The Influence of Japanese Nuclear Sewage Pollution on China's Import and Export Trade

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Abstract. The Fukushima Daiichi disaster occurred in 2011, leading to ongoing concerns about contaminated water. China and Japan have a complex trade relationship, which makes any disruption important. This background sets the stage for exploring potential trade implications. The research will discuss how Japan's nuclear and water pollution affect China's import and export trade. First, we will cover the background of the accident at the Fukushima nuclear power plant in Japan and the atomic sewage treatment plan. Next, we will analyze the potential impact of this incident on China's import and export trade, covering trade relations, seafood, and other aspects. Finally, we will discuss China's measures and proposals to address this impact. In short, it is concluded that Sino-Japanese trade will be subject to inevitable fluctuations in the short and medium term, but in the long run, its transaction will still show a steady upward trend.

Keywords: Nuclear sewage, Import, Export, Trend.

1. Introduction

1.1. Background

On March 11, 2011, Japan was hit by a magnitude nine earthquake, triggering a tsunami, which caused severe damage to the Fukushima Daiichi nuclear power plant and an atomic leakage accident. To cool the molten nuclear fuel, a large amount of seawater is pumped in, resulting in about 100 tons of contaminated water per day. In July 2022, Japan's Nuclear Regulatory Authority (NRA) announced approval to discharge radioactive water from Tokyo Electric Power Company's Fukushima Daiichi nuclear power plant. In August 2022, Japan's Fukushima Prefecture and other places approved the release of atomic sewage discharge facility construction plans, and the Fukushima First Nuclear Power Plant nuclear sewage Marine discharge facility project officially began. In January 2023, the Japanese government held a meeting on treating atomic sewage from the Fukushima First Nuclear Power Plant. It determined that nuclear wastewater would be discharged into the sea as early as this spring and summer. In August 2023, Japan decided to start releasing nuclear-contaminated water into the sea on August 24, which will continue for at least 30 years. Japan's move will affect life and trade on both sides.

1.2. Related research

Chen et al. discuss the possible global environmental impact of nuclear wastewater from a macro perspective, and the potential health impact of atomic sewage from an individual perspective, as well as the possible mental health problems. The research suggests that the release of atomic wastewater may have direct effects on plants, animals, or people in the contaminated area through enrichment and biomagnification caused by the food chain and radioactive substances [1]. Chen elaborated on the impact of the nuclear leakage accident of Japan's Fukushima nuclear power plant on China's maritime industry, and analyzed that due to the concern about the effect of nuclear radiation, some Chinese shipping companies canceled the voyage to Tokyo Bay port or changed the destination port, resulting in the export of goods to Japan blocked. To prevent the import of radioactive contaminated food and agricultural products, the export of Japanese goods will also be hindered [2]. Wang started with the source of toxic heavy metals in food, the impact and harm to the human body, and comprehensively analyzed the pollution of toxic heavy metals mercury, cadmium, lead, arsenic, and

chromium to food. Research has found that harmful metals in food can cause much harm to the human body, mainly having substantial accumulation, slow discharge, and biological half-life is long, the damage to the human body is often chronic poisoning and long-term effects [3].

Peng analyzed the impact of Japan's nuclear leakage accident on China from the perspective of the harm of nuclear pollution and the way of diffusion. It is pointed out that there are two main dispersions of nuclear pollutants: atmospheric diffusion and ocean current diffusion. After the atomic leakage accident in Japan, the phenomenon of "psychological typhoon eye" appeared in some areas [4]. Huang tested the mutagenicity of wastewater discharged from Jiujiang City utilizing a nuclear red cell micronucleus test of the Golden line frog. The results showed that the sewage could increase the micronucleus rate of nucleated red cells in frogs, and the dose-response relationship was apparent when different concentrations of sewage were used [5]. Ma et al. studied the genotoxicity of petrochemical wastewater J, N, and factory tap water Son mouse offspring (F1) and offspring (F2) somatic and sex cells. The results showed that the micronucleus frequencies of F1 and F2 bone marrow cells were significantly different from those of the control group after four weeks of free drinking by parents ($P< 0.05$), indicating that the petrochemical wastewater and tap water in the plant area had obvious genotoxicity to F1 and F2 cells. The results suggested that the genotoxicity of petrochemical wastewater to mammalian blood cells and sex cells should not be ignored [6].

