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CHINA AND THE OIL PRICE WAR: A MIXED BLESSING

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The oil price war started this month by Russia and Saudi Arabia is good news for the Chinese economy, which has been reeling from the coronavirus. After all, China is the world's largest crude oil importer. The savings in oil import costs will be significant. Yet the economic benefits to China will be limited by several factors, including lack of consumer demand due to the lingering effects of coronavirus disruptions. In addition, lower oil prices could make it more difficult for the Chinese government to meet its energy security and environmental goals, which have received considerable priority from Chinese leaders in recent years. The oil price war will also make it more difficult for China to hit the targets set out in the US-China Phase 1 trade deal signed in January. In sum, lower oil prices will deliver significant benefits for China, but are likely to be somewhat of a mixed blessing.

Economic Impacts

The Chinese economy sustained an enormous blow from the coronavirus in the first two months of 2020. Industrial production dropped 13.5%, retail sales dropped 20.5% and fixed asset investments dropped 24.5% as compared to the same period the prior year.[1] As of this writing, official GDP figures are still pending.

Against this backdrop, the oil price collapse will deliver some welcome relief to China's economy as it recovers from the coronavirus. In 2019, China imported roughly 10.2 million barrels per day (bpd) of oil.[2] At that level of imports, the plunge in the price of Brent crude from $67 per barrel in December 2019 to roughly $25 per barrel at the time of this writing would reduce China's oil import bill by $428 million per day—about 1% of GDP—for as long as the price war lasts. Even if oil imports fall by several million barrels per day on average over the course of 2020, the savings to China's foreign exchange accounts as a result of the price war will be significant.

While China stands to benefit from lower import prices, several factors will limit the extent to which the Chinese economy benefits from these discounts.

First and most important, lower oil prices cannot stimulate economic activities that are prohibited for public health reasons in China or its trading partners. To the extent that coronavirus-related measures continue to significantly restrict economic activity in China or its export markets, lower oil prices will have a limited overall impact.

The coronavirus caused Chinese end-user oil consumption to collapse in January and February (setting in motion the chain of events that led to the breakdown of the Russian-Saudi alliance on oil prices).[3] As air, road and rail transport ground to a halt and construction, automobile manufacturing and other labor-intensive industries came to a standstill, end-user demand dropped by an estimated 3 million to 4 million bpd. Signs of recovery are emerging in some segments of China's economy, including increases in the labor migration and freight logistics indices. Other indicators, such as the coal consumption by independent power producers and urban civil transportation indices,[4] as well as measurements of cement plant activity, remain deeply depressed. Meanwhile, the ripple effects of China's slowdown across the global supply chain and spread of the coronavirus around the world look set to depress external demand for Chinese exports, further hampering China's manufacturing and industrial activity.

When oil prices collapsed in 2014, low oil prices helped trigger an acceleration in Chinese economic growth. Such a surge may occur again once the coronavirus pandemic is safely behind us. Until then, however, no amount of oil price decline will be sufficient to offset the economic effects of nationwide lockdowns and quarantines in China and around the world.

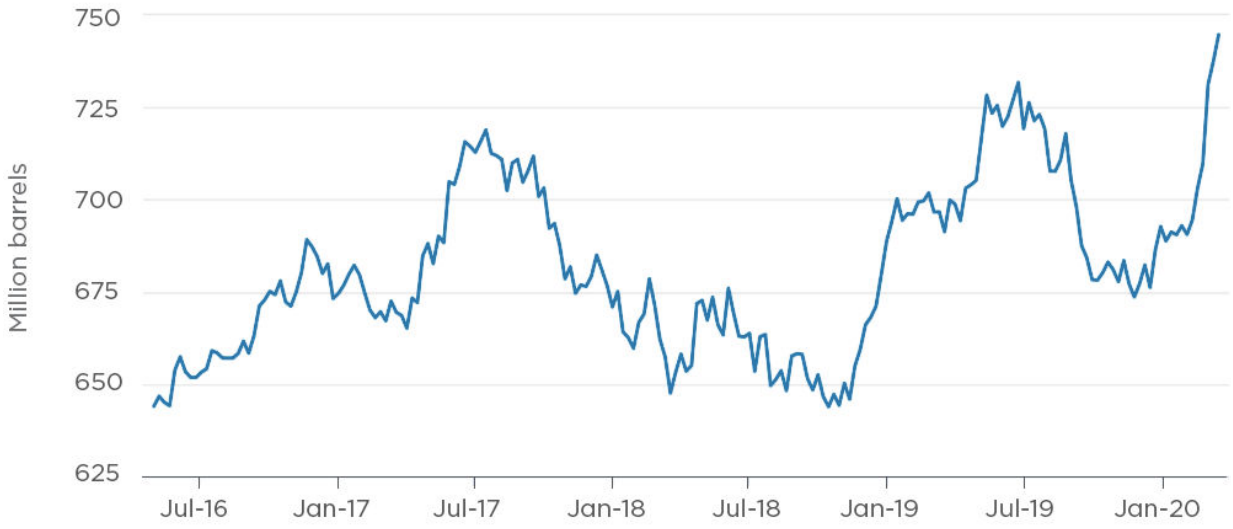
Second, Chinese drivers will enjoy only part of the benefit from lower global oil prices. The Chinese government sets retail gasoline and diesel prices, adjusting those prices every 10 working days in line with fluctuations in global oil prices. When crude prices fall below $40 per barrel, however, retail gasoline and diesel prices are not adjusted downward.[5] This $40-per-barrel floor helps limit losses at China's national oil companies (NOCs), which generally have average production costs in the range of $40-$50 per barrel, but also limits the extent to which a price decline puts money in the pockets of motorists.[6] Chinese drivers will benefit from global crude oil trading at $40 per barrel or lower, but not to the extent they would if China's retail fuel prices were fully liberalized.

