

The Impacts of COVID-19 on China's Domestic Natural Gas Market

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Introduction

This paper examines to what extent the new pandemic named COVID-19 by WHO, has impacted the domestic natural gas market in China. We provide a sectoral decomposition of the effects and discuss their potential short and long-run impacts. There is an important literature on the determinants of gas consumption in China and the future evolution of the gas market and gas consumption (Wang and Lin, 2014; Zeng and Li, 2016; Wang and Lin, 2017; Jiang et al., 2020). In addition, there is a stream of work on the potential economic impacts of COVID-19 (Qiu et al. 2020). However, to our knowledge, none of these works analyzes the specific impacts of COVID-19 on the Chinese natural gas market.

Natural gas is a more efficient and cleaner fossil fuel energy compared to coal and petroleum. The need to mitigate climate change by reducing global CO₂ emissions has led China to increase the share of gas in its energy mix to foster its energy transition (Li et al., 2011). In 1997, China's natural gas consumption was 19.8 billion cubic meters (bcm) which was 1.8% of world consumption. In 2015, this rose to 194.7 bcm (5.9% of world consumption) (Jinag et al., 2020) and peaked at 375.473 bcm in 2019 (Zang and Yang, 2015). The annual rate of growth of natural gas consumption in China is 13.5% (Zang and Yang, 2015).

Given the specificities of natural gas, to better adjust production and importation we need to forecast the evolution of consumption. There are several studies such as Wang and Lin (2014), Wu et al. (2015), Zeng and Li (2016) and Jiang et al. (2020) which use various datasets and estimation methods¹, and forecast increased consumption; however, none include risk of a pandemic.

COVID-19 has affected the consumption, production, storage and price of gas in China and these effects will remain in place in the immediate future due to uncertainty about potential new waves of the disease and its spread worldwide. COVID-19 is causing the most significant depression in modern history. Understanding the impact of COVID-19 on China's domestic gas market should be valuable for other countries and allow better management in future similar crises.

Our paper provides four main findings. First, growth in demand for (but not the quantity) natural gas in China experienced a significant drop during Q1-2020 due to COVID-19 and Chinese policy interventions. Second, the decreased demand for gas for industrial activity was almost completely offset by increased household demand for heating and cooking. Third,

the downward trend in the price of LNG for non-residents strengthened but there was no change in the price paid by residents signaling incomplete deregulation in the downstream market. Fourth, artificially low domestic prices discouraged growth in domestic production exacerbated further by the low international prices caused by the pandemic.

The paper is organized as follows. Section 2 describes the gas market in China before COVID-19; section 3 discusses and decomposes the effects of COVID-19 on the gas market; section 4 summarizes the findings and concludes.

Spread of COVID-19 in China

In December 2019, a cluster of patients suffering from a new strain of pneumonia was identified in Wuhan, capital of China's Hubei Province. On January 7, 2020, the pneumonia was diagnosed as being caused by a severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which the World Health Organization termed COVID-19.

On January 11, China reported its first death from COVID-19. Meanwhile, cases occurred in other Chinese cities and other countries and there were fears of a global outbreak (Wu et al., 2020). On January 20 there were 282 confirmed cases of COVID-19 in China, Thailand, Japan and the Republic of Korea. On January 27, there were 2,798 confirmed cases were in 12 countries (WHO, 2020a).

To slow the spread of COVID-19, on January 23 China put Wuhan under lockdown and imposed aggressive measures including suspension of flights and trains, cancelation of subway transport and buses, and a ban on all mass gatherings. People were told to work from home, schools and shops (except food and medicine retailers) were closed. In some areas, residents were not allowed to visit shops or order deliveries. Similar though softer measures were adopted later by many other Chinese cities and everyone was encouraged to stay at home to stay safe and help prevent the spread of COVID-19. As the number of cases rose, the health sector in China was strengthened, new hospitals were built and reserve beds were used. On February 20, China had 75,465 reported cases of COVID-19 (WHO,

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2020b).

