

Impact of Covid-19 on the Demand of Coal Bulk Transportation in China

Jiahua Liao

College of Arts & Science, New York University, New York, United States

jl11844@nyu.edu

Abstract. China's coal bulk transportation sector, instrumental in fulfilling 60% of the nation's primary energy demand in 2019, has been at the forefront of energy research given its criticality to China's energy matrix. Motivated by the widespread disruptions during the Covid-19 pandemic, this study employs a case-based method, focusing on the effects on both imported and domestically produced coal transportation, drawing from a plethora of references. This paper's findings indicate that while there was an initial decline in coal sales and imports in early 2020, strategic interventions led to a 4.6% rise in coal imports by 2021, coupled with a growth of 11% in domestic coal production in 2022. Emphasizing resilience, the sector witnessed a notable rekindling of coal trade with Australia by 2023. This research not only underscores China's capacity for adaptability in its coal sector amidst global disruptions but also lays a foundational framework for future studies, accentuating the significance of understanding energy resilience in a post-pandemic world.

Keywords: China, Coal, Bulk Transportation, Covid-19, Energy Adaptability, Resilience, Trade Dynamics.

1. Introduction

Coal bulk transportation has been a pivotal component of China's energy sector, consistently fueling the nation's energy needs and bolstering industrial operations. As of 2019, coal catered to an impressive 60% of China's primary energy requirements, showcasing its continued importance despite the global inclination towards renewable energies [1]. Even as the Covid-19 pandemic introduced disruptions across multiple industries worldwide, China's coal bulk transportation exhibited both resilience and adaptability, with minimal setbacks in its operations.

Amid the global upheavals induced by the pandemic, a standout feature of China's coal sector has been its tenacity in sustaining operations and confronting challenges head-on. This resilience is exemplified by the renewal of coal trade relations with Australia in February 2023, witnessing a surge in imports from a mere 3 Mt in early 2022 to 50 Mt by mid-2023 [2]. Given the significant role China plays in the global energy market, understanding these dynamics is imperative. This topic holds value as it offers insights into the adaptability of major economies during global crises, potentially guiding future strategies in energy transportation and trade. This research employs a case study approach to understand the dynamics of these implications, focusing on both imported and domestically produced coal transportation. The aim is to analyze the pandemic's impact, comparing its effects on different coal sources, and to suggest strategies that ensure resilience in future disruptions.

2. Case Description

2.1. Overview of Coal Bulk Transportation in China Pre-Covid-19

Before the outbreak of the Covid-19 pandemic, China's coal industry displayed impressive statistics, marking the nation as one of the top players in global coal production and consumption. In 2019, China produced an impressive 3,693 Mt of coal, witnessing a 4.1% surge from the previous year, with thermal coal dominating at 83% [3]. This robust production catered to a staggering consumption of 3,834 Mt in the same year, showcasing China's enormous appetite for coal energy [3]. Key to ensuring that this vast demand was met was China's intricate coal bulk transportation network, which primarily consisted of rail, road, river, and sea routes. Rail transport emerged as the

dominant mode, shouldering 63% of the transportation needs, followed by road at 25%, rivers at 10%, and sea routes accounting for 2% in 2019 [4].

Furthermore, China's reliance on imported coal, primarily seaborne, was evident, with imports in 2019 pegged at 308 Mt, of which 227 Mt was thermal coal [5]. Notably, in the year leading up to the pandemic, China's seaborne coal imports recorded figures of 260 Mt in 2018, followed by an increase to 273 Mt in 2019 and an estimated 261 Mt in 2020 [3]. The key players contributing to China's imported coal stockpile in 2021 included Indonesia at 34%, Australia at 24%, Mongolia with 15%, and Russia contributing 14% [6]. The robustness of this sector before the pandemic is further illustrated by the data indicating that coal constituted 60% of China's primary energy consumption [5].