Third, the oil price war creates considerable challenges for China's powerful oil industry, which employs millions. China is the world's sixth largest oil producer, with estimated output of more than 3.8 million bpd in 2019.[7] The industry's domestic upstream operations will become less profitable and some oilfields may incur losses as oil prices fall.

Nevertheless, the price war creates at least two opportunities for Chinese oil producers and refiners, by utilizing their vast storage capacity to buy cheap oil for resale later and by increasing exports of refined products.

- First, low global oil prices will stimulate demand for storage from oil market participants eager to play a "carry game"—that is, to store cheap oil today to resell it at a profit when the market picks up again. China has emerged in recent years as the world's second largest holder of crude storage capacity—whether for commercial or strategic purposes—after the US. That said, whether China's oil companies can use that capacity to their competitive advantage remains to be seen, given the extent to which terminals were already filled before the price war (Figure 1), the lack of connectivity of Chinese terminals with the global market and destination clauses in Saudi contracts (See Textbox).

Figure 1: China crude oil inventories



Source: Kayrros

China's Ability to Play a "Carry Game" Is Likely to Be Limited

China is well-positioned to play the carry-game because of its status as one of the world's top holders of crude storage capacity. China has more than 1.2 billion barrels of such capacity (including floating-roof and underground strategic storage capacity), or slightly more than 20% of the 5.8 billion barrels of global storage capacity.[8] China's share of global commercial storage capacity is also among the world's largest, at 16%, with 737 million barrels of nameplate capacity out of a total of 4.6 billion barrels, second only to that of the US (788 million barrels, or 17%).[9]

However, steep builds following the coronavirus outbreak but before the Saudi-Russian price war have left China with only limited spare capacity available to play the carry game. As of March 9, more than 68% of China's storage capacity was utilized, compared with 61% for the world as a whole.[10] By March 16, Chinese above-ground crude stocks had risen to 745 million barrels, a record high, or nearly 70% of nameplate capacity, a build of more than 50 million barrels in three weeks.[11] Capacity utilization in Eastern China, including Fujian and Zhejiang provinces, home to some of China's largest state-owned refineries, was even higher, at more than 72% by mid-March.[12] Assuming that maximum operable capacity is limited on average to around 80% of nameplate capacity or less, this leaves a limited runway for further stockbuilding.[13]

In Shandong province, home to the so-called "teapots"—the independent refineries that have led Chinese crude

demand growth for the last five years—several terminals were reaching tank tops. The province's largest tank farm was 80% full at mid-March, with two-thirds of its tanks totally maxed out.[14] Another facility at the province's largest port of Qingdao was nearly 90% full.[15] In February, there were trade press reports that crude cargoes were being diverted from Qingdao, as its commercial crude storage terminals had run out of spare capacity.[16]

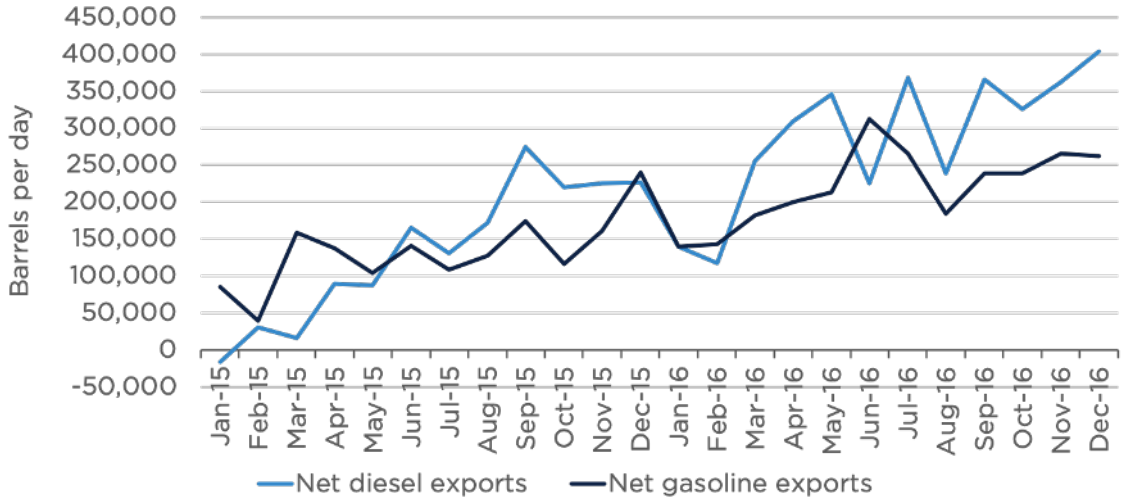
Whatever spare capacity remains available in China may be of relatively little use to play the carry game. Chinese teapot refiners are licensed by Beijing to import crude for their own processing needs but not to resell that crude to third parties. Chinese terminals, whether used and/or operated by independent or state-owned refiners, mostly serve the country's domestic requirements and are not well-designed to function as international trading hubs, making it difficult for capacity holders to use them to hold crude for resale on international markets. Saudi Aramco, China's largest crude supplier and one of the two protagonists in the oil price war, includes "destination clauses" in its contracts that specifically preclude buyers from reselling its crude to third parties. Until demand recovers in earnest, the only Chinese oil companies that may be truly positioned to benefit from current and future low prices may thus be those with access to crude storage facilities outside of China and with the regulatory authority to engage in speculative trading. The opportunity that this represents is by no means negligible, but it does not leave Chinese trading companies at a competitive advantage compared to major trading houses or other oil importers.

