U.S.-China Economic and Security Review Commission

Economics and Trade Bulletin

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Highlights of This Month's Edition

- **Bilateral trade:** In August 2017, U.S. goods trade deficit increased 3.1 percent year-on-year to reach $34.9 billion; U.S. exports to China were nearly $11 billion, up 16.3 percent year-on-year.
- **Bilateral policy issues:** President Trump blocks an attempted acquisition of Lattice Semiconductor by a company with links to the Chinese government amid potential national security concerns.
- **Policy trends in China's economy:** Chinese regulators are putting the brakes on bitcoin and other virtual currencies; U.S. coal and liquefied natural gas exports to China surge due to favorable pricing and growing demand.
- **Sector focus – Waste and Scrap:** China begins closing its waste and scrap market, putting $5 billion of U.S. exports at risk.

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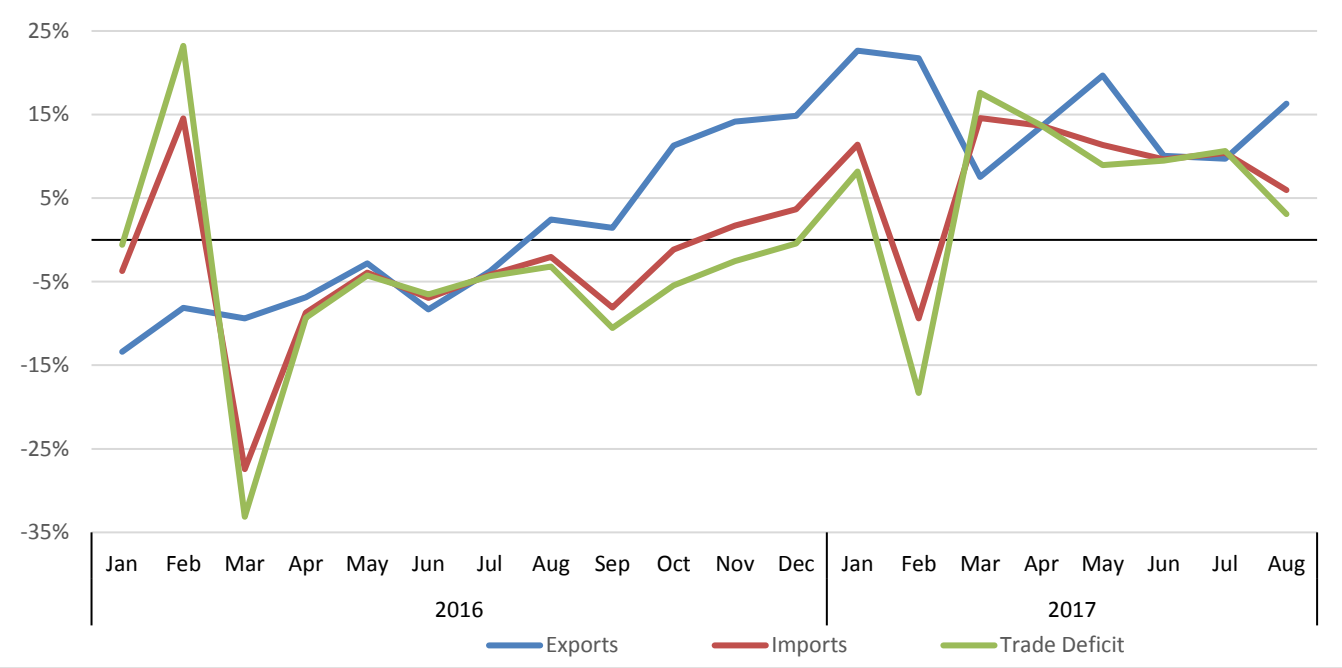
Bilateral Trade

U.S. Exports Maintain Robust Growth in August

In August 2017, U.S. goods trade deficit with China rose 3.1 percent year-on-year to reach $34.9 billion (see Figure 1).[1] This month, U.S. exports to China were nearly $11 billion, up 16.3 percent year-on-year.[2] Soybeans and automobiles largely contributed to this rapid increase.[3] U.S. imports from China increased 5.9 percent year-on-year to reach $45.8 billion, with cellphones and toys, games, sporting goods as leading import categories.[4]

In the first eight months of 2017, the U.S. deficit with China totaled $239.1 billion, a 6.2 percent increase over the same period in 2016.

Figure 1: U.S. Goods Trade with China, January 2016–August 2017



Source: U.S. Census Bureau, Trade in Goods with China, October 5, 2017. *https://www.census.gov/foreign-trade/balance/c5700.html*.

Bilateral Policy Issues

President Trump Blocks Lattice Deal Due to National Security Concerns

In September 2017, President Donald Trump blocked Canyon Bridge Capital Partners' attempted $1.3 billion acquisition of U.S. chipmaker Lattice Semiconductor.[5] The decision marked only the fourth time a president has blocked a corporate acquisition on national security grounds.[6] According to a White House statement, the deal was blocked because of concerns over "the potential transfer of intellectual property to the foreign acquirer, the Chinese government's role in supporting this transaction, the importance of semiconductor supply chain integrity to the United States Government, and the use of Lattice products by the United States Government."[7]

Canyon Bridge is a private equity firm based in California and funded solely by China Reform Holdings, an investment holding company controlled by China's State Council with indirect links to the Chinese government's space program.[8] Canyon Bridge's ties to the Chinese government attracted congressional attention, with 22 lawmakers writing to then U.S. Treasury Secretary Jack Lew in December 2016 to voice concerns that the deal could disrupt U.S. military supply chains and pose national security risks.[9]

The deal also came amid heightened scrutiny of foreign acquisitions of U.S. semiconductor firms. Since 2015, the Committee on Foreign Investment in the United States (CFIUS), which is tasked with reviewing foreign transactions for national security risks, has either outright rejected or caused investors to withdraw from at least seven deals involving Chinese companies, including the Lattice acquisition.[10] Although Lattice does not sell chips to the U.S. military, it manufactures a type of military-grade microchip that its two biggest rivals, Xilinx Inc. and Intel Corp.'s Altera, sell to the U.S. military, making Lattice's acquisition a potential national security concern.[11]

