The Chinese steel market transformation influenced by the economic recession

Yana Saltykova

1Moscow State Institute of International Relations (University) of the Ministry of Foreign Affairs of the Russian Federation, Russia

E-mail: saltykova.ya@mail.ru

Abstract. Since the beginning of 2020, sharp changes in China's economy have affected virtually all sectors of the country's production. Temporary decline in China's steel production and demand due to the coronavirus outbreak and associated restrictions may lead to the increased production of these goods in other countries and increased steel stocks stored in warehouses, which would have a negative impact on the world steel prices. The virus concentration in China, following a high steel production growth and exports since 2003, has created a demand vacuum throughout the region. At the same time, the world steel stocks are quite high and can compensate for the decline in steel production in China, which will affect the market transformation in whole. However, it should be borne in mind that the Industrial Revolution penetrates the entire added value chain, defining a set of technological solutions in metallurgy, which improves the prospects for further industry development and strengthening positions after a stagnation period. In this context, the dynamics of major economic indicators with regard to steel in China is relevant to study, which will allow to determine the short-term metallurgy development trends and the world steel market dynamics in general.

1. Introduction

The rapid changes that affected virtually all economic sectors early in 2020 has led to a number of transformational changes in the production infrastructure of the majority of the world's producers. The increasing impact of the coronavirus outbreak, shutdown of large manufacturing corporations in China and a number of other adverse factors have resulted in the decreased performance of all industries, having determined the steel market transformation focus. In the current context, the market paradigm is changing towards the metallurgists' using the most technological equipment, using less energy-intensive sources when processing raw materials, and using IT technologies. It turns into an opportunity to keep the break-even market in times of global shocks.

A fundamental change in the whole market paradigm allows settling conflicts between its new world infrastructure and the existing technological and market environment: metallurgy should develop new opportunities to balance industrial facility capacities and use the existing assets more intensively through the continuous industrial expansion obtaining significant savings on capital and operational costs. Through the use of global market mechanisms, these savings should be translated into reducing steel costs for end-users ensuring the required reliability and proper product quality and the overall production operation optimization. In general, the adverse influence of external factors on the steel market should produce a multiplicative effect on all China's economic sectors, since, being a primary resource, industry products are used as raw materials by the majority of country's industries.
The aim of the article is to study the transformational focus of the Chinese steel market under the influence of crisis phenomena in the world economy. The study objectives are to identify the role of the industry in the economy of the People's Republic of China, to study the adverse factors shown in the Chinese and the world’s economy at the beginning of 2020, the impact of adverse factors on the steel industry development.

2. Materials and methods

Materials and methods of the study: comparative historical method, regression and visual data analysis, comparison and analogy, statistical empirical data processing, expert analysis, and others.

3. Results

3.1. The PRC steel market by the early 2020

Determining the role of China's steel products in the world market, it is worth explaining that China is the largest world’s steel producer, holding more than half of the market share, being far ahead of other countries the metallurgy share of which is also quite significant to the international market. Figure 1 shows the statistics provided by the World Steel Association which proves the Chinese steel global importance.

| Country   | 2018 | 2019 |
|-----------|------|------|
| China     | 50.9 | 53.3 |
| Russia    | 4    | 3.8  |
| Turkey    | 2.1  | 1.8  |
| EU        | 9.3  | 8.5  |
| Brazil    | 2    | 1.7  |
| USA       | 4.8  | 4.7  |
| Japan     | 5.8  | 5.4  |
| India     | 6    | 5.9  |
| South Korea | 4  | 3.8  |

*Figure 1.* Top 10 leading countries in steel production over the period of 2018-2019, million tons.

Source: created by the author [1].

Based on the data presented, it is clear that China exceeds its largest competitors in the steel production volume by 8 and more times. Thus in 2018, India's share, the second-largest global producer, accounted for 5.9%, while China held 50.9% of the market. Japan occupied 5.8% of the market, and Russia and South Korea both held 4% of the market. It is also worth noting that China is actually the only largest producer in the world to increase market share in 2019 despite its stability. Thus, India reduced the market share by 0.1% in 2019, Russia and South Korea by 0.2% each. At the same time, only other countries actively entering the international market increased their market share. Iran, which increased its production in 2019 by more than 30% should be emphasized. Nevertheless, China is the world’s largest steel supplier, not only in terms of production but also in terms of domestic consumption, which is proved by the dynamics shown in Figure 2:
These data prove that more than 90% of the metal produced is consumed within China. At the same time, no economic shocks were able to reduce the domestic steel consumption dynamics, which justified the PRC production growth against the background of the global industry recession. The high growth of steel production and domestic steel consumption in China was ensured by the continuous development of the basic industries of the country, mechanical engineering, construction, chemical industry and others being the most crucial. China is the world’s largest product exporter and it adds to the importance of steel in the PRC economy.