- Chinese refiners may also be able to take advantage of the oil price war by ramping up their product exports, as long as they have export quotas and product prices in other markets warrant it. In recent months China has emerged as a growing exporter of refined products, notably to its neighbors Japan and South Korea, which reduced those countries' domestic refinery runs and increased their reliance on Chinese exports.[17] Indeed, China is set to become a key gasoline supplier to Japan when a six-month supply agreement goes into effect in April.[18] A fast recovery in Korean and Japanese demand from the coronavirus may provide China with an opportunity to ramp up its refining activity and product exports even if its internal demand remains relatively depressed, provided product prices in these export markets offer Chinese refiners acceptable margins. In that case, the reconfiguration of regional crude and product flows already underway may pick up further momentum, reinforcing China in its role of regional refinery hub (See Textbox).

Past as Prologue: Will low oil prices increase the utilization rates of China's independent refiners and China's exports of refined products?

After the oil price collapse in mid-2014, China's independent refiners took advantage of the gap between international crude prices and domestic fuel prices when crude traded below $40 to increase their utilization rates and profits.[19] The growth in gasoline and diesel outputs from the independent refiners contributed to the dramatic increase in China's net diesel and gasoline exports in 2015 and 2016 (Figure 2). This increase in China's refined product exports put pressure on refineries in other Asian countries, especially Australia, Japan and South Korea.[20]

Figure 2: China's net diesel and gasoline exports, 2015-2016



Source: General Administration of Customs of China via Dow Jones Factiva

After stringent US sanctions were imposed on Iranian crude oil exports and Washington lifted all sanctions waivers in May 2019, Japanese and Korean buyers of Iranian oil cut off their purchases but did not fully offset the loss with higher imports from other producing countries, opting instead to ramp up their refined product imports from China. Japanese and Korean oil companies in effect offshored their Iran supply risk to China, boosting the latter's role as regional refiner.

After slashing their throughputs in the face of plunging domestic demand in February 2020, China's independent refineries are again capitalizing on the oil price collapse to increase their run rates. According to media reports, independent refineries in Shandong province have raised their utilization rates from a five-year low of 36.9% during the last 10 days of February

to 65%–70% as of March 12, in a rush to profit from international crude prices below $40.[21] The independents undoubtedly share the view of one Chinese NOC executive who said "a refinery becomes a money-printing machine when international crude price drops below US$40 per barrel."[22]

Total Chinese throughputs rebounded to about 12 million bpd by mid-March from a 10.8 million bpd low in late February (on a two-week rolling average basis), but down from highs of more than 14.3 million bpd in November and December.[23]

Energy Security Impacts

Energy security is a longstanding objective of the Chinese government. This includes both increasing domestic production and diversifying sources of foreign supply. Yet as China's oil consumption has climbed in recent years, so has its import dependence, reaching around 70% in 2019.[24] If oil prices stay lower for longer, they are likely to affect China's energy security by creating challenges for domestic oil producers, enhancing competition between its two top oil suppliers and favoring LNG imports over pipeline imports.

Challenges to Increasing Domestic Oil and Gas Production

In July 2018, China's President Xi Jinping, facing pressure from the US-China trade war, instructed China's NOCs to ramp up their domestic output to enhance national energy security. This guidance prompted China's NOCs to increase their upstream capex to the highest levels since 2014 and to publish their first-ever seven-year plans for increasing domestic output.[25] Their efforts paid off. In 2019, China's oil production grew by 0.8%, to 3.84 million bpd, bringing an end to a three-year decline in output, and China's natural gas production increased by 9.8%, to 173.6 billion cubic meters (bcm).[26]