Wu and Meng pointed out that the issue of Fukushima nuclear sewage discharge has become an important issue affecting Sino-Japanese relations, and Sino-Japanese links in 2021 did not show a promising development trend. Although some of Fumio Kishida's public remarks after the election have released the signal of easing Sino-Japanese relations to a certain extent, there are still many challenges. The Kishida government is still adopting a strict and aggressive policy in terms of sensitive issues related to Taiwan and history, maritime and territorial disputes, as well as China's strengthened security strategy and human rights issues [7]. Liu viewed the incident from the perspective of international law, and there is a severe paradox of Japan's nuclear sewage discharge, which is entirely contrary to international law. Studies have shown that the atomic risks in the use of atomic energy mainly include radioactive pollution, nuclear accidents, nuclear weapons, and other threats to human beings and the environment, and Japan's action violates the 1972 London Convention, the United Nations Convention on the Law of the Sea and the 1986 Convention on Early Notification of Nuclear Accidents. In addition, Japan is suspected of human rights violations and violations of international human rights law [8].

Meng briefly analyzed the characteristics of the generation of nuclear waste in the world as a whole and its pollution pattern, examined the effectiveness of a series of policies and measures adopted by China for nuclear waste pollution and management, and focused on the comparison of the management and policies of atomic waste in China and several developed countries at the present stage, trying to find effective measures for nuclear waste management in China. Finally, although China has a complete legal system, from the current situation of nuclear waste management, there are still some problems [9]. According to the causes of ocean currents and the distribution characteristics of ocean currents in China, it is concluded that nuclear wastewater will reach the coast of various countries sooner or later. Still, the diffusion effect of ocean currents is not enough to eliminate the long-term nuclear pollution hidden dangers in the ocean, and neighboring countries will be the first to hit it. Therefore, it is inevitable that once Japan releases atomic wastewater into the sea, it will have a long-term impact on the Marine ecological environment, nuclear pollution will affect fisheries and aquatic products, and the effect on human health is also apparent [10].

1.3. Objective

This research will study the impact of Japan's nuclear sewage incident in 2023 on bilateral trade between China and Japan. The second chapter is to check the types of products greatly affected by the atomic sewage incident and the fluctuation range and number of changes in import and export data in recent years. The third chapter is to study the short and medium-term impact of the nuclear

sewage incident on the bilateral trade between China and Japan and the difference in the long-term impact.

2. Products and data on the impact of nuclear-contaminated water discharges

2.1. Product Sorting

Seafood: The potential contamination of the marine environment due to Japan's nuclear wastewater discharge may adversely affect marine products. Seafood, fish, and other marine products could be subject to pollution, resulting in increased prices or shortages of aquatic products.

Food and Beverages: If the discharge of nuclear wastewater leads to soil and water source pollution, it may impact food and beverage production in Japan. This could include vegetables, fruits, grains, and drinking water.

Tourism Industry: If concerns among the public arise regarding Japan's tourist destinations due to nuclear wastewater discharge, it may affect the tourism industry. Tourists may opt to avoid affected areas, leading to a decrease in tourism revenue.

Domestic Japanese Market: If the public expresses concern about domestically produced goods in Japan, it may reduce consumer purchasing intent, affecting the domestic Japanese market. This could encompass various product types, from food to electronic devices.

International Trade: If the international community expresses concern about Japan's nuclear wastewater discharge, it may result in other countries imposing trade restrictions or bans on Japanese products. This could adversely affect Japan's exports, particularly for sensitive products like seafood and food.

