

# The Transmission of Global Supply Chain Disruption to Inflation in China

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**Abstract.** In the tide of globalization, the global supply chain acts as a bond connecting countries. It can not only break through the limitations of resource endowment but also promote the development of international trade. However, the special situation of the COVID-19 pandemic has severely hit the global supply chain. The transportation of raw materials needed for production in many countries has been blocked, and the supply has sharply decreased. This chain reaction has a strong impact on China and even the world. It has pushed up production costs and led to a sharp increase in domestic inflation. This study takes the medical equipment and electronic equipment industries, which have complex supply chains, as samples to deeply analyze the impact transmission mechanism of the pandemic on the global supply chain. The research finds that the disruption of the global supply chain will significantly increase China's inflationary pressure. In addition, we will also compare and analyze the common characteristics of these two industries and provide practical solutions for enterprises and governments based on the analysis.

**Keywords:** Global supply chain disruption; inflation in China; COVID-19.

## 1. Introduction

In the current of globalization, the global supply chain which is based on international cooperation plays an important role in the circulation of production factors among countries. However, when the global supply chain is interrupted under the impact of the emergencies, its impact will transmit to China and lead to the inflation to a certain extent.

The background of this research is that the global supply chain was often interrupted by many kinds of events in recent years. Since 2020, the COVID-19 has swept the world. To control the disease, many countries took action to block people's activities, which led to factories shutting down and the disruption of traffic lines. As a result, the supply chain among countries was affected, causing it to scale down or even break. The economy, the people's livelihood and import and export trade of China were affected severely by the disruption of global supply chain. In the economy, the disruption of the supply chain led to the supply of goods decreasing, but the demand was relatively stable. According to the supply and demand curve, when the supply of goods decrease, the supply chain will shift to the left and push up the price of the goods. In people's livelihood, the disruption of the supply chain led to the supply of necessity decreasing. The quantity of necessity that people could get decreased and the price of necessity was increased so that people's burden was increased. In import and export trade, the transaction with other countries was decreased because of the disruption of supply chain and it became more difficult to trade with each other because of the increase of transaction time cost. Meanwhile, the difficulty of transaction led to the shortage of goods and exacerbated inflation in China further.

Currently, existing articles often look into the correlation between inflation in China and globalization. This research will contribute to specify the relationship between the global supply chain and inflation in China.

The main problem involved in this research is how global supply chain disruption influences inflation in China. During the analysis process, the research will use the cases of medical equipment and electronic devices and sort out the data to demonstrate the transmission logic. Besides, the transmission logic involved in this research is imported inflation and cost-push inflation. When the price of imported raw material increased, the production cost of enterprise will be increased directly

according to the definition of the transmission logic. The purpose of the research is clarify the transmission logic of global supply chain to inflation in China. The meaning of the research is to fill the blank in other research on the relationship between globalization and inflation in China and provide scholars with a new approach to studying inflation in China Besides, the research contribute to help China's government take actions regarding the global supply chain to relieve inflation or prevent inflation.

## 2. Literature Review

Inflation is widely defined as a process in which prices increase constantly or the valuation of currency decreases continuously[1]. The Consumer Price Index(CPI) is often used to measure inflation. Inflation has different definitions in different schools. For example, inflation means rising prices in modern economics. Keynesian economics holds that the movement of price levels that caused by the change of aggregate supply and aggregate demand lead to inflation. Monetarist economics holds that when the issuance of currency exceeds the amount of currency needed for circulation the currency will depreciate and lead to an increase in prices. This research studies how the disruption of global supply chain influence the inflation in China mainly from the aspect of modern economics and Keynesian economics. From the aspect of Keynesian economics, the disruption caused by COVID-19 is negative supply shock and will make the short-run aggregate supply curve shift upward and left so that the price will increase. The causes of inflation are diverse, generally including excessive growth in aggregate demand, increased production costs for producers or a combination of the change of supply and demand[2].The global supply chain is complex[3]. Its main performance is modern technology makes an opportunity for enterprises from various countries to cross national borders to develop business. Enterprises can cross the resource gap, reduce cost, improve the quality of the product and decrease the production risk[3]. Simultaneously, global supply chain also faces many risks. In the context of economic globalization, the change of international situation, especially global events, will have a huge impact on the global supply chain and cause the disruption of supply chain[4]. The global supply chain is a complex entity that is composed of many participants. The participants may be located in distant regions of the world and are easily affected by transportation. About 80% of the international trade is completed by maritime transport[5]. As a result, the supply chain is fragile and can be easily interfered with[6]. Global supply chain pressure has a huge influence in inflation[7]. Supply chain disruptions are the main driving force behind global inflation today[8]. Different from demand-driven inflation, the inflation caused by supply shock often occurs with the stagnation of production, leading to a decrease in production capacity and may causing stagflation. Global supply chain disruption slows down production and delivery activities[9], leading to an increase in the price of goods and exacerbating inflation[10]. Take the inflation after the COVID-19 as an example. After the COVID-19, the global economy gradually recovered, consumer demand surged, and the imbalance between supply and demand caused by the COVID-19 impact on the global supply chain has not recovered from the interruption, such as a serious shortage of container transportation. This has led to price increases and exacerbated inflation [11].