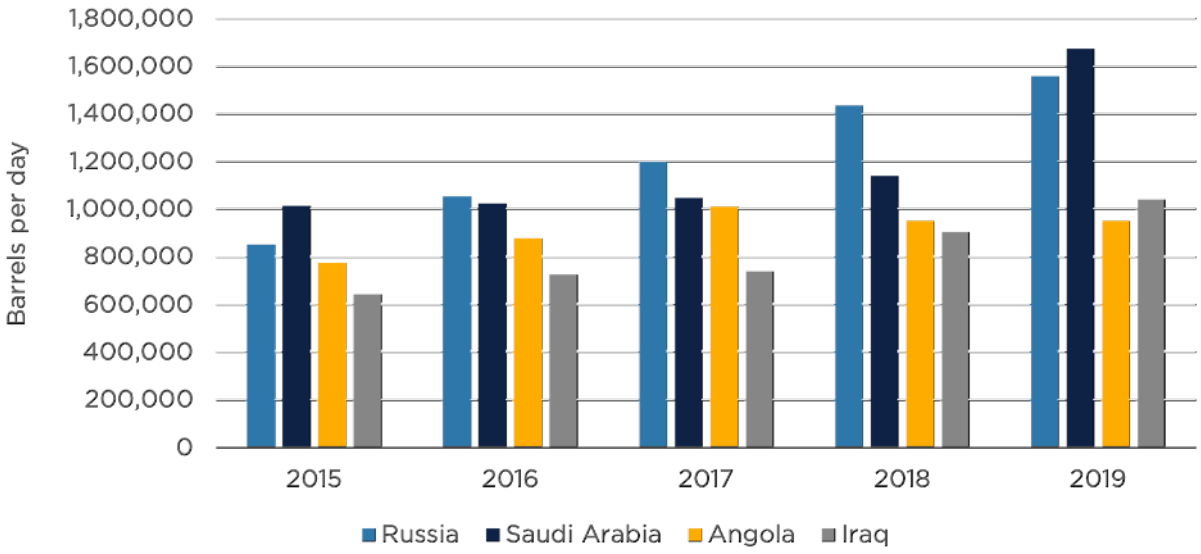
A prolonged period of lower oil prices will complicate the efforts of China's NOCs to increase domestic oil and natural gas output. As noted, the collapse of crude oil prices in 2014-2016 spurred China's NOCs to intentionally stop production at some oil fields because those fields were operating at a loss.[27] Instead, China's NOCs began to stock up on cheaper imported crude. As a result, China's oil output peaked at 4.3 million bpd in 2015 and decreased on an annual basis through 2018.[28] If crude prices stay lower for longer, China's NOCs may have to navigate between bolstering their bottom lines and further increasing domestic output for non-economic reasons.

Competition Between Its Two Largest Suppliers for Market Share in China

Nowhere is the Saudi-Russian oil rivalry playing out more fiercely than in China. Saudi Arabia and Russia are China's top two crude oil suppliers and they are engaged in an ongoing competition for shares of China's crude oil imports.[29] Purchases of Russian crude by China's independent refiners helped make Russia China's top crude supplier on an annual basis in 2016–2018, eclipsing Saudi Arabia.[30] By the end of that period, China sourced 15% of its crude imports from Russia, or 1.44 million bpd out of a total 9.26 million bpd.[31] Just as Russia rose to become China's top supplier, so too did China become Russia's largest customer. In response,

Saudi Aramco ended its long-standing policy of limiting its sales to the two main state-owned refiners, Sinopec and PetroChina, and managed to reclaim its position as China's top supplier after entering into its own supply deals with other privately owned refiners, including Zhejiang Petrochemical's 400,000 bpd refinery in Zhoushan, in the eastern province of Zhejiang, and Hengli Petrochemical's Dalian plant, also 400,000 bpd, in the northeastern province of Liaoning.[32] Saudi crude deliveries to China surged by almost 50% to 1.67 million bpd in 2019, accounting for half of China's growth in crude oil imports and 16% of overall crude imports of 10.16 million bpd.[33] As a result, Saudi Arabia replaced Russia as China's top crude supplier on an annual basis (Figure 3). The day after the collapse of the OPEC+ deal, Aramco slashed its Official Selling Price[34] to Asia in an apparent bid to grab further market share from Russia. Prices for Russian grades sold in China quickly fell in response to the Saudi pricing adjustment.[35]

Figure 3: China's crude oil imports from its top four suppliers, 2015-2019



Source: General Administration of Customs of China via Dow Jones Factiva and Customs Statistics, http://43.248.49.97/indexEn

LNG Imports Favored over Pipeline Imports

Another implication of a sustained period of lower oil prices is that China will likely favor cheap LNG over new pipeline imports to meet natural gas demand. As China's demand for natural gas starts to pick up again as industrial output resumes, talks of force majeure or suspension of LNG deliveries should fade, especially as LNG imports should remain competitive to pipeline gas given the global oversupply of LNG now looks likely to persist through 2021. Current spot prices for May delivery are $3.40/MMBtu, while oil-linked LNG contracts are below $6/Mmbtu.[36] While China has been nearing capacity of around 100 bcm across 22 LNG import terminals in operation, another 60 bcm is under construction

that should come into service by 2022.[37] This would enable China to meet projected import needs mainly through LNG and take advantage of lower spot and contract prices. As a result, Beijing is likely to put on the back burner plans to develop Line D of the Trans-Asia Natural Gas Pipeline, which delivers natural gas from Central Asia to China, or the Power of Siberia II pipeline, which would send gas from western Russia to western China, because such projects are expensive to develop.

Meanwhile, the Power of Siberia pipeline likely will continue its gradual ramp-up to maximum capacity but the pace may accelerate at the margins when China's natural gas demand recovers. The Power of Siberia, which commenced operation in December 2019 (and is offline for maintenance from March 16 until April 1), delivers gas from Russia to China's northeast region, which has cold winters and few LNG terminals. Gazprom expects the pipeline will deliver 5 bcm in 2020 and reach its full capacity of 38 bcm by 2025, although some industry analysts suspect it will take longer to reach maximum capacity.[38]

Environmental Impacts

China is the world's largest greenhouse gas emitter by far, with more emissions last year than the United States and Europe combined. Roughly 15% of China's greenhouse gas emissions come from oil. Urban air pollution remains a serious and visible problem throughout much of China. Vehicle emissions are the second largest contributor to air pollution in China's cities (after coal combustion).[39]

Pollution levels in China dropped significantly during the past few months due to the unprecedented disruptions caused by the coronavirus. Emissions of carbon dioxide (CO_2)—the leading greenhouse gas—fell roughly 25% in February year-over-year. (Twenty-five percent of Chinese CO_2 emissions is almost 7% of global CO_2 emissions.) Emissions of nitrous oxides and other local air pollutants fell sharply as well. As public health restrictions related to the coronavirus are lifted in the months ahead, those emissions will begin to climb.[40]

Whether lower oil prices will significantly affect pollution levels in China is unclear.