Canyon Bridge's failed attempt to acquire Lattice began in November 2016, when the firm first announced the proposed deal and submitted the transaction for CFIUS review.[12] After CFIUS did not complete its assessment within the 75-day review limit,[*] Canyon Bridge resubmitted the deal for review in March 2017 and again in June 2017.[13] In August 2017, CFIUS completed its review and recommended the president block the deal. Rather than withdraw the bid, Canyon Bridge and Lattice allowed the transaction to proceed to the presidential review stage, hoping—ultimately unsuccessfully—that President Trump would disagree with CFIUS' assessment and approve the deal.[14]

This was not the first time a Chinese firm has attempted to acquire Lattice's technology. In 2004, Lattice paid a $560,000 civil fine for illegally exporting products to China.[15] In 2012, two Chinese nationals were indicted for violating export controls after trying to smuggle Lattice chips to China.[16] Four years later, Chinese state-owned chipmaker Tsinghua Unigroup purchased a 6 percent stake in Lattice—around the same time China Reform Holdings first contacted Lattice about a potential deal—before selling off its shares a few months later, just weeks before the Canyon Bridge deal was announced in November 2016.[17]

China's efforts to acquire U.S. semiconductor technology raise concerns that the Lattice acquisition was motivated by political factors (such as furthering industrial policies laid out by the Chinese Communist Party [CCP]) rather than commercial considerations. In November 2016, then U.S. Commerce Secretary Penny Pritzker warned that the U.S. semiconductor industry is "seeing new attempts by China to acquire companies and technology based on their government's interests—not commercial objectives."[18] A January 2017 report from the U.S. President's Council of Advisors on Science and Technology also warned that China's increased semiconductor investment represents "a concerted push by China to reshape the market in its favor ... [and] threatens the competitiveness of U.S. industry and the national and global benefits it brings."[19]

The Chinese government has made developing its semiconductor industry a key priority of its industrial policy, seeking to enhance the global competitiveness of its domestic semiconductor firms and reduce its reliance on foreign semiconductor imports.[20] In 2014, for instance, the Ministry of Industry and Information Technology created $107.5 billion in national and regional semiconductor investment funds to finance foreign acquisitions that accelerate China's high-tech development.[21] Chinese firms have leveraged this state funding to attempt to acquire or invest in at least 27 U.S. semiconductor firms since 2013.[22]

Policy Trends in China's Economy

China Puts the Brakes on Bitcoin

Chinese regulators are attempting to assert control over bitcoin[†] and other virtual currencies, announcing a series of bans on bitcoin fundraising and trading over the past month. On September 4, the People's Bank of China (PBOC)

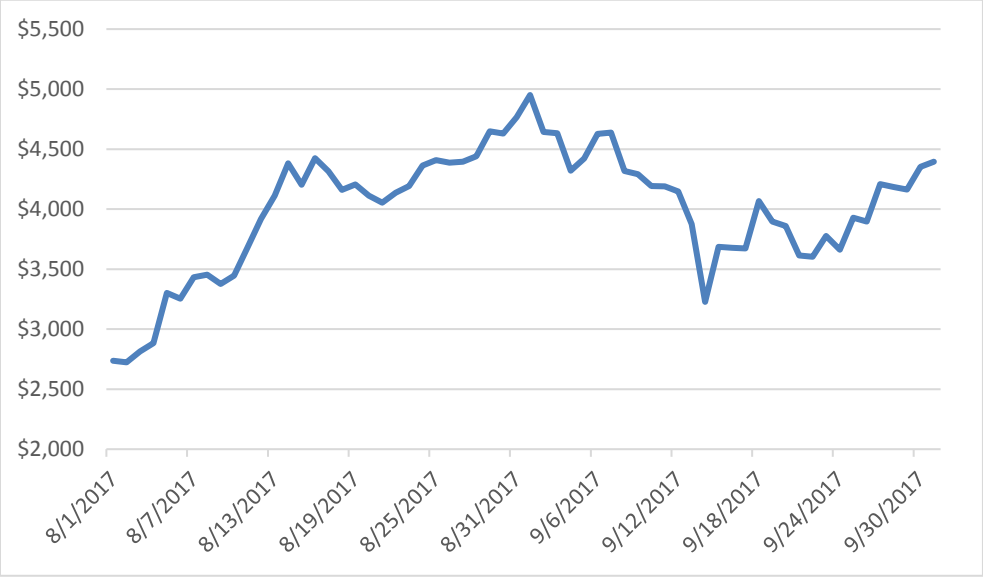
[*] CFIUS is allotted 30 days to conduct its review and, if necessary, 45 days to conduct an investigation and make a recommendation. After the CFIUS review and investigation period is completed, the president of the United States has 15 days to decide whether to suspend, make changes to, or prohibit the investment. Defense Production Act of 1950 § 721 (Amended by the Foreign Investment and National Security Act of 2007), Public Law No. 110-49, 2007.

[†] Created in 2009, bitcoin is a digital cryptocurrency created for use in peer-to-peer online transactions. Bitcoins are not issued or backed by any banks or governments, and the cryptocurrency's value fluctuates based on supply and demand and the public's perception of bitcoin as a store of wealth. Every transaction is verified and recorded on a public ledger that is maintained by a network of computers. Bitcoin can be used as payment for goods and services and as an investment vehicle, and can be converted into fiat currencies at various exchanges. For more background on how bitcoin works, see Satoshi Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System," 2009. *https://bitcoin.org/bitcoin.pdf*. For general background on bitcoin and its history in China, see Lauren Gloudeman, "Bitcoin's Uncertain Future in China," *U.S.-China Economic and Security Review Commission*, May 12, 2014.

deemed initial coin offerings (ICOs)—an unregulated fundraising method where investors raise money by selling digital coins akin to a cross between crowdfunding and initial public offerings—illegal and ordered related fundraising activities to be halted immediately.[23] The PBOC announcement noted many ICOs in China have been tied to "financial frauds, pyramid schemes, and other criminal activities" that have "seriously disrupted the economic and financial order."[24]

According to media reports, the following week Chinese officials ordered virtual currency exchanges to cease trading and notify users of their closure.[25] By September 15, the country's three largest bitcoin exchanges—BTC China, Huobi, and OKCoin—announced they would suspend renminbi [RMB]-denominated trading services in the coming weeks.[*] In response to news of China's bitcoin crackdown, bitcoin prices fell as low as $2,975 on September 15, from a record of $4,951 on September 1.[26] However, by September 18, bitcoin prices had recovered, crossing and largely staying above the $4,000 mark (see Figure 2).[27]

Figure 2: Bitcoin Price, August 1–October 1, 2017



Source: CoinDesk, "Bitcoin (USD) Price." *https://www.coindesk.com/price*.