In summary, Japan's nuclear wastewater discharge may adversely affect the seafood, food and beverage industry, tourism, the domestic Japanese market, and international trade. These impacts could have lasting effects on Japan's economy and image.

2.2. Import and Export Data

As shown in Fig.1, starting from the second quarter of 2021, the total amount of China's imports to Japan shows a gradual decline, while the total amount of China's exports to Japan has been showing a steady increase.

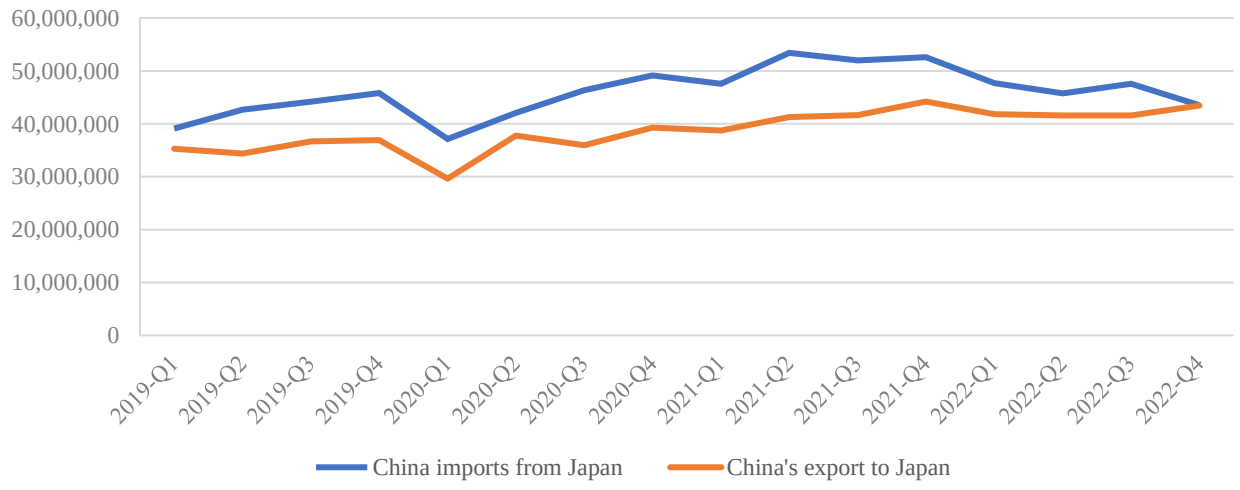


Figure 1. Total imports and exports between China and Japan (Q1 2019-Q4 2022)

Table 1. The total value of imports and exports of China and Japan in August 2023

Import country of origin (place) Export country of final destination (place)	Import and export		Export		Import		Cumulative compared with the same period last year ± %		
	August	January to August	August	January to August	August	January to August	Import and export	Export	Import
Japan	24,807.2	207,969.8	11,971.2	104,122.3	12,836.0	103,847.5	-12.8	-8.6	-16.7

It can be seen from Table 1 that by August 2023, the import and export volumes of China and Japan both showed a downward trend compared with last year, and the import data of China from Japan showed an even more significant decline.