In today's world, China is the world's most important exporter and an important global investor. The "the Belt and Road" initiative spans more than 150 countries[12]. As the world's second largest economy and the world's largest trade country in goods, China is the only country in the world with all industries. It can be seen that China is an important hub of the global supply chain[13]. Therefore, once the global supply chain breaks, the impact on China will be enormous. In summary, the transmission mechanism to be discussed in this study is the disruption of global supply chains caused by transportation disruptions due to the impact of the pandemic, resulting in insufficient supply of raw materials, increased production costs for enterprises, and ultimately rising commodity prices, ultimately driving up inflation levels.

### 3. Case Analysis

This study selects two industries, medical equipment and electronic equipment, for case analysis. These two industries require a large amount of raw materials, complex supply chains, and high technological content and standards, making it difficult to find suitable domestic manufacturers to replace them in the short term. Being able to amplify the impact of short-term emergencies on product production is beneficial for analyzing the transmission process involved.

#### 3.1. Medical Equipment Industry

During the COVID-19 epidemic, the demand for medical equipment surged, such as nucleic acid testing device, respirators, blood oxygen meters, and artificial heart and Extracorporeal Membrane Oxygenation (ECMO). Affected by the epidemic, most regions implemented blockade measures, reducing the number of labor, reducing production efficiency, and making it difficult to transport the materials needed for production. Countries around the world reduced trade with other countries to control the epidemic, breaking the global supply chain of medical devices. From raw materials to finished medical devices, they are all affected by the epidemic and difficult to transport, resulting in shortages.

During the epidemic, the demand for non-invasive ventilators in China continued to grow, with a demand of approximately 522,200 units in 2022, a year-on-year increase of 7.16%. Affected by global supply chain disruptions, the price of a mainstream ventilator in China has surged from an average of 302,800 yuan per unit in 2019 to an average of 495,500 yuan per unit in 2021, as can be seen in Table 1 [14].

**Table 1.** Purchase price of a certain type of ventilator equipment in China from 2019 to 2021

Year	Model 1	
	Average	Median
2019	30.28	29.75
2020	36.36	36.25

As the Table 2 shown the price of ECMO, an important medical device during the epidemic, has increased from an average of 1,590,700 yuan per unit in 2019 to an average of 1,904,800 yuan per unit in 2022 [14].

**Table 2.** Procurement prices of ECMO equipment in China from 2019 to 2022

Project	2019	2020	2021	2022
Effective purchase item unit price and quantity per item	51	126	133	133
Average unit price	1,590,700	1,704,200	1,766,100	1,904,800

The price increase of medical devices is significant, which intuitively reflects the characteristic of rising inflation commodity prices.

According to the data, during the COVID-19, the supply and demand were unbalanced due to the impact of the global supply chain rupture. The supply was reduced due to the increase of production difficulties such as the difficulty in obtaining raw materials, and the demand for medical devices increased due to the increase of the number of patients during the epidemic, which led to the rise of the price of medical devices. According to relevant data from the National Bureau of Statistics, the weight of healthcare in China's eight major Consumer Price Index (CPI) categories is about 10%, and the higher the weight, the greater the overall impact on CPI. The weight of healthcare CPI is relatively high compared to daily necessities, and medical devices have risen rapidly during the epidemic, with a large price increase. The price increase multiplied by the weight determines the impact on CPI increase. Therefore, the rise in medical equipment prices will lead to an increase in China's CPI, representing intensified inflation. And as the prices of medical equipment rise, some of the costs will be passed on to consumers through medical services, causing an increase in medical prices and exacerbating inflation for consumers.