It seems the lockdown was effective. On February 27, there were 36,117 reported cases of recovery from COVID-19 in China (WHO, 2020c). The number of new cases fell and the number of COVID-19 survivors continued to increase. However, the disease spread quickly to many other countries and on March 11 was declared a pandemic by WHO. On April 8, China lifted the 76-day lockdown in Wuhan. However, due to fears of a second wave of infections, some restrictions remained in place. On April 16, China reported 1,107 active cases of COVID-19, 77,892 patients who had recovered and 3,342 deaths from the disease (Worldometer, 2020), while across the world there were 2,094,884 reported cases and 135,569 deaths in 210

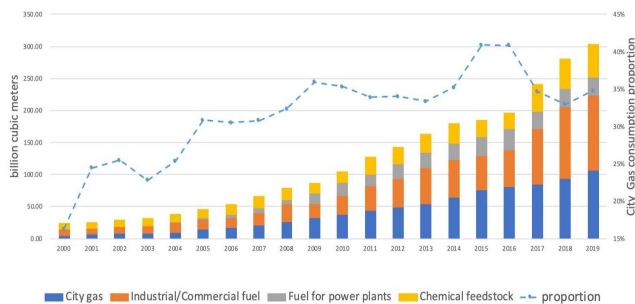


Fig.1. Natural Gas Consumption Structure in China.
Source: Gastank and National Bureau of Statistics of China

countries and territories.

Overview of China's pre-COVID-19 natural gas market

Natural gas consumption

According to the City Statistical Yearbook, China's natural gas is used in the industrial, residential, transport and other sectors (Liu et al., 2018). In 2015, some 285.6 million people had access to gas. The National Energy Administration of China forecast consumption of 360bcm in 2020; approximately 10% of China's total energy demand (Liu et al., 2018).

Residential natural gas consumption is the main driver of growth of China's natural gas demand due mainly to recent national energy policies such as the coal-to-gas reform and urbanization intensification. Fig. 1 shows that city natural gas consumption accounted for approximately 19% in 2000 and 41% in 2016. However, demand is seasonal and related mainly to demand for winter heating (Liu et al., 2018). Liu et al. (2018) suggest that the price elasticity of residential gas consumption is -0.895. Studies of the determinants of gas consumption growth in China identify economic growth, urban population growth, industrial structure, energy efficiency and export of goods and services (Deng, 2019).

Natural gas production and importation

China is ranked sixth for world gas production. Domestic production has not kept pace with demand resulting in China being the third-largest gas importer and the second-largest importer of LNG. In the last 10 years, dependence on imports rose to above 40% from effectively zero (O'Sullivan, 2018) and is set to increase further. Although China is the world's largest energy market, natural gas represents a small share of its energy supply. To try to reduce pollution, the government wants to increase this share to 10% in 2020 and 15% by 2030, and to make this law². To increase this share would require market deregulation and a lower price but that would reduce the incentive for local investment in production and further aggravate dependency.

In 2019 the U.S. became the top oil and gas producing country with a market share of 18% (up from 16%) compared to Russia 16% and Saudi Arabia 15%³, which resulted in a buyers' market. Based on Europe's success in obtaining more favorable terms from Russia, China seems to be able to make demands based on its pivotal position as a major buyer. Achieving more favorable pricing would counterbalance its dependence on imports and reduce the importance of this issue.

Price and market dynamics

Natural gas price fluctuations have been small for some time due to reduced global demand⁴ and the recent warm winter. Global gas companies with excess supply of LNG now have to face the COVID-19 pandemic and oil price fluctuations. All of these issues will extend and increase the current imbalance between supply and demand for LNG. Up to 8% (over 25mtpa) of global LNG demand could be at risk in the near term while the low prices could continue for 12-24 months. LNG buyers may be able temporarily to capitalize on these low prices to improve contract terms and allow substitution from coal to gas.