However, the Covid-19 pandemic did cast shadows over this sector. In the early stages, China's GDP declined 6.8% in Q1 2020, marking its first negative growth since 1992. The pandemic affected coal production and transportation, with daily coal sales by road in areas like Ordos falling significantly. However, China's resilience is evident in its post-pandemic endeavors. By 2022-2023(Q1), there was a surge in coal gasification to produce synthetic fuels, plastics, and fertilizers. Demand for non-power coal usage grew by 7% in 2022 and 2% in 2023 [2]. Coal continues to be pivotal, as it shouldered 60% of China's primary energy consumption palette as of 2020. For a visual representation of global coal production and annual changes by region during this period, see Figure 1.

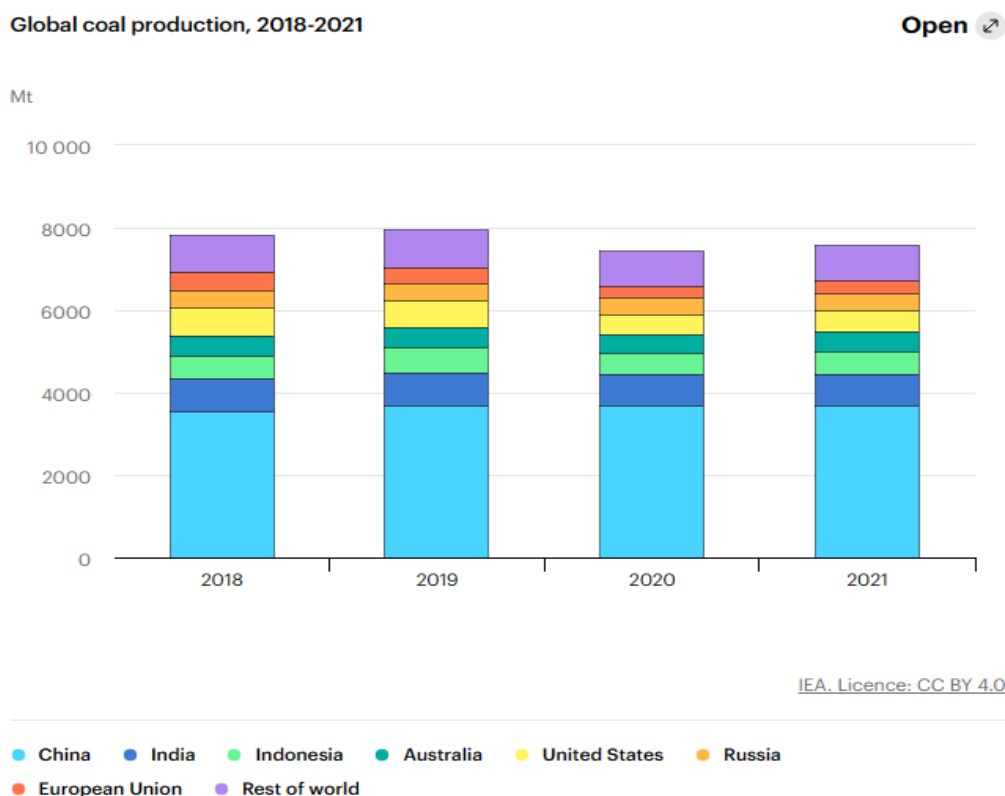


Fig. 1 Global coal production and annual changes by region, 2018-2021

2.2. Covid-19 and Its Impact on Global Trade and Local Economy

In the face of the COVID-19 pandemic, global trade experienced significant disruptions. According to UNCTAD's 2020 report on the impact of COVID-19 on trade and development, global trade declined by 20% in April 2020, an unparalleled contraction that highlighted the profound interdependence of global supply chains [6]. This downturn wasn't isolated to trade alone; ports worldwide also faced reductions in calls, with Chinese ports experiencing a 1.1% fall in Q1 2020 and a further 3.6% decline in Q2 2020 [6]. Despite these challenges, certain sectors remained resilient. For instance, China's coal industry saw a rise in imports, even in the midst of the pandemic [3].

However, the overarching theme was one of decline, adaptation, and strategic realignment in global trade, all triggered by the unforeseen impacts of the pandemic.