### **3.2. Electronic Equipment Industry**

In the era of intelligence, the demand for electronic devices has skyrocketed. Taking smartphones as an example, producing a phone may require the collaboration of manufacturers from various countries, such as Samsung's phone screens, Sony's phone cameras, Google's chips, and so on. After purchasing raw materials from various countries, manufacturers often use logistics to transport them to areas with low labor costs, such as Southeast Asia. Due to the impact of the epidemic, the global supply chain has been disrupted, and the transportation of raw materials and mobile phone goods required for producing a smartphone has been greatly affected and restricted.

For example, under the effect of COVID-19, the iPhone shipment volume of China in the first quarter of 2021 was 13.2 million units, but by the first quarter of 2022, iPhone shipment volume had dropped to 12.4 million units. iPhone shipment volume declined sharply because of the difficulty of transporting raw materials, leading to the decrease of supply. Besides, COVID-19 increased the cost of transporting phone about 60% so that the price of the phone was forced to increase. As a result China's CPI was affected to increase which means the inflation in China was exacerbated.

Due to the decrease in mobile phone shipments and the rise in transportation costs, mobile phone prices have correspondingly increased, while residents' income has remained relatively unchanged or even decreased due to the impact of the epidemic. As a necessary tool for production and daily life, the rising price of smartphones ultimately exacerbates inflation.

### **3.3. Transmission Mechanism**

The analysis of inflation caused by global supply chain disruptions in this study mainly involves the model of international trade channels, where global supply chain disruptions affect the import and export of some countries, thereby affecting domestic price levels and ultimately exacerbating inflation. The transmission of inflation caused by global supply chain disruptions is essentially a gradual process from the production sector to the consumption sector. The medical and electronic equipment industries in China worldwide have a high dependence on imports and are highly sensitive to changes in the global supply chain. When sudden events such as epidemics cause a disruption in the global supply chain, it will directly affect upstream products, namely the import of some raw materials, and push up the price of raw materials, namely the Producer Price Index (PPI) of upstream raw materials. In addition, industries such as medical equipment and electronic devices involve some key chip technologies in the midstream, relying on overseas intermediate goods. When the global supply chain disrupts, it will directly affect the import of these products, leading to difficulties in midstream production. Due to technological limitations, it is difficult to find suitable alternatives in the short term, ultimately affecting the production of downstream finished products, pushing up product production costs and affecting final prices. In addition, demand growth during later economic recovery will cause downstream commodity CPI to rise. The lockdown measures implemented by countries around the world during the epidemic have led to a decrease in port efficiency and an increase in quarantine costs during transportation, causing a surge in global logistics costs and directly affecting commodity prices. In addition, the impact of the epidemic has led to preventive hoarding in various industries, resulting in an exacerbation of raw material shortages in the short term and pushing up prices in the plateau material market. If the inflation caused by supply chain disruptions leads residents to form inflation expectations, they may demand higher wages to compensate for the lack of purchasing power. After enterprises form inflation expectations, they will raise commodity prices to cope with rising costs, ultimately leading to a "wage-price spiral" that further exacerbates inflation and is difficult to alleviate.

## **4. Characteristic Summary and Policy Recommendations**

### **4.1. Summary of Characteristics**

Through case analysis of the medical device and electronic equipment industries in the context of global supply chain disruptions after the pandemic, it can be found that there are certain similarities between the two in the transmission of global supply chain disruptions to China. Due to the disruption of the global supply chain, it is more difficult to obtain raw materials for products, resulting in reduced labor and low production efficiency. Additionally, the transportation of finished products is difficult, leading to increased production costs and a decrease in product supply, which in turn drives up product prices [15]. From the bottlenecks encountered by these two complex supply chain industries, it can be observed that during special periods, global supply chain disruptions have had a significant impact on various industries in China, reducing product supply and driving up China's inflation level.

### **4.2. Policy Suggestions**

#### **4.2.1 Enterprise**

The biggest impact of global supply chain disruptions is the increased difficulty in obtaining raw materials. To cope with the inflation caused by global supply chain disruptions, companies should develop diversified suppliers, selecting at least three or more suitable suppliers for each required material as reserves, and diversifying the distribution of suppliers in as many countries as possible to reduce dependence on a single supplier and prevent the global supply chain disruptions from having a significant impact on the entire enterprise.