The fall in China's demand for natural gas has yet to be investigated. Total imports rose 9.6% in 2019, and pre- COVID-19, growth in Beijing's demand for natural gas for 2020 was estimated by the China National Petroleum Corp (CNPC) to be 8.6%. However, the major economic slowdown caused by COVID-19 is decreasing production. At the beginning of March, Reuters claimed

Month	City Gas	Industrial	Power	Chemical Feedstock
Jan 19	46.7%	27.9%	19.5%	5.9%
Feb 19	45.8%	28.2%	17.7%	8.3%
Mar 19	36.1%	35.1%	19.4%	9.4%
Dec 19	47.9%	30.0%	16.3%	5.8%
Jan 20	49.8%	26.1%	16.9%	7.2%
Feb 20	54.5%	21.3%	16.8%	7.4%

Table 1: China's Monthly Natural Gas Consumption Rate by Sector
Source: Gastank

that PetroChina had suspended natural gas imports, issuing *force majeure* clauses to unspecified suppliers of

piped natural gas.

4. The impact of COVID-19 on China's gas market

The impact of COVID-19 on China's natural gas market is mixed. We show that reduced industrial

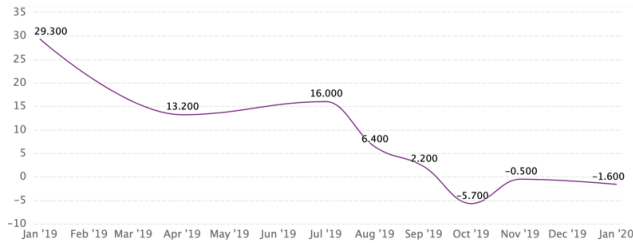


Fig.2. Year-on-Year Growth Rate of Natural Gas Imports in China (1 year)

demand is being absorbed by increased household consumption for heating and cooking during the lockdown.

Demand-side impacts

Data from Gastank show a 29% drop in two months (from 30% in December 2019 to 21.3% in February 2020), and a YOY decline in the industrial gas consumption ratio of 1.7 percentage points in January 2020 and 6.9 percentage points in February 2020 due to the lock-down (table 1). This is significant considering the 10 years of consistent growth averaging 16% despite downward growth in the most recent two years which recorded a one-year average monthly growth rate of 15%.

However, overall demand has barely changed. Gastank data collected from gas suppliers and major downstream users show that monthly average daily consumption in February 2020 due to increased demand for household use was 0.83 bcm compared to 0.85 bcm in February 2019¹. Table 1 column 2 presents combined consumption by residents, public services, heating, compressed natural gas automobiles, and LNG trucks. City gas use tends to drop significantly in February and March when heating needs reduce; however, in February 2020 YOY growth was 17% (from 45.8% to 54.5%), with all users except residents severely affected by the lockdown.

While the LNG market is still expected to grow in the medium-to-long term, growth in demand for LNG is likely to slow this year. Based on past trends, in

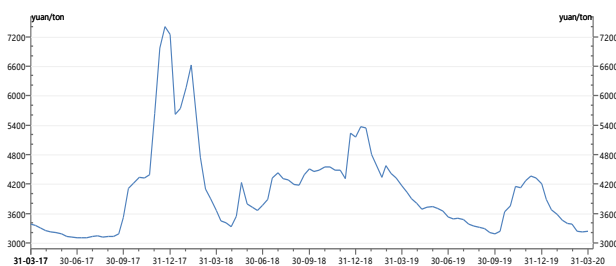


Fig.3. LNG National Market Price in the Last Three Years

Source: WIND and National Bureau of Statistics of China

the short term global demand for LNG is expected to flatten or decline by up to 3% which would result in the LNG market in 2020 being 25mtpa (8%) smaller than previously forecast.

Impact on the supply side and imports

CNOOC (China National Offshore Oil Corporation), China's largest importer of LNG, has suspended several transactions with its main suppliers (see Fig. 2). Economic indicators show that natural gas storage space in China is saturated which situation is set to continue for some time.

Chinese upstream production sites were restricted areas pre-COVID-19 which explains the minimal infections there. Midstream management of the pipes is fully automated and not labor-intensive, and therefore the lockdown did not affect pipeline transportation. Tanker transport was affected only over short periods and mostly in Hubei province and households did not suffer significant shortages. Gas tankers were unable to unload due to lack of storage resulting from the sharp decrease in industry demand for natural gas. Also, the negative effect of COVID-19 on domestic production has been masked by lower international prices. Historically, national oil companies increase production with a lag when international prices are high (O'Sullivan, 2018) because governments set artificially low domestic prices which are unrelated to the world price. The current low world prices do not encourage increased production.