China, as one of the foremost global economies, felt the brunt of the pandemic's economic impacts in ways both predictable and unexpected. According to UNCTAD's 2020 assessment, the country's GDP plummeted by 6.8% in Q1 2020, marking the first instance of negative growth since 1992 [6]. This economic slump was manifested in several sectors. The industrial production index saw a staggering decline of 13.5% in the months of January and February 2020, the steepest dip since 1990. Similarly, the service sector's output fell by 13%, the most significant decline since 2011 [6]. One of the most affected sectors was transportation. China's passenger transport nosedived by 84.5% in the early months of 2020, while freight transport experienced an 11.9% drop [6]. Despite these setbacks, the coal sector painted a somewhat different picture. While there were disruptions in coal production and transportation, notably a 23% decline in coal cargo in Q1 2020, China still managed to maintain a stable coal price and even resumed imports from key players like Australia by early 2023 [2,3]. The trends in global coal consumption during this period are illustrated in Figure 2.

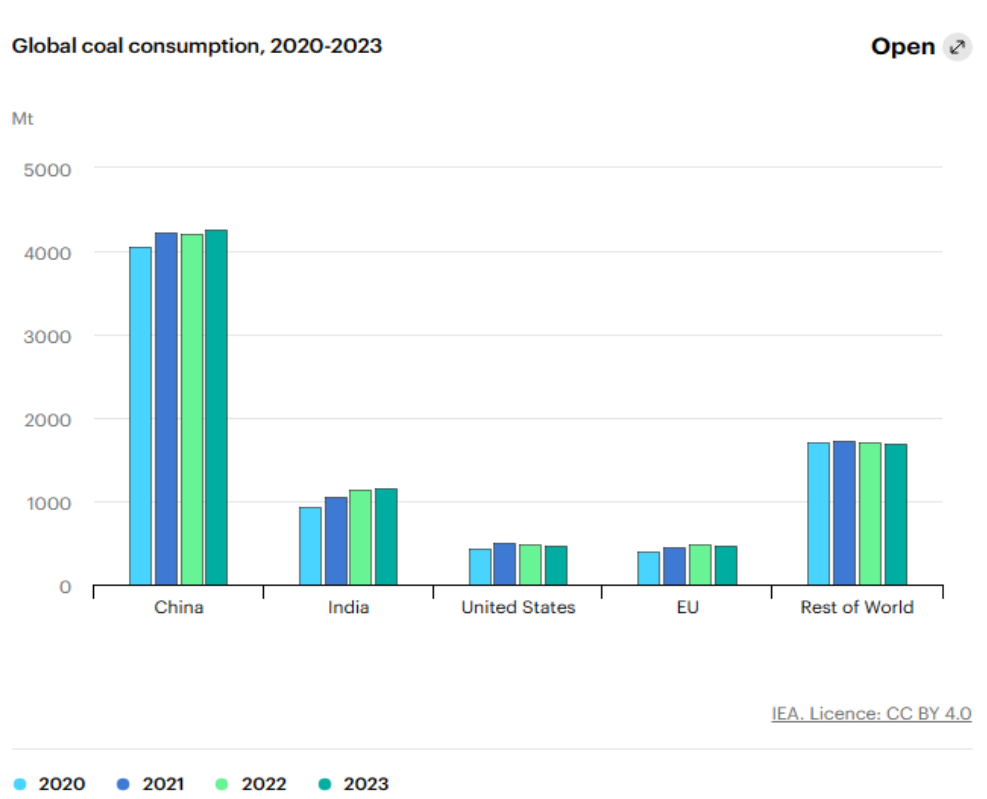


Fig. 2 Global coal consumption, 2020-2023

2.3. Covid-19 and Its Direct Impact on Coal Bulk Transportation

The outbreak of the COVID-19 pandemic significantly impacted numerous industries worldwide, and the coal transportation industry was no exception. As the UNCTAD's "Impact of the COVID-19 Pandemic on Trade and Development" asserts, China's GDP recorded a decline of 6.8% in the first quarter of 2020, which was the first negative growth observed since 1992 [6]. This economic downturn was accompanied by drastic declines in China's industrial production index and the service sector output by 13.5% and 13% respectively in January-February 2020 [6]. Such dramatic economic downturns led to repercussions in China's coal industry. Zijin Tianfeng Futures Research Institute noted that daily coal sales by road in Ordos plummeted by about 500,000 tons than usual during the pandemic [7]. Moreover, the IEA revealed that China's coal imports fell by 6% in Q1 2020, with imports from major supplier Australia dropping by 15% [5]. This implies a direct impact on coal transportation, supported by the fact that China's rail freight traffic, a dominant mode for coal transport, decreased by 18% in the same period [5].

On comparing the impact on imported versus domestically produced coal transportation, the data presents an interesting narrative. The UNCTAD reports that China's imports of coal experienced a significant rise of 12.4% in 2021 compared to 2020 [8]. This resurgence can be partially attributed to China resuming its coal imports from Australia in February 2023 after a ban in place since October 2020, leading to a substantial increase from 3 Mt to 50 Mt in the first half of 2023 [2]. On the domestic front, China's coal production achieved record highs in 2022, with a growth of 11% that year, and a forecasted growth of 3.3% in 2023 [2]. This suggests that while imported coal transportation might have been more sensitive to global dynamics and trade relations, domestically produced coal transportation reflected China's effort to meet its energy demand amidst the challenges posed by the pandemic.