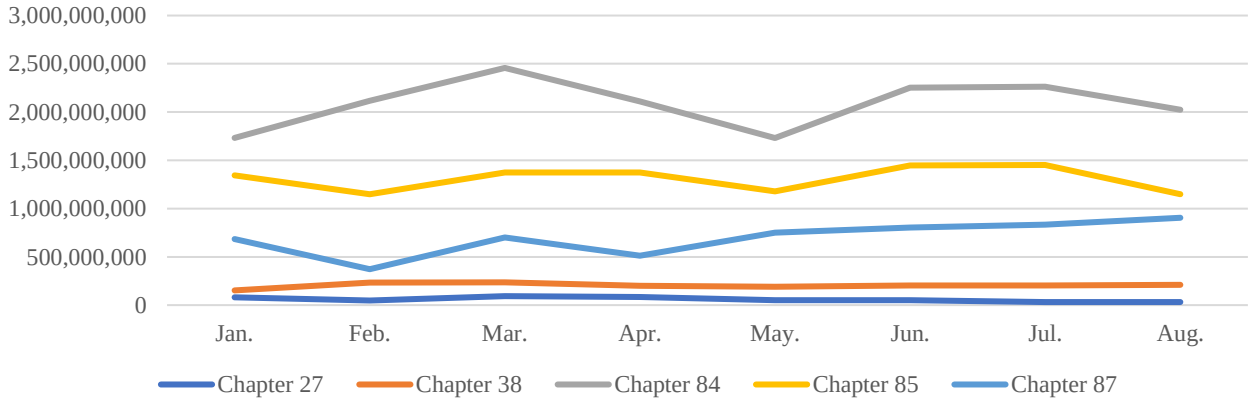


Figure 2. Amount of China's import of essential products from Japan in January-August 2023

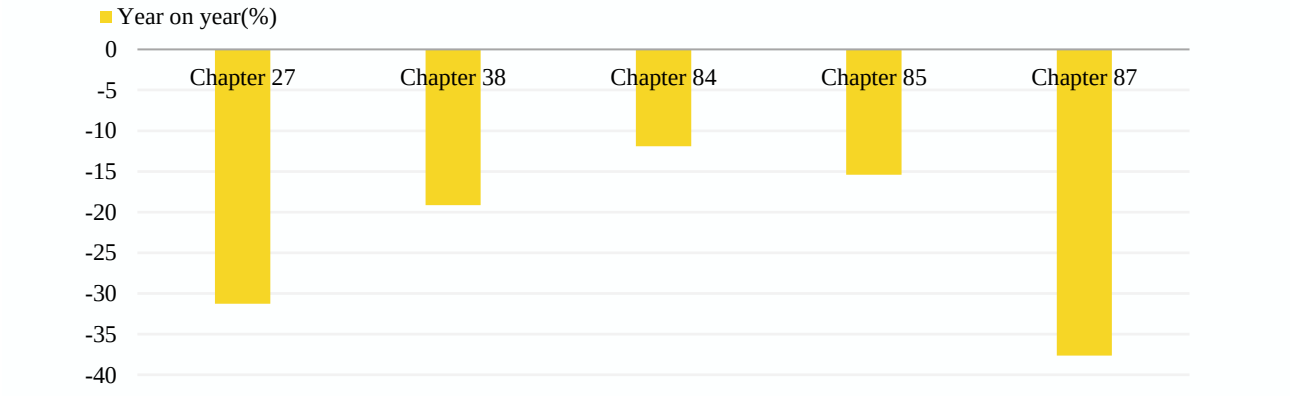


Figure 3. Year-on-year data on China's total imports of essential products to Japan from January to August 2023 and from January to August 2022

China's top five imports from Japan are petroleum and petroleum products (HS code: 27), electronic equipment and components (HS code: 85), automobiles and spare parts (HS code: 87), machinery equipment and surplus parts (HS code: 84), and plastics and plastic products (HS code: 39). As can be seen from Fig.2 and Fig.3, the number of significant products imported by China from Japan in 2023 is still rising, but it is declining compared with last year, especially automobiles and spare parts (HS code: 87).