China is home to one of the most active bitcoin mining[†] and trading communities in the world. Bitcoin's popularity in China has been fueled by investors eager for alternative assets, a lack of trading fees,[‡] and the low cost of electricity for running mining infrastructure.[28] As recently as January 2017, Chinese exchanges accounted for about 90 percent of global bitcoin trading volume (see Figure 3).[§] The PBOC increased its scrutiny of bitcoin, conducting

https://www.uscc.gov/sites/default/files/Research/USCC%20Economic%20Issue%20Brief%20-%20Bitcoin%20-%2005%2012%2014.pdf.

[*] BTC China announced it would suspend local trading services on September 30. Huobi and OKCoin said they would halt local trading by October 31. Chao Deng, "China's Interference on Bitcoin Tests Currency's Foundation," *Wall Street Journal*, September 18, 2017. *https://www.wsj.com/articles/china-widens-bitcoin-crackdown-beyond-commercial-trading-1505733976*; Jon Russell, "China's Three Largest Bitcoin Exchanges Will All Stop Offering Local Trading," *Tech Crunch*, September 15, 2017. *https://techcrunch.com/2017/09/15/chinas-three-largest-bitcoin-exchanges-will-all-stop-offering-local-trading*.

[†] The bitcoin "mining" process involves "miners" solving complex mathematical problems to generate new bitcoins. Miners also verify and add transactions to the public ledger, known as the blockchain. Investopedia, "Bitcoin Mining." *http://www.investopedia.com/terms/b/bitcoin-mining.asp*.

[‡] Until late January 2017, Chinese exchanges charged zero fees for trading, a significant draw for high-speed traders. Following the PBOC's spot checks on domestic exchanges, on January 24 China's three largest bitcoin exchanges instituted a flat fee of 0.2 percent per transaction to suppress speculation and prevent volatility in bitcoin prices. Bloomberg, "Trading Plunges at China's Bitcoin Exchanges after Fees Levied," January 24, 2017. *https://www.bloomberg.com/news/articles/2017-01-24/trading-plunges-at-china-s-bitcoin-exchanges-after-fees-levied*.

[§] Several major Chinese exchanges—including OKCoin and BTC China—are reported to have artificially inflated their trading volumes. Xiaoyu Huang, a cofounder of BTC China, acknowledged the exchange had faked some of its volume, adding that "it was the fake volumes that made the government mistakenly believe the Chinese market accounted for so much of the global trading volume, and cause the

checks of the exchanges in January and requiring exchanges to halt bitcoin withdrawals in February due to concerns the cryptocurrency was being used to circumvent capital controls and launder money.[29] Chinese bitcoin trading volumes subsequently fell, and as of mid-September, China accounted for under 10 percent of bitcoin trades.[30] While China's dominance in bitcoin trading has waned, the country remains a major center for bitcoin mining; about two-thirds of all bitcoin issued daily is mined in China.[31]

Figure 3: China's Share of Global Bitcoin Trading Volume, January 1, 2016–October 1, 2017

Source: Bitcointy, "Bitcoin Trading Volume." *https://data.bitcoinity.org/markets/volume*; CoinDesk, "Bitcoin (USD) Price." *https://www.coindesk.com/price*.

This new wave of regulatory scrutiny appears to stem from concerns over the soaring price of bitcoin, particularly in the context of China's focus on financial security ahead of the 19th Party Congress.[32] Bitcoin prices leapt nearly 600 percent in dollar terms over the past year, fueling worries of a bubble.[33] But this also reflects Chinese authorities' mixed feelings about bitcoin and similar cryptocurrencies and concerns that they facilitate capital flight and illegal activities. While bitcoin presents an opportunity for China to develop new and emerging technologies, officials view it as a source of financial risk and dislike its independence from government control.[34]

Top PBOC officials have indicated their support for blockchain[*] and digital currencies, and the PBOC is developing its own digital currency (for more on the differences between virtual, digital, and cryptocurrencies, see textbox below).[†] For instance, PBOC Vice Governor Fan Yifei has argued digital currency should play a role in replacing traditional currency, but that central banks should "take the lead, both in supervising private digital currencies and in developing digital legal tender of their own."[35] From Chinese regulators' perspective, a central-bank-issued digital currency can make it easier to monitor risk in the financial system and track financial transactions across the economy.[36]

Chinese authorities have not made public their stance on virtual currency trading; despite regulators' instructions to exchanges to shut down, it is not clear if this is just a temporary cooling measure.[37] A lack of clarity from

government to supervise bitcoin in China so forcefully." Steve Stecklow et al., "Chaos and Hackers Stalk Investors on Cryptocurrency Exchanges," Reuters, September 29, 2017. *https://www.reuters.com/investigates/special-report/bitcoin-exchanges-risks/*.

[*] Blockchain is an electronic distributed ledger first introduced by bitcoin that allows multiple parties to share records. Beyond financial assets, blockchain has applications for most major industries, including consumer business, financial services, manufacturing, healthcare, and real estate, as well as for the public sector. David Schatsky and Craig Muraskin, "Beyond Bitcoin," *Deloitte Insights*, December 7, 2015. *https://dupress.deloitte.com/dup-us-en/focus/signals-for-strategists/trends-blockchain-bitcoin-security-transparency.html*.