The world events having been unfolding for the past few years have affected the redistribution of production activity centers in the steel market again. The beginning of the century was accompanied by a series of "short economic cycles," passing which each wave showed the steel market share redistribution. In particular, India has taken key positions in the world of metal. In addition, new countries that had previously been major metal importers entered the market. In particular, these were Thailand, Bahrain, Panama, Palestine, Macau, Malta, Laos, Niger and Cambodia [3]. Thus, the product market has become highly competitive throughout the world. These trends were strengthened through the use of protective measures adopted by different governments reducing the attractiveness of export conditions for foreign suppliers.

However, by 2019, China's steel demand had been still stable, despite the world's second-largest economy coming under pressure due to domestic growth slowdown and a fierce trade war with the United States. In late 2019, the Chinese Steel Association announced to expect further growth in 2020, predicting growth of demand for steel inside China in 2020 up to 890 million tons, which is 2% higher than in 2019 [4]. At the same time, the growth rate of domestic steel consumption was assumed to slow down due to decrease in demand from car and shipping manufacturers, while the new property construction is also expected to slow down.

All exported goods are shipped to the countries with no production of this item or to the countries production of which does not meet all the country's needs. However, the countries which produce sufficient volumes of goods import the products as well. In such a case, imports benefit customers in terms of prices provided by foreign producers. The majority of governments do not encourage such exporters and develop protective measures against them.

Thus, steel appears to be a strategically important industry for China's economy, being the world's major supplier of these goods. At the same time, in the context of instability, the industry is going through significant transformations, which was particularly evident in 2019-2020.
3.2. Adverse factors that influenced the PRC steel market
The PRC steel market, the same way as the entire economy of the country in 2019-2020, is influenced by a number of adverse factors that strengthen the negative development trend and adversely affect the import volumes of these products. These factors include:

- producing high stock of steel globally considerably decreases the industry demand to import steel from the People's Republic of China;
- trade wars with the USA;
- shutdown of some plants at the beginning of 2020 associated with coronavirus outbreak;
- sharp decrease in asset value of metallurgical corporations in the stock market;
- decline in energy resource prices.

Let's consider it in more detail:

The reason for the US-China trade war is the growing foreign trade deficit between the countries, the PRC winning the war. By purchasing goods and services twice as much as selling their own, the U.S. barrier sanctions planned to prevent domestic price increase and the U.S. business drop in profits. At the same time, throughout 2019, the PRC was largely responding in a mirror-like manner, having gained almost two-thirds coverage of the losses incurred from the American measures by introducing their own counter-response actions. The US imposed 15% duties on certain Chinese goods amounting to 120 billion dollars, which reduced imports of Chinese goods to the USA twice [5].

The second major reason for the adverse impact on the industry was producing of high steel stocks. Thus, according to the steel industry sources of March 2020, the industrial recovery rate in China was only 58.9 percent [6]. The efficiency rate of 7,326 construction projects in China was only 10.2 percent. At the same time, 25% of the companies that restarted their operations and 48% of the companies that couldn’t restart their operations experience difficulties due to labor shortage [7].

Because of slowly recovering processing industries, China's steel stocks amounted to 23.75 million tons, the highest rate since 2006 [8]. Under these conditions, producers began seeking higher prices due to a sharp rise in materials prices in 2019, but a coronavirus outbreak and low oil prices undermined their intentions to raise prices.

The COVID-19 spread disrupted the supply chain of the largest manufacturers in the industry, like Hyundai Motor, and reduced the plant capacity rate. The shipbuilding industry is in a continuous need to freeze or reduce steel prices. In fact, POSCO and Hyundai Steel insisted on raising prices for hot-rolled steel products in March 2020, but eventually they had to focus on price maintenance as demand declined. Unprecedented quarantine measures have brought many industrial plants and structures to a halt, thus causing a sharp drop in demand for steel products across the country and leading to surplus stocks. So far, the impact of Chinese events on the world steel market has remained limited and is so far has affected East Asia only. However, the spread of the epidemic outside China may cause recession in other regions as well [9].