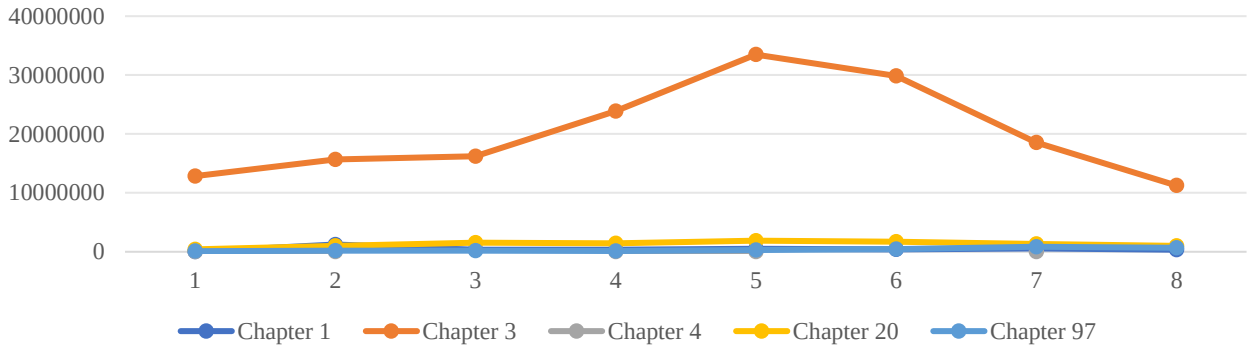


Figure 4. The amount of China's imports of certain Japanese products (Chapter)fluctuated from January to August 2023

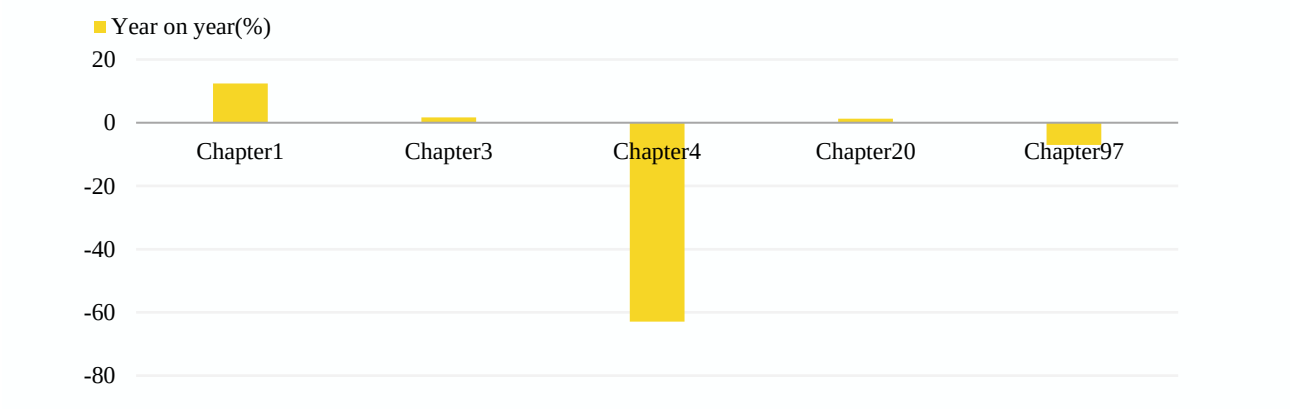


Figure 5. Year-on-year value of China's imports of some Japanese products (chapters) from January to August in 2023 and 2022

As can be seen from Fig.4 and Fig.5, after May 2023, the number of Chinese imports of Japanese seafood (Chapter 3) has decreased significantly, while the rest of the food, beverages, and other products have not changed much. Compared with last year, it was found that Chapter IV products, mainly some dairy products, eggs, honey, and some seafood, experienced the most significant change in imports, down 62.95%.

3. Trend Analysis

3.1. Affected by Pollution, Sino-Japanese Trade Will Have an Inevitable Friction in the Short and Medium Term

According to the data on Sino-Japanese import and export trade in recent years, the overall development trend of Sino-Japanese marketing is gradually increasing. According to data released by Chinese Customs, the total trade volume between China and Japan increased from $315.013 billion in 2019 to $357.424 billion in 2022, with an average annual growth rate of about 8.07 percent. Sino-Japanese trade has shown a trend of increasing year by year, which is mainly due to the interdependence and close ties between the two economies.