Enterprises can use corresponding risk hedging tools, such as some supply chain breakage insurance, to cope with the losses caused by global supply chain breakage. Enterprises can reduce losses and production costs in production, which can drive product market price stability. Enterprises can lay out production near the market, retain China as a manufacturing base, and transfer some production capacity to countries with higher demand for products and lower labor costs, reducing the required transportation links. When the global supply chain breaks, minimizing transportation links will reduce the risk of supply shortage.

In the new era, with the rapid development of digitalization and intelligence, enterprises can quickly perceive the fluctuations of various raw material suppliers in the supply chain through digital tools and issue abnormal warnings, in order to take early actions such as replacing suppliers to reduce the huge impact of supply chain disruptions.

#### **4.2.2 Government**

To cope with global supply chain disruptions, governments should regulate from a more macro perspective. The government can strengthen port construction, invest in the construction of a new era digital port, improve logistics efficiency, expand international logistics scope, and reduce logistics costs. At the same time, the Chinese government is also opening up the supply chain with Central Asia and Europe through some key projects such as the "the Belt and Road", expanding the scope of the global supply chain, and reducing the risk of a branch supply chain rupture. The impact of global supply chain disruptions on raw material supply is enormous. The Chinese government can respond to the market impact of raw material shortages by strengthening strategic reserves, thereby alleviating the inflation caused by global supply chain disruptions.

During the peak of inflation, the government should take measures to organize the purchase of goods to curb the continuous rise in commodity prices, and release the reserved materials to the market in response to relative supply shortages caused by supply chain disruptions. And when the government regulates the market, it can adopt price limit measures in the face of inflation to prevent the continuous aggravation of inflation.

Similar to the measures that enterprises need to adjust, the government should also strengthen the diversification of the supply chain, enhance cooperation with countries around the world, increase

the source of suppliers, and prioritize the selection of cooperating countries based on resource endowment and distance.

The excessive dependence on the global supply chain is also an important reason why countries are deeply affected by the inflation transmitted by globalization. China should take measures to improve its productivity, production efficiency, and production technology, continue to increase investment in technology research and development, concentrate on attacking bottleneck technologies such as chips, reduce dependence on foreign suppliers, and invest funds to improve the product quality of local suppliers.

The government can take preventive measures to address the issue of the "wage price spiral" mentioned above. Through transparent policy release, it can convey confidence to the market, inform them of the temporary nature of inflation, and lower the inflation expectations of residents and businesses to cope with the possible "wage price spiral" problem.

Strengthen the construction of the "dual circulation" development strategy, that is, accelerate the construction of a new development pattern with domestic circulation as the mainstay and domestic and international circulations mutually promoting each other. In the face of complex domestic and international situations, reduce dependence on foreign supply chains and enhance the resilience of the Chinese economy.

When facing inflation transmitted by global supply chain disruptions, central banks should remain cautious and not adopt a monetary policy of raising interest rates like demand driven inflation, which is caused by a surge in consumer demand. Raising interest rates cannot solve the problem of transportation congestion, making it difficult to solve the supply gap. Moreover, raising interest rates will lead to a decrease in demand, which may ultimately cause economic recession due to the impact of the decline in demand and supply. Therefore, when facing inflation, the government should first identify the type of inflation. If the inflation caused by the global supply chain disruption studied in this study occurs, the government should consider feasible paths other than monetary policy to avoid implementing erroneous measures that may cause more serious impacts on the economy.

## **5. Conclusion**

This study analyzes the medical and electronic equipment industries, which have complex supply chains and high import dependence. When the global supply chain is disrupted, the transportation of raw materials required for product production is limited, and finished products are difficult to quickly reach the market due to poor transportation, resulting in increased costs from upstream to downstream of product production. In order to ensure profits, businesses will choose to raise commodity prices, ultimately leading to intensified domestic inflation.

This study analyzes a series of transmission mechanisms caused by global supply chain disruptions, and provides a new perspective on the possible reasons for exacerbating inflation in China. This enables corresponding enterprises and governments to consider the causes of inflation and measures to alleviate inflation based on the phenomenon of global supply chain disruptions, which is conducive to enhancing economic vitality and promoting post pandemic economic recovery.

This study mostly observes phenomena from a macro perspective, and only selected two industries for relevant data analysis. Most of the inferences are based on data summaries, with few examples and no relevant models established. It is expected that future research can use certain technical means and a large amount of simulated data to visually observe phenomena. And in the future, the global supply chain may develop towards "regionalization", prioritizing suitable suppliers from neighboring countries and regions. Future research can also consider how such changes will affect the transmission mechanism of inflation.

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