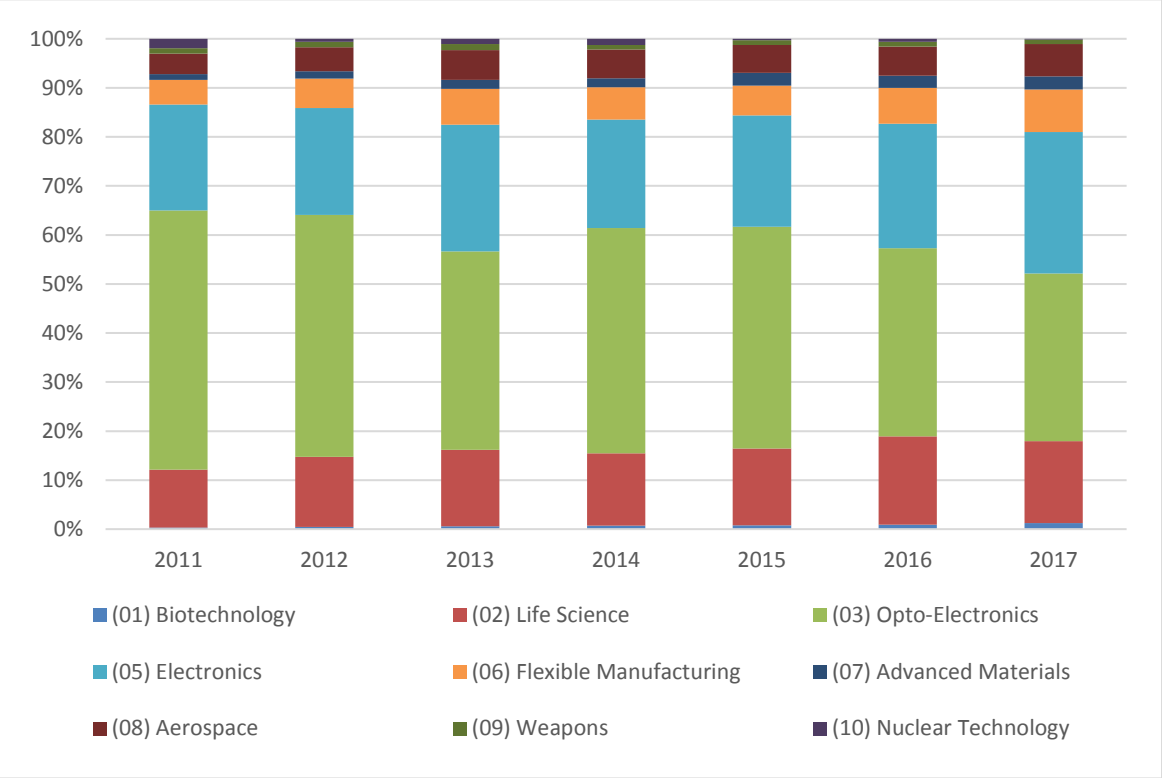
ATP trade between the United States and China over the past six years has remained lopsided in both aggregate value and composition. China continued to maintain its enormous surplus in ATP trade, driven primarily by sales of ICT products. The overall deficit grew from $109 billion in 2011 to $135 billion in 2017, largely tracking U.S. imports of ICT products from China, which increased from $115 billion in 2011 to $156 billion in 2017.[274]

* China imposed a tax on imported auto parts that corresponded to the tariff rate for complete motor vehicles (25 percent) if vehicle manufacturers failed to meet local content requirements. This rate was more than double the applicable tariff rate for auto parts (10 percent) under China's Schedule of Concessions. Office of the U.S. Trade Representative, *United States Files WTO Case against China over Treatment of U.S. Auto Parts*, March 30, 2006. *https://ustr.gov/archive/Document_Library/Press_Releases/2006/March/United_States_Files_WTO_Case_Against_China_Over_Treatment_of_US_Auto_Parts.html*; World Trade Organization, "China—Auto Parts." *https://www.wto.org/english/tratop_e/dispu_e/cases_e/1pagesum_e/ds342sum_e.pdf*.

† Export-based subsidies are forbidden under WTO agreements because they distort international trade.

Figure 19 charts the composition of U.S. ATP imports from China, excluding ICT imports.* [275] The largest decline in ATP imports was in optoelectronics, a category that includes products like solar cells and laser printers.[276] Imports of these goods dropped from 6 percent to 3 percent of total ATP imports from 2011 to 2017, a drop of $2.6 billion.[277] This decline was counterbalanced by a $1.2 billion increase in the import of electronic products and an $831 million increase in the import of life science† products over the same period.[278]

Figure 19: U.S. ATP Imports (Excluding ICT Imports), 2011–2017



Source: U.S. Census Bureau (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *https://www.census.gov/foreign-trade/statistics/product/atp/select-ctryatp.html*.