3. Analysis on the Problem

3.1. Analysis on the Impact of Covid-19 on Imported Coal

3.1.1 The Influence of Covid-19 on the Demand for Imported Coal

In the wake of the Covid-19 pandemic, the global economy underwent a significant deceleration, which led to a notable decrease in coal demand across various nations. In China, this global economic impact was evident with a 6.8% reduction in coal consumption in the first quarter of 2020 [9]. As a result of this reduced demand, there was a surplus in coal supply, causing a 13.4% drop in the average price of imported coal in China during the same period [2]. Yet, amidst this global downturn, China strategically leveraged the situation. According to the IEA's 2022 Coal Market Update, China augmented its coal imports by 4.6%, achieving a record peak of 4,230 Mt in 2021 [2]. This strategic move solidified China's position in the international coal landscape during the pandemic's economic aftershocks.

3.1.2 Factors Contributing to Changes in Coal Demand

While the pandemic-induced global economic slowdown significantly shaped the international coal landscape, it was not the sole factor influencing China's coal demand and import behaviors. A pivotal challenge for China emerged from its trade tension with Australia, its principal coal supplier. [10]. Furthermore, China grappled with coal and power shortages, especially in the second half of 2021, due to factors such as transportation bottlenecks which saw a growth of 14.3% in coal output in April 2020 [9]. Weather disruptions, strict environmental regulations, and a surge in domestic demand by 0.7% year-on-year in April 2020 further strained supplies [9]. Adapting to these challenges, China fortified its energy security, increasing imports from nations like Indonesia and Mongolia [11].

3.1.3 Impact of Covid-19 on the Demand for Coal Bulk Transportation in China

Covid-19's tentacles extended to the domain of coal bulk transportation within China. While the pandemic initially led to a slump in domestic coal demand due to stringent lockdown measures and economic stagnation, it also inadvertently triggered an increase in domestic coal supply as coal mines resumed operations post-lockdown [12-14]. The initial stages of the pandemic led to a slump in domestic coal demand, with coal consumption dropping by 6.8% year-on-year in Q1 2020 [9,15]. However, the subsequent period saw a 0.9% year-on-year rise in China's coal output in the same quarter [10]. This dual scenario of decreased demand but increased production created logistical challenges for China. Responding strategically to the pandemic's implications, China prioritized the enhancement of its domestic coal transportation infrastructure. Efforts included expanding rail networks, with policies promoting coal transportation by railway, and initiating new coal terminal constructions, signifying China's proactive approach to maintaining energy stability [9,14,15].