[†] After assembling a research team in 2014, the PBOC has conducted trial runs of its prototype cryptocurrency. In January 2016, the PBOC said it will have its own cryptocurrency "soon," but there has still been no formal start date announced. Bloomberg, "China Is Developing its Own Digital Currency," February 23, 2017. *https://www.bloomberg.com/news/articles/2017-02-23/pboc-is-going-digital-as-mobile-payments-boom-transforms-economy*.

regulators has fueled worries about how far government restrictions will go. Chinese miners fear authorities may move to curb their operations, and it remains unclear if peer-to-peer, over-the-counter trades will be banned.[38] Despite the tighter regulation, Chinese investors are still trading through over-the-counter exchanges or exchanges based in other jurisdictions.[39] Although domestic exchanges can no longer facilitate the buying and trading of bitcoins using RMB, they can continue to operate international-facing exchanges.[40] "The fact that bitcoin is still being traded is an indication that China isn't looking to eliminate them, but reposition things in a way to have better control over them," said Marshall Swatt, the founder of New York-based bitcoin exchange Coinsetter.[41]

China's crackdown on bitcoin comes as regulators around the world consider how to regulate cryptocurrencies. Following China's lead, South Korea banned ICOs on September 29.[42] In contrast, Japan established the first national licensing program in the world for virtual currency exchanges in April 2017 and awarded the first licenses to 11 exchanges this September.[43] While the U.S. Securities and Exchange Commission (SEC) has not issued formal restrictions on ICOs, it announced in July 2017 that some virtual tokens being sold to investors through ICOs "may be securities" and, as such, are subject to federal securities law.[44] On September 29, the SEC charged a businessman for defrauding investors in two ICOs that were purported to have been backed by investments in diamonds and real estate, the first time the agency has filed fraud charges related to an ICO.[45]

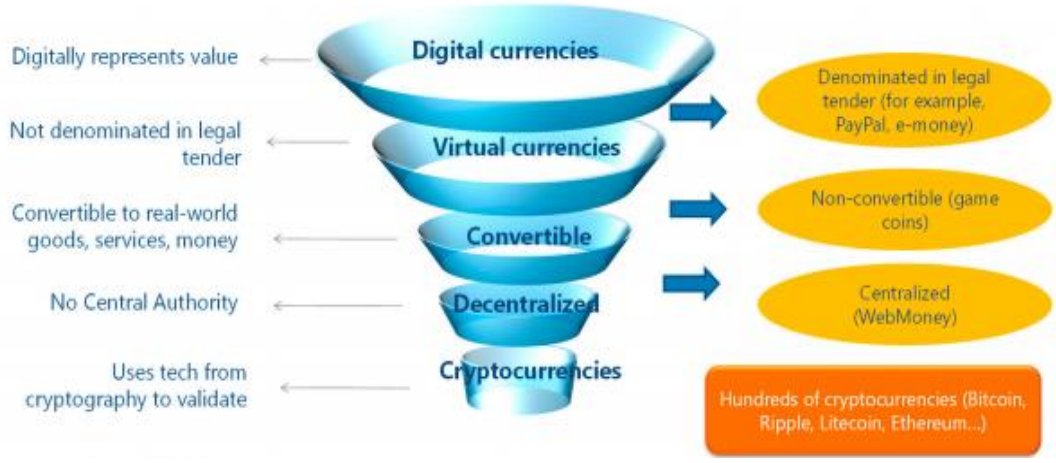
What's in a Name? Comparing Virtual, Digital, and Cryptocurrencies

Virtual currencies, digital currencies, and cryptocurrencies are often used interchangeably in media reports but are not synonymous.[*] Virtual currencies and cryptocurrencies fall under the broader category of **digital currencies**, defined as currencies that are stored and transferred electronically (see Figure 4).[46]

Virtual currencies are "digital representation[s] of value that [are] neither issued by a central bank or a public authority, nor necessarily attached to fiat currency, but [are] accepted by natural or legal persons as a means of payment and can be transferred, stored or traded electronically."[47] They are issued by private developers and denominated in their own unit of account.[48]

Cryptocurrencies are a type of digital or virtual currency that use cryptography to validate and secure transactions. Bitcoin and ethereum are among the best known types of cryptocurrencies.[49]

Figure 4: Taxonomy of Virtual Currencies



Source: Dong He et al., "Virtual Currencies and Beyond: Initial Considerations," *International Monetary Fund Staff Discussion Note*, January 2016, 8. *https://www.imf.org/external/pubs/ft/sdn/2016/sdn1603.pdf.*

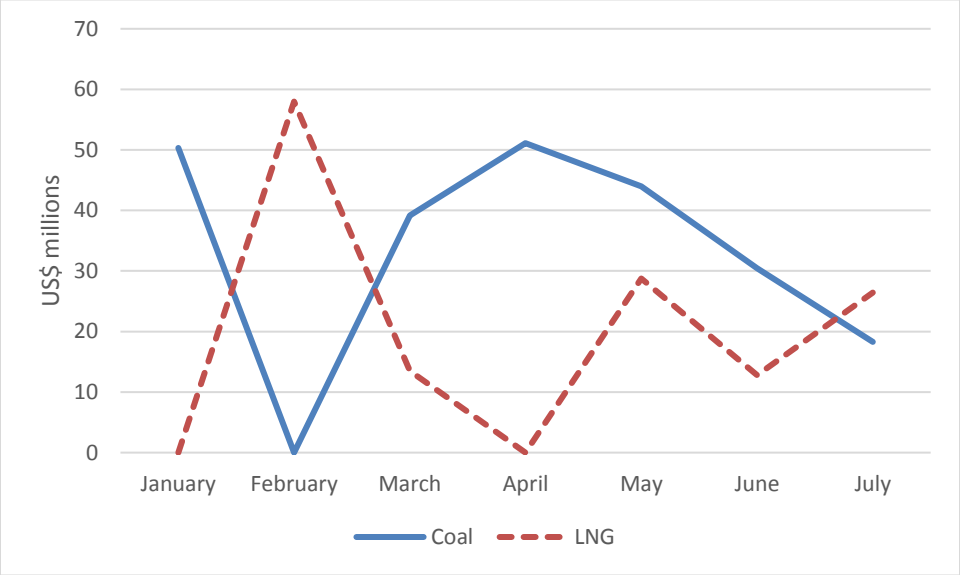
[*] Given the rapidly evolving nature of the industry, there are no universally agreed upon definitions for these terms.