- Lower prices will spur greater oil consumption—and as a result, greater emissions—at the margin.
- Yet public health measures responding to the coronavirus will continue to dampen oil demand in China's transport sector in the months ahead, potentially outweighing the impact of lower oil prices. (Also, as noted, the central government sets a floor on retail fuel prices in China. Those prices do not follow the global oil market below $40 per barrel.)
- A global recession, which appears likely, would dampen oil demand in many Chinese industries, especially those with export markets. Those impacts would likely outweigh the impact of falling oil prices as well. (China's industrial sector uses roughly as much oil as China's transport sector.[41])

Given the unprecedented nature of the coronavirus market disruptions in China and around the world, more data are needed to assess these impacts.

Lower oil prices could affect two important Chinese policies for fighting pollution, in different directions.

- First, lower oil prices could support the Chinese government's program to convert coal heating to natural gas in northern China—a program critical to cutting pollution. Many of China's LNG supply contracts are oil-indexed, which means natural gas will be available at lower costs in the months ahead. However, China's natural gas demand is highly seasonal and plummets in the summer. The lack of natural gas storage capacity will constrain the ability of China's natural gas distribution companies to take advantage of lower prices. Nevertheless, lower global oil prices—especially if they last until next fall—could increase the use of natural gas in northern China, helping cut pollution.

- On the other hand, lower oil prices might somewhat slow the growth of China's electric vehicle (EV) industry—the world's largest. Falling retail gasoline prices could modestly dampen demand for EVs and spur demand for popular SUV models, increasing pollution. However, lower gasoline prices may be less important to EV sales than government subsidies and the pace at which EV charging infrastructure is built. (Last year, EV sales in China fell 2%, largely due to a subsidy cut. This was less than the 8% sales drop for China's vehicle market as a whole, but a change from the double-digit growth in EV sales in recent years. In February, two Chinese provinces announced EV subsidy increases as part of their post-coronavirus economic recovery programs.[42])

To the extent lower oil prices spur faster economic growth in China, that could exert modest upward pressure on pollution levels as well. Yet Chinese economic growth has been significantly (though not entirely) decoupled from emissions growth in recent years. As the Chinese economy grew roughly 48% in the past six years, Chinese CO_2 emissions grew 5%–9% and air pollution levels in many major Chinese cities declined.[43]

US-China Phase I Trade Deal

On January 13, 2020, US and Chinese officials signed a Phase 1 trade deal. The agreement calls for China to increase its purchases of US energy from 2017 levels by $18.5 billion in 2020 and $33.9 billion in 2021.[44] Oil market professionals questioned whether those targets could be met from the outset.[45] The drop in Chinese domestic oil demand from the coronavirus made hitting the targets even less likely.

The oil price war makes the Phase 1 trade deal's energy targets even harder to meet. Lower crude oil and LNG prices mean Chinese buyers would need to purchase larger volumes to meet those targets. As a result, Beijing may seek to renegotiate the targets by referring to the statement in the agreement that both parties acknowledge that the purchases will be made based on "market conditions."[46] (There is also a provision in the agreement that requires US and Chinese officials to consult if an "unforeseeable event outside the control of the Parties delays a Party from timely complying with its obligations."[47]) If the "market conditions"—i.e., demand for the volumes of energy required to meet the monetary targets in a lower for longer oil price environment—do not exist, then the purchases will not be made. The coronavirus and oil price war provide the United States and China with face-saving excuses for why the energy targets cannot be met. The oil price war between Moscow and Riyadh may be a death knell for the Phase 1 trade deal energy targets.

Conclusion

The oil price collapse triggered by the end of Saudi-Russian cooperation earlier this month will deliver significant benefits for China's economy. As the world's largest net oil importer, China stands to benefit from a substantial drop in its oil import bill. However, coronavirus-related restrictions on economic activities in China and around the world, as well as the $40 per barrel floor under domestic fuel prices, may limit the extent to which lower oil prices stimulate economic growth.

The price collapse is a mixed bag for China's oil industry. It provides an opportunity for refiners to profit from the difference between higher state-set fuel prices and lower international crude prices (when crude trades below $40); increase product exports and consolidate China's role as a regional refining hub; and—depending on the amount of available crude oil storage capacity in China—stock up on cheap crude to sell at a profit when oil prices recover. However, lower for longer oil prices will make it more challenging for China's oil producers to increase China's oil and natural gas output and may force China's NOCs to choose between bolstering production or their bottom lines.

That said, the oil price collapse is not all bad news for China's energy security. China benefits from the ongoing competition between its two largest crude suppliers: Russia and Saudi Arabia. In addition, a sustained period of low oil prices would provide China with the opportunity to meet more of its future import requirements with cheaper LNG, reducing reliance on Russian and Central Asian gas exporters.