By the end of February 2020, 65-75% of Chinese industrial enterprises but less than 25-35% of construction projects had restarted their operations [10]. Platts estimates that visible steel consumption in the country has reduced by 75% compared to February last year, and a March decline may reach 30% [11]. First of all, this drop has affected the rolled section steel, but its production dropped due to the shutdown of many small plants at the same time.

At the same time, according to the CISA National Steel Association, 94% of metallurgical complexes operated in China as of February 21 [12]. This sector accounts for almost all Chinese flat steel production. Thus, demand for steel products in the country has decreased much more than supply. This contributed to the rapid growth of surplus steel products stored in warehouses. Under these conditions, export quotations for Chinese hot-rolled steel coils, which reached $520 per ton on terms FOB at the end of 2019, fell down. In the second half of February 2020, the price of deals was about $450-460 per ton on terms FOB, and individual offers were received at $420-440 per ton [13], which is confirmed by Figure 3.
As the steel crisis is also transforming, the People’s Republic of China is providing financial support to national companies and is taking measures to stimulate the economy after the epidemic fades (presumably in April). Finally, Chinese steel producers are attempting to stop the quotations from falling and to change them towards increasing. As industry comes to life in the country, so does the demand for flat steel. Under these circumstances, the government has been replacing 8,700 industrial robots. At the same time, the supply of flat steel and rolled metal in the PRC, including the steel producers, is increasing. Meanwhile, 10,000 jobs in the country industry have been replaced by 870 industrial robots. At the same time, in Japan this indicator accounts for 400

![Figure 3. Flat steel price behavior on the world market, $/ton.](image)

However, by the end of February there came signs of stabilization in the Asian region. First of all, Chinese exporters attempted to stop the quotations from falling and to change them towards increasing. As industry comes to life in the country, so does the demand for flat steel. Under these circumstances, the government is providing financial support to national companies and intends to take measures to stimulate the economy after the epidemic fades (presumably in April). Finally, Chinese steel producers are providing financial support to national companies and intend to take measures to stimulate the economy after the epidemic fades (presumably in April). Finally, Chinese steel producers are attempting to stop the quotations from falling and to change them towards increasing. As industry comes to life in the country, so does the demand for flat steel...
robots, 270 in South Korea [16]. Industrialization is integrated into all industries, including steel production. At the same time, development of "new economic" processes in some industries immediately affects other ones. The dependence of metallurgy on industrialization processes can be traced by the dynamics correlation of physical output indicators of three key product types: cast iron, rolled steel and the most important engineering products - metal cutting machines produced between 1955 and 2018 worldwide (Figure 4).

Figure 4. Flat steel price behavior on the world market, $/ton. Source: created by the author [3].

The pattern observed demonstrates the influence on the cycle and wave dynamics of the world economy industrial modernization. At the same time in a number of the certain periods, the economy was forced and administrative in nature, and in some cases – market and conjunctural in nature that proves dependence of the industry development not so much on the crisis phenomena, as on the sector industrialization. The change in the technological steel market paradigm is followed by a qualitative change in the market environment. New production technologies, controlled consumption, virtual aggregation of resources determine the trends for formation of fundamentally new conditions of highly competitive market development, built on the basis of automated trading platforms of the Internet of Things, use of system and more complex information services [17]. The technological breakthrough in the industry provides a significant expansion of the economically attractive resource base or increase in the efficiency of the technologies used, leads to radical changes in the market conditions of China. And if a single technology separated from technological breakthroughs or technological revolutions is not expected to be used, together these technologies produce a revolutionary effect: these provide a significant increase in the growth rate of the entire world industry. Due to both the changing economic structure and the new industry progress after many decades of continuous material and other cost escalation, economic growth is for the first time breaking away from the escalation of the used raw materials costs. Technologies aimed to increase the efficiency of industrial production, to use new architectural and design solutions when engineering residential and industrial buildings and structures - "smart construction," active and passive houses, intelligent air conditioning and heating systems, to use smart metrics and other metering devices on the world steel market in general have already reduced the production cost by 1.3-5.7% [18]. Again, it proves the importance of industrialization for industry development in general, and metallurgy development in particular.
Thus, the Chinese modern metallurgy, as elsewhere in the world, is in the process of intensive modernization, which is likely to help the industry to withstand the effects of the economic crisis. Its further development trend will involve the completion of design and engineering reconstruction, the industry transition into a fast-growing, highly efficient and highly competitive industry, which provides all the world’s demands for metallurgical products. China’s metallurgy is not likely to avoid losses in the industry incurred by the identified adverse factors in 2020. Nevertheless, optimized management of production processes, industrial safety, labor resources, financial flows, as well as the e-commerce service application will help to weather the crisis as painlessly as possible with minimum losses. At the same time, crisis trends are currently growing so rapidly that no forecasts can be made, the near future of the industry seems uncertain and poorly predicted.