The first is food safety, with the contaminated water incident raising concerns about the safety of seafood and possibly other aquatic products. As one of Japan's essential import markets, China may strengthen quarantine and supervision of food imports from Japan, resulting in a particular impact on bilateral trade.

Secondly, trade barriers will be strengthened. If China sets trade barriers to Japanese food imports, including import restrictions and stricter inspection standards, it may lead to a decrease in bilateral trade volume.

There is also the impact of anti-Japanese sentiment; the nuclear sewage incident may arouse the emotions of the domestic people, aggravate the dissatisfaction with Japan and boycott sentiment, resulting in Chinese consumers boycotting Japanese products, and then affecting bilateral trade.

Finally, there is the dispute over the rules of the World Trade Organization. If China believes that Japan's nuclear sewage incident violates the relevant laws of the WTO, it may launch disputes and lawsuits through international institutions such as the WTO, which will further affect bilateral trade between China and Japan.

All in all, the discharge of nuclear sewage in Japan has a considerable impact on Sino-Japanese trade in the short and medium term, but this is only a temporary trend.

3.2. In the Long Run, It Will Remain Stable and Sustainable

Although Japan's pollution problem may cause some friction to Sino-Japanese trade in the short and medium term, in the long run, the development of Sino-Japanese business still has a steady upward trend. Here are some reasons why:

First, there is economic complementarity between China and Japan. China and Japan are complementary in terms of economic structure, and there is potential for cooperation between the two countries in many fields. China, as the world's most extensive manufacturing base, can provide a large number of goods and products. At the same time, Japan has a competitive advantage in high-end manufacturing, technological innovation, and services. This kind of complementarity makes Sino-Japanese trade have long-term cooperation space and potential.

Second, policy support: Both the Chinese and Japanese governments attach great importance to trade cooperation, especially after improving bilateral relations, intergovernmental trade negotiations, and cooperation mechanisms have been strengthened. The two governments have promoted the development of bilateral trade through the signing of free trade agreements and the establishment of economic cooperation zones. Such policy support is conducive to the steady growth of Sino-Japanese work.

Third, market demand: As one of the largest population and consumer markets in the world, China has a huge demand for various goods and services. As the world's manufacturer of high-quality products and technologies, Japan can meet the Chinese market's demand for quality and innovation. This will provide more opportunities and potential for Sino-Japanese trade.

Fourth, technological cooperation: Japan has a high level of technology and innovation in many fields, and China also has certain advantages in technology introduction and innovation capabilities. Technical cooperation and innovation cooperation between China and Japan are conducive to enhancing the added value and competitiveness of trade cooperation. In particular, in environmental protection technology, clean energy, and intelligent manufacturing, there is broad room for cooperation between enterprises of the two countries.

To sum up, although Japan's pollution problem may cause unavoidable friction to Sino-Japanese trade in the short and medium term, in the long run, the development of Sino-Japanese business has a steady upward trend. Economic complementarity, policy support, market demand, and technical cooperation between the two countries will provide a sustained boost to Sino-Japanese business.

4. Conclusion

The research examines the recent hot topic of whether Japan's nuclear sewage discharge will have an impact on Sino-Japanese trade. By comparing the current import and export data of related products between China and Japan with the data of previous years, it is found that the import and export amount of some seafood and certain food products has significantly fluctuated. However, from 2019 to 2022, the amount of Sino-Japanese trade still shows an upward trend.

In order to improve bilateral trade, China and Japan should strengthen communication and cooperation, especially in the field of environmental protection, and regular high-level meetings and

working groups can be established to promote collaboration and exchanges. Strict regulatory mechanisms can also be installed to strengthen monitoring and testing capacity.

All in all, the nuclear sewage incident reminds us that we should pay attention to environmental protection and sustainable development, and international trade should be built on the basis of environmental friendliness and sustainable development. At the same time, strengthening international cooperation and communication is the key to resolving trade disputes, and only through collaboration can we achieve a win-win situation.

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