Lower oil prices will have only modest impacts on Chinese emissions and pollution levels. On the plus side, lower oil prices support Beijing's policy of converting heating in northern China from coal to natural gas (since natural gas prices are often tied oil prices). On the minus side, lower oil prices may somewhat slow the development of China's EV industry and increase purchases of larger, more-polluting SUVs.

Finally, the oil price collapse will make the energy purchase targets in the Phase 1 US-China trade deal more challenging for China to achieve. Those targets were unlikely to be met in any event, and the combination of the coronavirus pandemic and oil price collapse may provide both countries with a face-saving way to explain the failure to deliver on the energy purchase terms of that agreement.

Notes

1. Simina Mistreanu, "Coronavirus causes a dramatic collapse in China's economy," Forbes, March 17, 2020, https://www.forbes.com/sites/siminamistreanu/2020/03/17/coronavirus-causes-a-dramatic-collapse-of-chinas-economy/#3856e1bb6cea; National Bureau of Statistics of China, "Investment in Fixed Assets from January to February 2020," March 17, 2020, http://www.stats.gov.cn/english/PressRelease/202003/t20200317_1732659.html; National Bureau of Statistics of China, "Total Retails Sales of Consumer Goods Went down by 20.5% in the First Two Months of 2020," March 17, 2020, http://www.stats.gov.cn/

english/PressRelease/202003/t20200317_1732694.html; and National Bureau of Statistics of China, "Industrial Production Operation in the First Two Months of 2020," March 17, 2020, http://www.stats.gov.cn/english/PressRelease/202003/t20200317_1732640.html.

2. Oceana Zhou, "China's 2019 crude imports grow 9.5% to 10.2 mil b/d despite Dec dip," S&P Global Platts, January 14, 2020, https://www.spglobal.com/platts/en/market-insights/latest-news/oil/011420-china-data-2019-crude-imports-grow-95-to-102-mil-bd-despite-dec-dip.

3. For more on the impact of the coronavirus on oil markets, see Antoine Halff, "When China sneezes: OPEC's struggle to counter the oil demand impact of coronavirus," Center on Global Energy Policy (CGEP), Columbia University, March 4, 2020, https://energypolicy.columbia.edu/research/when-china-sneezes-opec-s-struggle-counter-oil-demand-impact-coronavirus.

4. Steve Bernard, Cole Tilford and John Burns-Murdoch, "Coronavirus Tracked: the latest figures as the pandemic spreads," *Financial Times*, March 18, 2020, https://www.ft.com/content/a26fbf7e-48f8-11ea-aeb3-955839e06441.

5. "China sets floor for retail oil pricing," Xinhua, January 13, 2016, http://english.www.gov.cn/news/top_news/2016/01/13/content_281475271410529.htm.

6. In 2016, China's Ministry of Finance and National Development and Reform Commission announced that when international crude prices are at $40 per barrel or lower the incremental value between international crude prices and China's domestic fuel prices would be collected from China's national and local oil companies and deposited in a fund controlled by the central government to be used for a variety of purposes including promoting energy conservation, improving fuel quality and ensuring oil supply security. See Ministry of Finance and National Development and Reform Commission, "Notice of the Ministry of Finance and the National Development and Reform Commission on the Administrative Measures for the Management and Collection of the Oil Price Adjustment RiskProvision " (财政部，国家发展改革委员会引发 "油价调控风险准备金征收管理办法"的通知; Caizhengbu, Guojia fazhan gaige weiyuanhui yinfa "youjia tiaokong fengxian zhunbeijin guanli banfa" de tongzhi), December 15, 2016, http://czt.ln.gov.cn/zfxxgk/zdgkwj/tfw/201701/W020170117524285304958.pdf.

7. International Energy Agency, *Oil Market Report*, March 9, 2020, Table 3, "World Oil Production," p. 22. The IEA estimates China's 2019 oil production at 3.88 million bpd, whereas China's National Bureau of Statistics lists it as 3.84 million bpd. See National Bureau of Statistics, "Above-scale industrial value-added increased by 6.9% in December 2019" (2019年12月份规模以上工业增加值增长6.9%; 2019 nian 12 yuefen guimo yishang gongye zengjia zhi zengzhang), January 17, 2020, http://www.stats.gov.cn/tjsj/zxfb/202001/t20200117_1723387.html.

8. Estimates from data analytics company Kayrros SAS. See Kayrros, "Accelerating Down the Crude Storage Runway," March 16, 2020. CGEP co-author Antoine Halff is a co-founder and chief analyst at Kayrros.

9. Kayrros calculation.

10. Kayrros, "Global Crude Oil Inventory Report: China Stocks Hit Highest Level Since 2016," March 11, 2020.

11. Kayrros, "Chinese Crude Oil Inventories Climb to Record Highs; Uptick in Implied Demand," March 17, 2020.

12. Kayrros, "Chinese Crude Oil Inventories Climb to Record Highs; Uptick in Implied Demand," March 17, 2020.

13. Tanks are typically not filled to nominal capacity for a combination of operational and commercial reasons. From an operational standpoint, active tanks rarely exceed 80% utilization. Logistically and commercially, it is also practically impossible to fully optimize capacity, i.e., to perfectly match stockholders and capacity holders, as tank owners or leaseholders may not wish to make capacity available to competitors. Differences in crude quality also require that different crude grades be stored in dedicated tanks and restrict operators' ability to comingle grades of different qualities (e.g., high-sulfur and low-sulfur crudes) in shared facilities.