U.S. Coal and LNG Exports to China Surge

U.S. thermal coal* and liquefied natural gas (LNG) exports to China have surged in the past few months (see Figure 5). Two factors have contributed to this surge. First, high Asian prices for thermal coal made U.S. coal, normally too expensive for this market, cost competitive.[50] Second, low Asian LNG prices have encouraged Chinese buyers to purchase more LNG to diversify China's coal-dominated energy mix.[51] United States has exported $233 million of coal and $139 million of LNG to China in the first seven months of 2017.[52] These amounts already surpassed the 2016 total exports by 87 percent for coal ($125 million) and 2 percent for LNG ($137 million).[53]

The spike in U.S. coal and LNG exports indicates a sustained recovery since 2016 in U.S. coal exports to China, and a robust demand for U.S. LNG from China.†[54] U.S. coal exports to China suffered a huge decline from its peak in 2012 and reached a bottom in 2015.[55] U.S. global coal exports rose more in the first seven months of 2017 than during any other period in the last two years, driven by demand from Asian markets.[56] A temporary rise in Asian thermal coal prices and recent growth in demand from Asian markets made shipping U.S. coal to Asia profitable.[57] In contrast, Asian LNG prices are their lowest in more than a decade, making the cost premium of purchasing LNG instead of coal the lowest since 2000.[58] Coupled with low U.S. transport costs to Asia, these favorable conditions increased Asia's demand for LNG, boosting U.S. exports.[59]

Figure 5: U.S. Coal and LNG Exports to China, January–July 2017



Source: U.S. Census Bureau, Trade by Commodity – Exports to China – Coal and Liquefied Natural Gas.

Other factors affecting the recent surge include China's ongoing efforts to combat pollution. From May to October 2017, China required utilities to reduce coal imports, banned coal imports from small ports, suspended operations at two large coal mines, began pressuring local officials to reduce carbon emissions, pledged to shutdown thousands of coal-fired boilers, banned sales, transport and use of coal by most companies and power plants, and is in the process of expanding gas infrastructure for the coming winter.[60]

In the past few years, Beijing adopted many policies targeted at curbing coal output, reducing coal power generation, and promoting natural gas consumption.[61] For instance, in the 13th Five-Year Plan, Beijing outlined plans to reduce coal dependence from 59 percent of electricity production in 2015 to 55 percent by 2020, and to raise natural gas consumption to 10 percent by 2020 and 15 percent by 2030.[62] Since natural gas burns cleaner than other fossil fuels, is a safer alternative compared to nuclear power in China's earthquake-prone interior, and is easier than renewable energy to integrate with China's power grid originally designed for coal-driven power, the government has

* The United States is a dominant exporter of metallurgical coal but plays a small role in trading thermal coal. Metallurgical coal, or coking coal and another hard coal called anthracite are the types used to make steel. In contrast, thermal coal or bituminous coal is used for power plants. This section refers to only Asian thermal coal prices and U.S. total coal exports to China, which consisted primarily of thermal coal.

† The United States started shipping LNG to China for the first time in July 2016.

introduced many market-oriented policies and LNG pricing reforms aimed at encouraging conversion from coal to gas consumption.[63] In 2016, China's energy consumption mix was 62 percent coal and 6 percent natural gas.[64]

According to China's National Bureau of Statistics, China's coal consumption and production have both been declining since 2013, with production decreasing at an even faster pace: In 2016, production declined by 9 percent, while consumption only declined by 4.5 percent year-on-year.[65] According to China's General Administration of Customs, China's coal exports has declined substantially over the past decade, while coal imports declined after 2013 but recovered since 2016.[66]

In contrast, natural gas plays a small but growing role in China's energy sector.[67] According to China's National Bureau of Statistics, China's natural gas consumption and production have both increased steadily over the past decade, with a supply gap widening substantially since 2009.[68] In the first half of 2017, natural gas consumption soared 15 percent year-on-year to 115 billion cubic meters (bcm).[69] This growing demand has been met through imports via pipelines and import terminals; in particular, LNG imports are growing rapidly, reaching 26.2 million tons in 2016.[70]

Beijing's policies offer opportunities for the United States to boost both coal and LNG exports to China. However, several factors continue to affect U.S. coal and LNG exports to China. In the coal sector, United States faces intense competition from countries that have significantly lower production and freight costs.[71] Analysts believe U.S. coal exports are very vulnerable to China's policy fluctuations.[72] For instance, China's coal production has started to show signs of recovery and China is starting to block some coal imports to support domestic miners.[73] Several analysts forecast that low long-term demand and declining coal prices will moderate U.S. coal exports.[74]

In the gas sector, United States currently only sells LNG to China indirectly via third-party short-term spot trades, unlike many U.S. competitors, such as Australia and Qatar, which already have long-term LNG contracts with China.[75] In May United States and China agreed to allow Chinese buyers to secure long-term contracts and purchase LNG supplies from the United States directly as part of the 100-Day Action Plan.[*76] However, only one company—Cheniere—is currently able to export large cargoes of LNG from the continental United States, and five export terminals under construction are not expected to open until 2020.[† 77] As a result, Sinopec said it will consider long-term imports from the United States in 2022.[78] Meanwhile, as long as LNG prices remain low and demand keeps growing in Asia, U.S. LNG exports could become increasingly attractive for Asian markets seeking to diversify their LNG sources.[79]

Sector Focus: China Ends Waste and Scrap Imports

China has recently taken steps to close its waste and scrap market—the world's largest—to imports, jeopardizing more than $5 billion in exports from the United States, the world's largest waste and scrap exporter.[80] On July 18, China notified the World Trade Organization (WTO) that it would no longer accept imports of plastic,[‡] textiles, unsorted paper, artificial fibers, and certain metals.[81] The notification stated China's restrictions would enter force in September 2017 and all imports of these items would be blocked by the end of the year.[82] On July 27, China's State Council went further, setting a goal of ending all solid waste and scrap imports by 2019 and replacing them with domestic sources.[83] Additionally, Chinese regulators have taken steps that place de facto limits on waste and scrap imports into China. China's Ministry of Environmental Protection (MEP) issued a draft regulation in August

[*] For more information on the 100-Day Action Plan, see U.S.-China Economic and Security Review Commission, *Economics and Trade Bulletin*, May 4, 2017. *https://www.uscc.gov/trade-bulletin/may-trade-bulletin-0*.