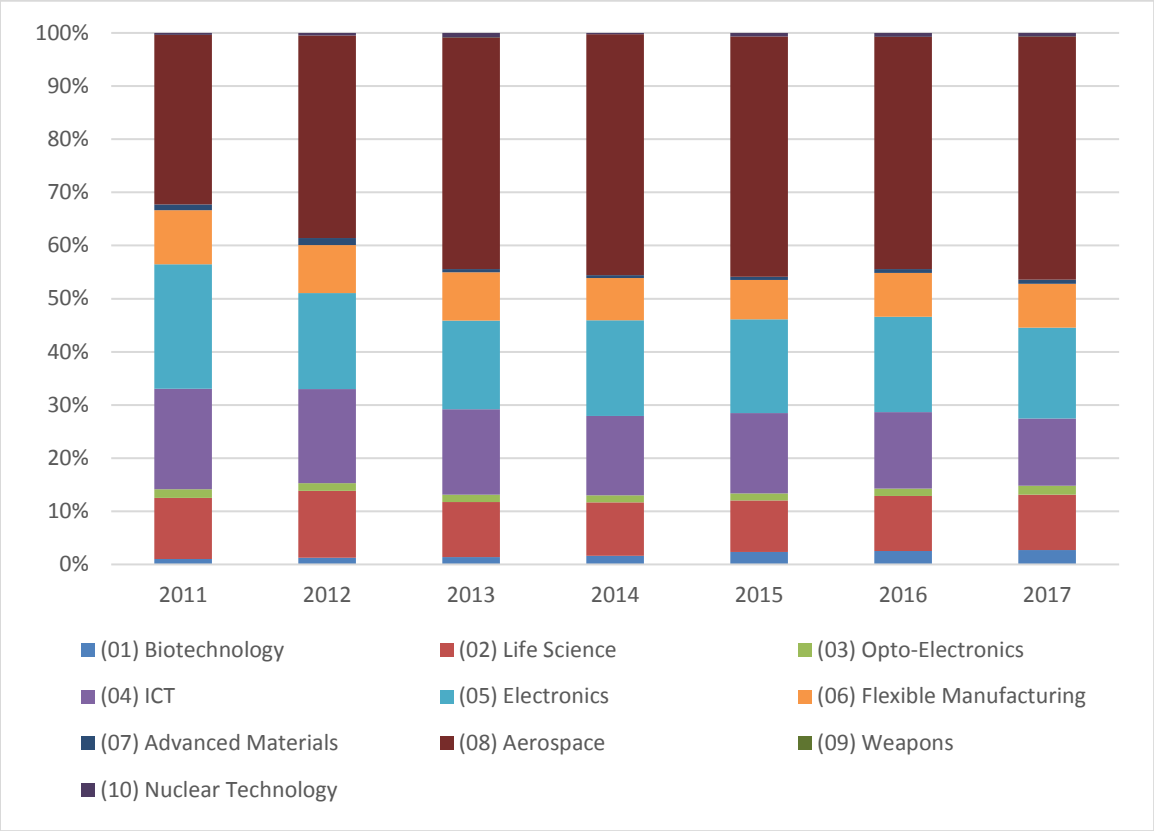
On the export side, the United States enjoyed solid gains in a broader range of ATP categories. Figure 20 charts the composition of U.S. ATP exports to China. The fastest-growing category was aerospace, annual sales of which increased by $9.9 billion over the six-year period.[279] Aerospace products' share of total ATP sales grew by about 14 percent from 2011 to 2017, mostly driven by Chinese airlines' purchase of planes from Boeing.[280] The United States also exported about $1.4 billion more in both electronics and life science products in 2017 than in 2011.[281] Another promising category was flexible manufacturing, which includes products such as robotics and numerically controlled machine tools that reduce the need for human intervention in manufacturing processes.[282] The United States exported $900 million more of these products to China in 2017 than in 2011.[283] The growth in flexible manufacturing exports corresponds to China's emphasis on smart manufacturing since 2013. [284] Finally, biotechnology‡ exports increased by $752 million over the last six years.[285]

* Despite a $41 billion increase from 2011 to 2017, ICT's share of total ATP imports has remained close to 90 percent over the past six years. U.S. Census Bureau, *U.S. Trade with China in Advanced Technology Products - Monthly and Cumulative Data (in Millions US $)* (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *https://www.census.gov/foreign-trade/statistics/product/atp/2017/12/ctryatp/atp5700.html*.