14. Kayrros, "Global Crude Oil Inventory Report: China Stocks Hit Highest Level Since 2016," March 11, 2020.

15. Kayrros data accessed March 18, 2020.

16. See, for example, Muyu Xu, Shu Zhang and Devika Krishna Kumar, "Stranded tankers, full storage ranks: coronavirus leads to crude glut in China," *Reuters*, February 13, 2020, https://www.reuters.com/article/us-china-health-oil-storage/stranded-tankers-full-storage-tanks-coronavirus-leads-to-crude-glut-in-china-idUSKBN2072NR; and "Oil Tankers Idling Off Shandong Show Depth of Demand Destruction," *Bloomberg*, February 13, 2020, https://www.bloomberg.com/news/articles/2020-02-13/oil-tankers-idling-off-shandong-show-depth-of-demand-destruction.

17. Koustav Samanti and Muyu Xu, "China opens fuel export taps as coronavirus slows domestic demand," *Reuters*, February 25, 2020, https://www.reuters.com/article/china-health-oil-exports/china-opens-fuel-export-taps-as-coronavirus-slams-domestic-demand-idUSL3N2AO18T?rpc=401&.

18. Daisuke Shibata, Takeo Kumagai and Mark Tan, "China to become key gasoline supplier to Japan as term contract starts," S&P Global Platts, March 18, 2020, https://www.spglobal.com/platts/en/market-insights/latest-news/oil/031820-china-to-become-key-gasoline-supplier-to-japan-as-term-contract-starts.

19. For more on this issue, see Erica Downs, "The Rise of China's Independent Refineries," Center on Global Energy Policy, Columbia University, September 2017, https://energypolicy.columbia.edu/sites/default/files/CGEPTheRiseofChinasIndependentRefineries917.pdf.

20. Clyde Russell, "Refinery Wars: China, India win; South Korea, Japan, Singapore Lose," *Reuters*, August 26, 2016, https://www.reuters.com/article/us-column-russell-refineries-asia/refinery-wars-china-india-win-south-korea-japan-singapore-lose-idUSKCN1140JN.

21. Frank Tang, "China's teapot refineries could become 'money-printing machines' amid crude price crash," *South China Morning Post*, March 12, 2020, https://www.scmp.com/economy/china-economy/article/3074703/chinas-teapot-oil-refineries-could-become-money-printing.

22. Ibid.

23. Kayrros, "Chinese Crude Oil Inventories Climb to Record Highs; Uptick in Implied Demand," March 17, 2020.

24. "China's Dependence on Foreign Oil and Gas Sets a New Record" [我国油气消费对外依存度双创新高; Woguo youqi xiaofei duiwai yicun du Shuang chuang xingao], Xinhua [新华; Xinhua], March 27, 2019, http://www.xinhuanet.com/energy/2019-03/27/c_1124287213.htm.

25. Erica Downs, "High Anxiety: The trade war and China's oil and gas supply security," Center on Global Energy Policy, Columbia University, https://energypolicy.columbia.edu/research/commentary/high-anxiety-trade-war-and-china-s-oil-and-gas-supply-security.

26. National Bureau of Statistics, "Above-scale industrial value-added increased by 6.9% in December 2019."

27. See, for example, Aibing Guo, "'No Hope' Fields Spur 1st PetroChina Output Cut in 17 Years," *Bloomberg*, March 24, 2016, https://www.bloomberg.com/news/articles/2016-03-24/-no-hope-oilfields-spur-1st-petrochina-output-cut-in-17-years.

28. China's Crude Oil Production, 2013–2018" [2013–2018年中国原油产量; 2013–2018 nian Zhongguo yuanyou chanliang], *International Petroleum Economics* [国际石油经 济; Guoji shiyou jingji], 27, no. 4 (2019): 104, China Academic Journals.

29. Daisy Xu and Gawoon Philip Vahn, "Analysis: China to remain a battleground for Saudi Aramco, Russian crude suppliers in 2020," S&P Global Platts, November 11, 2019, https://www.spglobal.com/platts/en/market-insights/latest-news/oil/111119-analysis-china-to-remain-a-battle-ground-for-saudi-aramco-russian-crude-suppliers-in-2020.

30. "Russia Seals Position as Top Crude Supplier to China, Holds off Saudi Arabia," *Reuters*, January 24, 2019, https://www.reuters.com/article/us-china-economy-trade-crude/russia-seals-position-as-top-crude-oil-supplier-to-china-holds-off-saudi-arabia-idUSKCN1PJ05W; "Table of China December Data on Oil, Oil Product, LNG Imports," Dow Jones Institutional News, January 25, 2018, Factiva; and "Table of China December Data on Oil, Oil Product, LNG Imports," Dow Jones Institutional News, January 23, 2017, Factiva.

31. Custom Statistics, http://43.248.49.97/.

32. Rania El Gamal, Chen Aizhu and Min Zhang, "Saudi Aramco shifts strategy in China to boost oil sales," *Reuters*, March 14, 2019, https://www.reuters.com/article/us-saudi-aramco-china-oil/saudi-aramco-shifts-strategy-in-china-to-boost-oil-sales-idUSKCN1QV1JC; and Philip Vahn, Oceana Zhou and Eesha Muneeb, "Analysis: China's Hengli, Zhejiang offer relief for Saudi Aramco's faltering sales to Asia," S&P Global Platts, July 9, 2019, https://

www.spglobal.com/platts/en/market-insights/latest-news/oil/070919-analysis-china-s-hengli-zhejiang-offer-relief-for-saudi-arabia-s-faltering-crude-sales-to-asia.