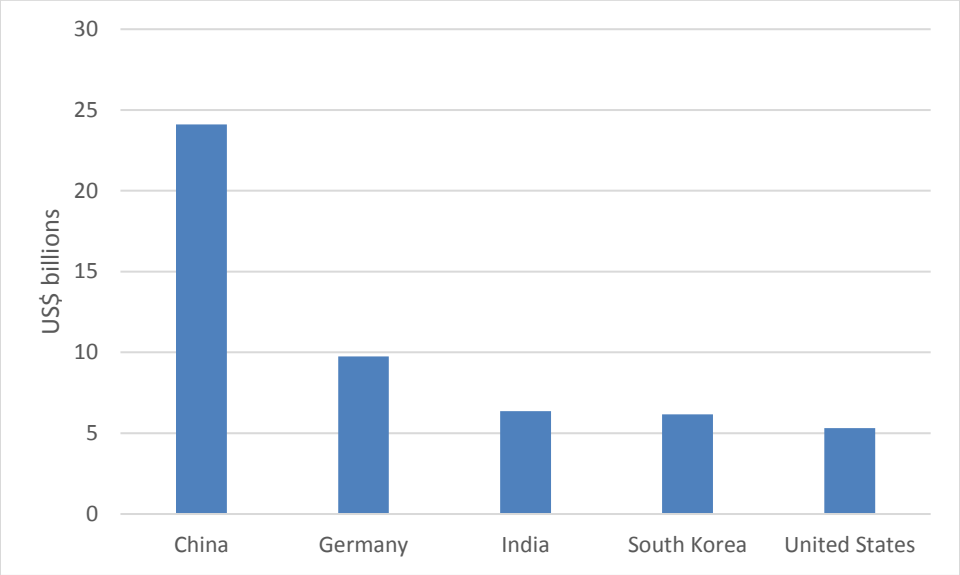
[†] The United States used to be a primary importer of natural gas, and most of its natural gas facilities are designed for import rather than export. As a result, U.S. gas infrastructure needs both modernization of existing facilities and investment for new facilities to realize the potential for U.S. gas exports. Andrew Follett, "New Deal Allows U.S. to Sell Tons of Natural Gas to China," National Interest, May 15, 2017. *http://nationalinterest.org/blog/the-buzz/new-deal-allows-us-sell-tons-natural-gas-china-20677*; Russell Gold and Alison Sider, "Long Promised, the Global Market for Natural Gas Has Finally Arrived," Wall Street Journal, June 6, 2017 *https://www.wsj.com/articles/long-promised-the-global-market-for-natural-gas-has-finally-arrived-1496761392*.

[‡] The Chinese government has clarified that post-consumer plastic—such as used water bottles—will be banned outright, while recycled plastics from industrial sources will be "restricted," suggesting some may be allowed into China. Colin Staub, "China Offers Clues on What Will (and Won't) Be Allowed In," *Resource Recycling*, August 22, 2017. *https://resource-recycling.com/recycling/2017/08/22/china-offers-clues-will-wont-allowed/*.

setting a maximum contamination* rate of 0.3 percent for scrap imports.[84] According to the Institute of Scrap Recycling Industries (ISRI), a U.S. recycling industry association, China's proposed contamination threshold would constitute a ban on the import of all scrap imports to China, as it is not possible to achieve such a low contamination level.†In August and September 2017 industry sources reported China has not issued new import permits for plastic or paper scrap for several months, preventing importers whose permits have expired from doing business.[85]

China's steady closure of its waste and scrap market will have a significant effect on waste and scrap trade worldwide. China has long relied on imported scrap metal, paper, and plastic as a low-cost source of raw materials for its manufacturing sector. Today, China is the world's largest importer of waste and scrap (see Figure 6) accounting for 22 percent of global waste and scrap imports in 2015 ($24 billion out of $109 billion total imports).‡ In 2015, China accounted for 57 percent of global plastic scrap imports ($4.2 billion), 31 percent of nonferrous metal scrap imports ($11.3 billion), 51 percent of paper scrap imports ($5.3 billion), and 28 percent of electronics scrap imports ($1.8 billion).[86] As seen in Figure 7**,** China's waste and scrap imports grew from $12 billion in 2005 to $42 billion in 2011, an increase of 246 percent, before declining to $24 billion in 2015.[87] Since 2009, China's share of total waste and scrap imports has largely held steady between 22 and 25 percent.[88] China's restrictions have already interfered with waste and scrap processing elsewhere. For example, Hong Kong has historically sent much of its waste and scrap to mainland China for recycling.[89] Since September the ban has disrupted Hong Kong's recycling operations, and so-called "mountains" of waste paper have accumulated in Hong Kong's docks and landfills.[90]