† The U.S. Census Bureau defines life science products as those that "[concentrate] on the application of scientific advances (other than biological) to medical science. Recent advances, such as nuclear resonance imaging, echocardiography, and novel chemistry, coupled with new production techniques for the manufacture of drugs have led to many new products for the control or eradication of disease." U.S. Census Bureau, *Advanced Technology Product Code Descriptions*. *https://www.census.gov/foreign-trade/reference/codes/atp/index.html*.

‡ The biotechnology sector focuses on the application of advances in genetic science to create new medicines or technologies for both human and agricultural use. U.S. Census Bureau, *Advanced Technology Product Code Descriptions*. *https://www.census.gov/foreign-trade/reference/codes/atp/index.html*.

Figure 20: U.S. ATP Exports, 2011–2017



Source: U.S. Census Bureau (Washington, DC: U.S. Department of Commerce, Foreign Trade Division, March 2018). *https://www.census.gov/foreign-trade/statistics/product/atp/select-ctryatp.html.*

Implications for the United States

Since 2011, the bilateral trade deficit has increased and the composition of U.S. goods exports to China has changed dramatically as China moves up the value-added chain. In the 2012 to 2017 period, nonmanufactured exports remained strong, but the majority of growth occurred in a few select manufacturing sectors, most notably aviation, semiconductor machinery, and medical devices. The composition of U.S. imports remained concentrated in high-tech and industrial sectors, such as computers and electronics and machinery.

U.S. export growth is limited by China's protectionist measures, particularly in value-added, high-technology sectors. The report finds existing and emerging problems with the bilateral trade relationship. China is trying to become dominant in high-technology, value-added sectors and develop internationally competitive export champions while continuing to limit foreign access to its own market. These are areas where the United States excels, but if China is successful in its plans, opportunities to export these products to China will decrease.

Previous Chinese subsidies targeted auto parts, wood, metals, textiles, and many agricultural products, and since China joined the WTO, Chinese producers have gained considerable market share domestically and abroad. Now that Chinese companies in these industries are globally competitive, there is less need to protect them. The next generation of industrial policy initiatives—such as Made in China 2025—aim to capture domestic and global market share in higher-value-added sectors, like robotics, advanced machinery, new-energy vehicles, and semiconductors. A central challenge for U.S. policymakers over the next ten years will be to adopt more proactive and flexible responses to Chinese measures protecting these high-value-added sectors.

Rising imports of manufactured goods from China had a negative impact on employment and wages in trade-exposed industries in the United States. Recent economic literature has demonstrated that the influx of manufactured Chinese goods since the early 1990s has had substantial negative effects on U.S. labor markets. In

several papers, economists David Autor, David Dorn, and Gordon Hanson (Massachusetts Institute of Technology, University of Zurich, and the University of California, San Diego, respectively) have called into question long-held assumptions about the impact of trade on labor markets in developed economies.* [286] The authors measured the effects of import competition from China on employment and wages in U.S. labor markets between 1999 and 2011 and found local labor markets most exposed to Chinese import competition suffered employment and wage declines.[287] Moreover, contrary to the logic of neoclassical trade theory, declines in employment and wages did not lead to offsetting employment gains in industries not exposed to import competition from China.[288] Without labor reallocation and increased hiring from non-exposed industries, the negative effects of the China trade shock have been geographically concentrated and persistent. A separate study Autor, Dorn, and Hanson authored with MIT economists Daron Acemoglu and Brendan Price estimated that rising Chinese imports from 1999 to 2011 led to a reduction of 2 to 2.4 million U.S. jobs.[289]

While these studies do not look at the net economic impact of increased trade with China, their findings have serious implications for future U.S. trade policy. U.S. policymakers should give due consideration to the enduring effects of the China trade shock while recognizing the new opportunities and increased purchasing power it has provided for U.S. workers and consumers.

* Mainstream economists have long held that trade improves the economic welfare of a country's citizens, and the benefits from trade offset the negative effects of import competition from trading partners. The general consensus is that trade has not been a major contributor to decreasing manufacturing employment and increasing wage inequality in developed countries; workers can readily move to other regions if they are displaced by trade, and the downward pressure imports place on low-skill wages affects low-skilled workers across the board, not just those working in trade-exposed sectors. David H. Autor, David Dorn, and Gordon H. Hanson, "The China Shock: Learning from Labor-Market Adjustment to Large Changes in Trade," *Annual Review of Economics*, August 2016, 207–208. *https://www.ddorn.net/papers/Autor-Dorn-Hanson-ChinaShock.pdf*.

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