3.2. Analysis on the Impact of Covid-19 on Domestically Produced Coal

3.2.1 Covid-19 and the Demand for Domestically Produced Coal

According to the IEA report from 2022, the demand for coal worldwide experienced a slowdown due to the global economic impacts of Covid-19. However, the effects on China were more nuanced. On one hand, sectors such as steel and cement saw a decrease in demand for domestically produced coal, primarily attributed to economic slowdowns and strict lockdown measures [9,14]. Despite these drawbacks, the power sector exhibited a surge in coal demand, a consequence of the rebound in economic activities and the exacerbated cooling requirements induced by a severe heatwave [11]. A significant factor to note here is the decline in domestic coal demand by 6.8% in the first quarter of 2020, as pointed out by the National Bureau of Statistics (NBS). But, as lockdown measures were eased and economic activity was rejuvenated, there was a subsequent rise in power consumption by 0.7% in April 2020 [13].

3.2.2 Factors Influencing the Changes in Coal Demand

Several externalities came into play, influencing the aforementioned demand dynamics. Economically, China's coal consumption patterns were directly impacted by its domestic production. While there was an initial decline in coal consumption, coal output saw a growth of 0.9% in the first quarter of 2020 [13]. This resurgence in coal production was a reaction to the alleviation of the pandemic's first wave, with output further surging by 14.3% in April 2020 [13]. In the international arena, geopolitical tensions, especially with Australia, China's major coal supplier, proved detrimental. The imposed ban on Australian coal in October 2020 created a supply void [10]. China's tactical response was to diversify its coal sources, increasing imports from countries like Indonesia, Mongolia, Russia, and South Africa, as reflected by a 9.8% increase in coal imports in 2022 [9,16].

3.2.3 The Confluence of Government Policies, Production Costs, and Local Conditions

The Chinese government was not passive amidst these shifts. Policies were executed to ensure both coal supply and its stable pricing. This involved the release of coal from strategic reserves, elevation of coal imports, relaxation of environmental restrictions on coal mining, and the implementation of price caps on coal and electricity [9]. Infrastructure enhancements, such as the expansion of rail networks and the construction of new coal terminals, were initiated to alleviate transportation bottlenecks. Moreover, domestic coal production had its own set of challenges. Rising labor costs, the looming threat of resource depletion, safety hazards, and environmental repercussions were stark realities [9,11]. These combined with the external pressures of Covid-19, such as transport disruptions due to outbreaks, painted a complex picture for the coal industry in China during the pandemic years.

4. Suggestions

Given the pivotal role coal bulk transportation plays in China's energy sector, it is imperative for the government to establish a clear policy framework that ensures resilience against future disruptions. The primary goal of such policies should be to maintain energy security, stabilize coal prices, and ensure seamless transportation. Detailed policies could include:

4.1. Suggestions on Coal Bulk Transportation in China's Energy Sector

Firstly, a diversification of coal sources is recommended. This move would counterbalance the risks seen in cases like geopolitical tensions with Australia. China could strengthen its coal trade relations with nations such as Indonesia, Mongolia, Russia, and South Africa, ensuring a consistent supply even in times of global crises.

Secondly, enhancing the infrastructure is essential. The government can invest in the expansion and modernization of coal transportation, incorporating the upgrading of rail networks, construction

of new coal terminals, and the introduction of technological advancements within the transportation sector.

Thirdly, it would be prudent to maintain strategic coal reserves. These reserves would serve as a significant buffer during supply interruptions. Periodic audits of these reserves would ensure they remain replenished and poised for deployment whenever necessary.

Fourthly, it is crucial to have robust environmental and safety regulations in place. Any boost in coal production must not sacrifice environmental standards or worker safety. Policies must be crafted in a way that balances increased production with sustainability, ensuring the sector's long-term viability.