Figure 6: Top Five Waste and Scrap Importers, 2015



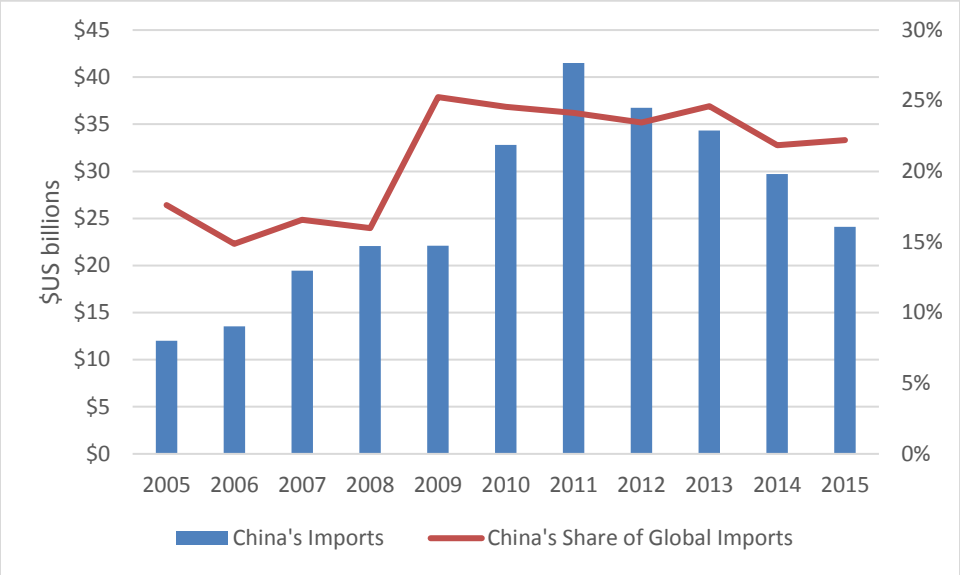
Source: United Nations Comtrade, "UN Comtrade Database." *https://comtrade.un.org/data/.*

* In recycling, "contamination" refers to the presence of waste or scrap not related to the commodity being recycled. For example, plastic bottles in a shipment of aluminum scrap would be considered contamination. Northstar Recycling, "Reducing Recycling Contamination," April 16, 2015. *http://www.northstarrecycling.com/reducing-recycling-contamination/.*

† By comparison, according to Waste Management, the United States' largest processor of recycling, contamination rates of its North American waste and scrap averaged roughly 16 percent from 2014 to 2016 from U.S. consumers. Dan Leif, "WM Leader Says Contamination Is 'a Slow Ship to Turn,'" *Resource Recycling*, June 20, 2017. *https://resource-recycling.com/recycling/2017/06/20/wm-leader-says-contamination-slow-ship-turn/*; Robin Wiener, "Comments to the Draft Environmental Protection Control Standards for Imported Solid Wastes as Raw Materials (GB 16487.1-13)," *Institute of Scrap Recycling Industries*, August 25, 2017. *http://www.isri.org/docs/default-source/default-document-library/2017-08-25-isri-comments-to-china-mep-on-gb-16487-standards.pdf?sfvrsn=2.*

‡ In this trade bulletin, the "waste and scrap" category includes the following: plastic scrap, scrap of ferrous metal, nonferrous metal scrap, used synthetic and wool fibers, used paper, glass waste, electronics waste, and used rubber. United Nations Comtrade, "UN Comtrade Database." *https://comtrade.un.org/data/.*

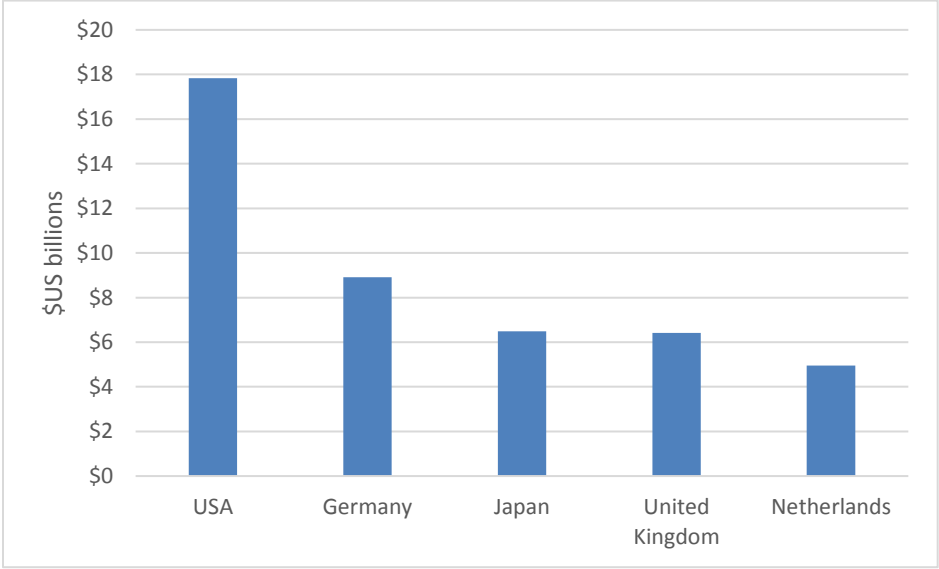
Figure 7: China's Share of Global Waste and Scrap Imports, 2005–2015



Source: United Nations Comtrade, "UN Comtrade Database." *https://comtrade.un.org/data/.*

China's decision to stop accepting waste and scrap will negatively affect the United States, the world's largest exporter of waste and scrap (Figure 8). In 2015, the United States exported $17.7 billion of waste and scrap, accounting for 19 percent of global waste and scrap exports.[91] China is the United States' largest export market for waste and scrap, accounting for roughly $5.2 billion (or 30 percent) of all U.S. waste and scrap exports in 2016.[92] As seen in Figure 9, while U.S. waste and scrap exports to China have declined—largely due to Chinese concerns over waste and scrap contamination and a Chinese inspection crackdown—they continue to constitute a large share of the United States' goods exports to China. In 2011, U.S. waste and scrap exports to China peaked at $11.6 billion (11 percent of all U.S. goods exports to China), before declining to $5.2 billion (4.5 percent of goods exports) by 2016.[93] Despite this decline, in 2016, waste and scrap was the United States' sixth-largest goods export to China, behind transportation equipment, agricultural products, computer and electronic products, chemical exports, and machinery.[94]

Figure 8: Top Five Waste and Scrap Exporters, 2015



Source: United Nations Comtrade, "UN Comtrade Database." *https://comtrade.un.org/data/.*

Figure 9: U.S. Waste and Scrap Exports to China, 2005–2016

Source: U.S. Census Bureau, *USA Trade Online*, August 4, 2017. *http://usatrade.census.gov/Perspective60.*

According to the ISRI, China's ban on plastics, fibers, paper, and textiles as described in its July 18 WTO notification would put 18 percent of U.S. waste and scrap exports to China by volume at risk, roughly $532 million annually.[95] If China fully closes its market by 2019 as set forth by China's State Council, the remainder of the United States' waste and scrap trade would be jeopardized, resulting in the loss of more than $5 billion annually, based on 2016 export numbers.[96] The United States would likely be challenged to find productive uses for its recycling in the event of a complete closure of China's market. According to the ISRI, roughly 30 percent of recyclables in the United States are exported overseas due to insufficient domestic demand.[97]