Market dynamics and price effect

While the average price for residents reported by NDRC is within RMB0.02 of the RMB2.62/cu.m. level for July 2019 to February 2020, immediately before the pandemic there was a marked downward trend (see fig.3) in the fully deregulated price for non-resident natural gas used directly for chemical feedstock, power generation, and industrial use. Fig.3 is consistent with deregulation promoting a price spike which was followed by a prolonged period of significant price drops from the end of 2017 with peaks during the winter. The pandemic exacerbated this trend with YOY growth rates of -2.8%, -0.2% and -0.2% in January, February, and March 2020.

There is no mechanism allowing adjustment to already low resident prices in the case of a dramatic event such as COVID-19. In fully deregulated markets the lower prices would have been passed on to customers. If the pandemic continues and prices fall even further below the regulated price, it is unclear whether the benefits can be passed to residents.

Finally, note that disentangling the effect of oil price shocks on economic growth in China is not straightforward. According to Kilian and Vigfusson (2017), little is known about the extent to which oil price shocks explain recessions.

Conclusions and policy implications

As a clean energy, natural gas provides China with economic and social benefits. This paper offers a new perspective on the impact of COVID-19 on China's gas market. It provides insights into various aspects of the gas energy market including energy demand and supply and gas price dynamics. We found a substantial decrease in gas consumption growth and decomposed this effect according to supply chain, production, importation, and consumption. While household consumption increased due to lockdown policies and restrictions on movements, industry consumption decreased sharply. Most significant is that our findings highlight the importance of including the risk of pandemics when predicting gas demand in China.

We offer two main recommendations. First, the urgent need to improve forecasting models to include pandemic and natural disaster events. Second, the importance of ensuring gas production and consumption during lockdown periods. Another pandemic or a second wave of COVID-19 will require new policies. A secure supply chain is paramount for China whose urbanization growth rate is increasing making more households reliant on gas compared to other energy sources.

The current world economic situation is characterized by an elevated level of uncertainty; thus, the results of this analysis should provide valuable insights for policymakers making decisions about efficient policy interventions related to how pandemics shape the structure of the energy market. Our findings should be helpful also to countries implementing energy efficiency policies to achieve a cleaner and low-carbon environment.

Footnotes

¹A range of methods can be used to forecast gas consumption including the Hubbert curve method, statistical methods, artificial neural networks, grey prediction model, econometric models, mathematical models, simulation techniques, etc. Most of these techniques have been used to forecast gas consumption in China.

² Art. 41 Natural Gas Usage of the "PRC's National Energy Law (Draft for Solicitation of Comments)" published April 10, 2020 mandates that the State Council's energy related ministries should increase the ratio of one-time natural gas consumption.

³ CEIC and OPEC data.

⁴ Global demand for natural gas surged by 4.6% in 2018, the fastest growth since 2010 according to the International Energy Agency.

⁵ We could have tested the sensitivity of consumption in different especially warmer provinces where more heating would be more likely due to the presence of boilers in many south China apartments. However, we do not have access to recent data.

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Annex

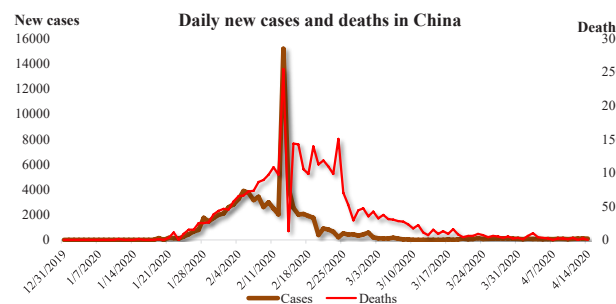


Fig. 4. Daily new cases and deaths in China (31 December 2019-14 April 2020).

Source (EU Open Data Portal)

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