5. Summary
The study proved the importance of metallurgy in the Chinese economy, as it is the PRC that is the world steel market leader. Having quite sustainable development in recent years, the industry was still undergoing the negative events associated with the oversaturated market and high stocks of goods, steel, trade wars, the growth of world market competition. However, the industry was affected the most severely in early 2020 when China was swept by coronavirus and energy prices fell. In this context, the demand for metallurgy products has significantly decreased, which has had a negative impact on the steel product prices. The situation was complicated by the labor shortage and China’s supply chain disruption, which jointly significantly lowered the industry performance. To withstand the crisis with minimum losses, Chinese steel producers are in the need to make decisions to optimize all managerial business processes, reduce costs and increase the product technological efficiency. High growth rate in steel production industry transformation, associated with the world science and technology development and the digital technological progress, can encourage producers to switch to a new technological production formed under the influence of the “industrial revolution”, while ensuring the production growth. At the same time, the world economic instability that has been evident since January 2020, gives no opportunity to reliably estimate the impact of technological solutions on the industry, while showing the chance for a significant industry stagnation in the short term.

6. References
[1] The review of the world market of steel in figures of the World association of producers of steel: 2019. Official site of World Steel Association. https://www.worldsteel.org/en/dam/jcr:96d7a585-e6b2-4d63-b943-4cd9ab621a91/World%20Steel%20in%20Figures%202019.pdf
[2] Metallurgical bulletin. https://www.metaltorg.ru
[3] Official site of United Nations Commodity Trade Statistics Database. http://comtrade.un.org
[4] China 's steel production exceeded 1 billion tons in 2019. 17.01.2020. Metal rolling and economics news. http://chnsk.ru/news/2020/1/17/proizvodstvo-stali-v-kitae-v-2019-godu-prevysilo-o/
[5] US trade war with China 2019. News Agency of the Russian Public Movement «Revival. Golden Age». novosti-ssha.ru-an.info/torgovaya-voina- sshsa-s-kitayem-2019/
[6] China 's steel production may increase in March. 17.03.2020. Information and analytical journal «Metallurgical Bulletin». https://www.metalbulletin.ru/news/black/10149994/
[7] In China, key enterprises resume production. 11.02.2020. News of Russia and the World for Today. ULR: https://www.bfm.ru/news/436225
[8] The Chinese economy is trying to get back to work. 10.02.2020. Vedomosti. — ULR: https://www.vedomosti.ru/economics/articles/2020/02/10/822694-kitaiskaya-ekonomika-rabote
[9] China 's steel prices rise on news of renewed production and construction. 17.02.2020. «Metal. Index», — ULR: http://www.metalindex.ru/news/tape/2020/03/17/tape_61082.html
[10] World and Russian steel market: results of February 2020. Metallurgical portal «Metall Place».
https://metallplace.ru/about/stati-o-chernoy-metalurgii/mirovoy-irossiyskiy-rynok-stalitogi-fevralya-2020-g/

[11] Platts predicts 75% drop in China’s steel demand in February and 30% in March. 25.02.2020. Metal supply and sale. https://www.metalinfo.ru/ru/news/114262

[12] Chinese steel exports: thematic news of metallurgy. 27.03.2020. Metal supply and sale. – ULR: https://www.metalinfo.ru/ru/news/s8518.html

[13] Global steel market at the beginning of the second half of March (semi-finished products, structural steel, sheet steel, scrap metal). 26.02.2020. Monitoring of the Prices. – ULR: https://www.mcena.ru/analitika/mirovoi_rynok_stali_v_chastochbe_vtoroi_polovini_marta

[14] Bodrunov S D 2014 Russian economic system: future of high-tech material production (Economic revival of Russia) 2(40)

[15] Import share in strategic industries exceeded 80 per cent. 10.07.2014. Lenta.ru. http://www.lenta.ru/news/2014/07/10/import

[16] Where are the most robots. 14.11.2019. EKONS. Economic conversation. https://econs.online/articles/details/gde-bolshe-vsego-robotov/

[17] Budanov I A 2014 Prospects of metallurgical production development in Russia (Bulletin «Iron and Steel») 5 3

[18] Hovhannesyan T K, Stodrin E M, Abdarkhananova G I 2018 Digital Economy: Global Trends and Practices of Russian Business Moscow: NIU Higher School of Economics» 121