Given China's share of U.S. waste and scrap exports, a complete closure of China's market would require the United States to find new uses for roughly 12 percent of the recyclable trash it generates domestically every year (as much as 8 million tons of recycling, according to United States 2014 recycling data).[98] As China is the largest importer of waste and scrap, the United States may not find international sources for all of this recycling, creating a risk that much of it would go to U.S. landfills. The closure of China's market would also affect U.S. jobs and government revenue. According to the ISRI, 40,000 U.S. jobs are directly supported by waste and scrap exports and 94,000 are indirectly supported.[99] More than $3 billion in federal, state, and local tax revenue is collected from U.S. waste and scrap exports.[100]

The U.S. recycling industry has protested the ban, noting that its implementation period was unworkable, that requests for clarification on China's restrictions have gone unanswered, and that the ban would harm both U.S. exporters and Chinese manufacturers.[101] The ISRI stated China's domestic scrap producers are less efficient than those in the United States—raising concerns that China would be unable to effectively transition to domestic scrap sources—and offered to help the Chinese government limit damaging recycling practices.[102]

In announcing the ban, China cited health risks and environmental damage associated with waste and scrap imports, stating that the government "found that large amounts of dirty wastes or even hazardous wastes are mixed in the solid waste that can be used as raw materials."[103] Imports of waste and scrap have resulted in some environmental contamination, although much of it seems due to mismanagement by Chinese importers. China's imported recycling industry is made up of thousands of small-scale businesses that do not always follow proper disposal practices.[104] For example, a 2002 Chinese documentary showcased Chinese recycling workers dismantling imported electronic devices and dumping toxic parts into a river.[105] According to Steve Wong, executive president of the China Scrap Plastics Association (an industry group), most Chinese recyclers "do not achieve very strict compliance and control on production pollution."[106] Mr. Wong anticipated a large number of factories would not be able to pass a round of inspections conducted by the Chinese government over the summer of 2017.[107] According to Will Flower, general

manager of Winters Bros. Waste Systems in New York, the vast majority of U.S. waste and scrap exports complied with Chinese standards.[108] For example, in 2013, during the first year of a massive Chinese inspection crackdown sparked by Chinese contamination concerns, only 0.04 percent of inspected waste and scrap containers were deemed unacceptable for import by Chinese customs agents.[109] Since 2013, the quality of U.S. exports has increased, according to Mr. Flower, and U.S. companies have invested hundreds of millions of dollars in new facilities to reduce contamination.[110]

The ban marks the latest in a series of Chinese government initiatives to reduce contamination in waste and scrap imports and crack down on smuggling. In 2013, China launched Operation Green Fence, an effort to inspect most waste and scrap imports. In the first year of the operation, 70 percent of all incoming waste and scrap containers were inspected for quality, and shippers found transporting low-quality scrap faced license revocations.[111] Operation Green Fence is credited by industry analysts for precipitating a drop in U.S. waste and scrap exports to China.[112] In February 2017, China's General Administration of Customs announced it would begin a one-year crackdown on smuggling of waste and scrap as part of National Sword 2017, a larger effort to combat smuggling of agriculture products, guns, drugs, and resource commodities.[113] During this crackdown, a team of inspectors was charged with visiting all Chinese waste and scrap importers, reportedly with the aim of decreasing the number of import permits by 60 percent.[114]

Some observers believe Beijing's decision to block imports is driven by political concerns as much as environmental concerns; in fact, in some respects, the decision to ban imported recyclables may have negative environmental consequences, running counter to the government's stated goal. According to Adam Minter, a Bloomberg journalist and author on trade in waste and scrap, "China's government has long played up stories about foreign waste, partly to deflect attention from unmanageable garbage problems at home."[115] The import of waste and scrap for recycling is largely unpopular among the Chinese public, and many Chinese citizens expressed support for the newly announced ban.[116]

Despite the popularity of China's restrictions, closing China to waste and scrap imports will impose costs on China. According to Chinese paper producers, the prices of finished paper and cardboard boxes have already doubled as foreign waste paper has been denied access to China's ports.[117] The timing of this rise in packaging costs is expected to negatively affect companies such as Alibaba and JD.com, as both companies are reliant on packaging to deliver purchases during Singles Day (November 11), the world's largest online shopping holiday.[*] U.S. firms such as Amazon may also be harmed by the rise in packaging prices because most of their cardboard boxes are sourced from China.[118]

Restrictions on imports for recycling are also environmentally dubious. For one, they will increase shipment of new paper, plastic, and metals into China.[119] In addition to being more expensive, these new raw materials will create more garbage and substantially raise energy consumption. For example, using recycled material to produce plastic reduces energy consumption by as much as 87 percent, and recycling one ton of paper saves enough energy to power an average U.S. home for half a year.[120] Producing steel from recycled material requires 60 percent less energy than creating steel from iron ore.[121] Second, these restrictions will exchange U.S. waste and scrap for Chinese recyclables, which are generally of lower quality. According to the ISRI, China's domestic waste and scrap is "of variable quality" and is "processed by enterprises employing poor operational, labor, and environmental standards," exacerbating environmental and social damage associated with waste and scrap processing.[122] U.S. waste and scrap collectors are generally more efficient than Chinese firms. According to the ISRI, in the United States roughly 1,150 tons of recyclable fiber is required to make 1,000 tons of new paper.[123] By contrast, in China roughly 1,300 tons of recyclable fiber is required to make the same amount of paper.[124]

[*] Last year, Alibaba sold more than $18 billion in merchandise during Singles Day. Pak Yiu, "China Ban on Waste Imports Leads to Piles of Paper Abroad, Surging Prices in China," Reuters, September 29, 2017. *http://www.reuters.com/article/us-china-commodities-environment/chinas-early-winter-smelter-cuts-boost-prospects-for-blue-sky-congress-idUSKCN1C41CA.*

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