4.2. Suggestion on Domestic Production and Consumption

In terms of domestic production and consumption, addressing the challenges faced by the domestic coal industry, ranging from escalating labor costs to environmental issues, becomes crucial. The government is advised to: Firstly, channel resources into research and development. Investment in R&D may lead to groundbreaking solutions that can counteract challenges like resource scarcity, safety issues, and environmental concerns. This investment might manifest in the development of cleaner coal technologies or more efficient mining methodologies. Secondly, fortifying domestic supply chains is of essence. The vulnerabilities exposed by the pandemic, especially in coal transportation, necessitate a strong domestic chain to ensure that local coal suffices in case of import disruptions. Thirdly, price stabilization mechanisms should be put in place. Mechanisms such as subsidies, price ceilings, or incentives for coal producers during shortages can help maintain stability during global crises. Fourthly, promoting alternative energy sources is advisable. While coal remains pivotal, diversifying the energy sector with research into and adoption of alternative energy sources can help in addressing environmental concerns.

4.3. Suggestion on Global Trade Dynamics

In light of the global trade dynamics, the perturbations brought on by the pandemic emphasize the necessity for a strategic reorientation in global trade. Thus, China is encouraged to: Firstly, bolster its trade diplomacy by fostering strong alliances with vital coal-exporting nations to alleviate risks tied to geopolitical frictions. Secondly, participate actively in multilateral trade agreements, ensuring a continuous coal supply during worldwide disruptions. Thirdly, a mechanism or dedicated body should be in place to keep an eye on global coal market trends. Such mechanisms can offer early indications of disruptions, allowing China to tweak its strategies suitably. Fourthly, China should endorse its enterprises to invest in coal mines abroad, ensuring not just a steady supply but also strengthening bilateral ties with these countries.

4.4. Suggestion on Future Preparedness

Lastly, in terms of future preparedness, the unexpected nature of global crises, as highlighted by the Covid-19 pandemic, indicates that China should: Firstly, create specialized crisis management teams. These teams would keep a vigilant eye on potential threats and formulate strategies proactively. Secondly, regular drills, akin to disaster preparedness exercises, are essential. Such drills ensure all involved parties in the coal industry are on the same page, allowing for rapid responses to disruptions. Thirdly, engaging in international collaborations can prove beneficial. Collaborating with other significant coal-importing countries to exchange research, best practices, and resilience strategies can be a significant asset. Lastly, public awareness campaigns can be launched to enlighten the populace about coal's significance in China's energy sphere and the government's efforts to ensure a steady supply. An informed public is more likely to rally behind government actions during any future crises.

5. Conclusion

The Covid-19 pandemic, with its far-reaching economic ramifications, presented a significant test to the vitality and resilience of China's coal bulk transportation sector. At the core of China's energy matrix, coal met 60% of the country's primary energy requirements. Despite significant disruptions in global trade and an initial decline in domestic coal demand, the coal sector in China demonstrated an impressive adaptability. This research revealed that while the onset of the pandemic led to reduced coal sales and imports in Q1 2020, strategic moves to increase coal imports by 4.6% in 2021, combined with the resurgence in domestic coal production (growing by 11% in 2022), underscore the sector's recovery and efforts to meet energy demands amidst the challenges. This study, while comprehensive in its examination of the impact of Covid-19 on China's coal bulk transportation, primarily focused on qualitative analysis and did not delve into quantitative data analytics. Future research endeavors could benefit from integrating quantitative data analytics to provide a more granular understanding of the sector's dynamics and resilience mechanisms. Additionally, the logistics challenges presented by the increase in domestic coal supply due to resumed mining operations present potential avenues for research. Exploring efficient and sustainable coal transportation strategies and further understanding the interplay between domestic production, imports, and economic factors could become critical areas of inquiry.

In light of the unexpected global disruptions and ensuing challenges, the adaptability and resilience demonstrated by China's coal sector are commendable. The swift recovery, reinforced by the significant renewal of coal trade with Australia in 2023 and the strategic decisions during the pandemic, shed light on the intricate balance between global trade dynamics, domestic production, and consumption needs. As nations across the world navigate through the aftermath of the pandemic, this research offers valuable insights, but also opens the door to a plethora of related topics, providing a roadmap for future academic explorations in this domain.

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