33. Custom Statistics, http://43.248.49.97/. See also Muyu Xu and Chen Aizhu, "China oil imports from top supplier Saudi Arabia rise 47% in 2019: customs," *Reuters*, January 30, 2020, https://www.reuters.com/article/us-china-economy-trade-oil/china-oil-imports-from-top-supplier-saudi-arabia-rise-47-in-2019-customs-idUSKBN1ZU0EH; and Oceana Zhou, "China's 2019 crude imports grow 9.5% to 10.2 mil b/d despite Dec dip," S&P Global Platts, January 14, 2020, https://www.spglobal.com/platts/en/market-insights/latest-news/oil/011420-china-data-2019-crude-imports-grow-95-to-102-mil-bd-despite-dec-dip.

34. Saudi Aramco's Official Selling Prices are set at the beginning of each month for all Saudi crude grades based on a price differential to local crude benchmarks. Different benchmarks or "marker" prices are used for the different regions where Aramco markets its crude, namely the Asia-Pacific market, Europe and Africa, and the Americas.

35. Unlike Saudi crude, which is sold on a long-term contract basis, Russian crude oil is entirely sold on a spot basis.

36. Aaron Sheldrick, "Japan Spot LNG Price Falls to Lowest Level on Record Amid Coronavirus Outbreak," *Reuters*, March 10, 2020, https://www.reuters.com/article/japan-lng-spot/japan-spot-lng-price-falls-to-lowest-on-record-amid-coronavirus-outbreak-idUSL4N2B323G; and Eric Yep, Shermaine Ang and Cindy Liang, "Analysis: Cheaper Oil-Linked LNG Unlikely to Accelerate China's Gas Demand Recovery," S&P Global Platts, March 10, 2020, https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/031020-analysis-cheaper-oil-linked-lng-unlikely-to-accelerate-chinas-gas-demand-recovery.

37. Cindy Liang, "China's LNG import growth expected to slow to 9.5% in 2020: CNPC," Platts LNG Daily, January 14, 2020, Factiva; "China-Projects-Gas-LNG," Global Energy Research, March 22, 2020, Factiva; and "Factbox: China's LNG import terminals and storage facilities," *Reuters*, August 16, 2019, https://www.reuters.com/article/us-china-gas-terminal-factbox/factbox-chinas-lng-import-terminals-and-storage-facilities-idUSKCN1V60OA.

38. See, for example, Gavin Thompson, "Power of Siberia Begins Gas Supply to China (and Why it's OK for LNG)," Wood Mackenzie, December 16, 2019, https://www.woodmac.com/news/opinion/power-of-siberia-begins-gas-supply-to-china-and-why-its-ok-for-lng/.

39. See David Sandalow, "Guide to Chinese Climate Policy 2019," Center on Global Energy Policy, Columbia University, Chapters 1 and 5, https://energypolicy.columbia.edu/research/report/2019-guide-chinese-climate-policy.

40. Leslie Hook and Christian Shepard, "Coronavirus leads to sharp fall in China's carbon emissions," Financial Times, March 4, 2020;, https://www.ft.com/content/df3fb3b2-5def-11ea-8033-fa40a0d65a98; Lauri Myllyvirta, "Coronavirus has temporarily reduced China's CO_2 emissions by a quarter," CarbonBrief, February 19, 2020, https://www.carbonbrief.org/analysis-coronavirus-has-temporarily-reduced-chinas-co2-emissions-by-a-quarter.

41. National Bureau of Statistics of China, "National Data," http://data.stats.gov.cn/easyquery.

htm?cn=C01.

42. Jill Shen, "EV Subsidies in China are Making a Comeback," Technode, March 5, 2020, https://technode.com/2020/03/05/ev-subsidies-in-china-are-making-a-comeback/.

43. See David Sandalow, "Guide to Chinese Climate Policy 2019," Center on Global Energy Policy, Columbia University, pp. 19, 146, https://energypolicy.columbia.edu/research/report/2019-guide-chinese-climate-policy.

44. "Economic and Trade Agreement Between the Government of the United States of America and the Government of the People's Republic of China," Office of the United States Trade Representative, January 15, 2020, Articles 6-1 and 6-2, https://ustr.gov/countries-regions/china-mongolia-taiwan/peoples-republic-china/phase-one-trade-agreement/text.

45. See, e.g., David Lawder and Andrea Shalal, "China to ramp up U.S. buys under trade deal, but skeptics question targets," *Reuters*, January 14, 2020, https://www.reuters.com/article/us-usa-trade-china/china-to-ramp-up-u-s-buys-under-trade-deal-but-skeptics-question-targets-idUSKBN1ZD0FN.

46. "Economic and Trade Agreement Between the Government of the United States of America and the Government of the People's Republic of China," Office of the United States Trade Representative, January 15, 2020, Articles 6-1 and 6-2, https://ustr.gov/countries-regions/china-mongolia-taiwan/peoples-republic-china/phase-one-trade-agreement/text.

47. Ibid., Article 7-2.

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