

## Waste generation embodied in international trade between China and Japan : China-Japan WIO Analysis

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Author: Makiko TSUKUI

Co-Authors: Chen LIN

China's rapid development since adopting reform policies and opening its doors in the 1990s has brought about a dramatic increase in environmental loads, such as GHG emissions, air, soil and water pollution, and waste generation, all of which are serious environmental problems. Numerous studies have demonstrated that Chinese exports to other countries are among the main reasons underlying the environmental problems in China. While some of these studies have quantitatively investigated consumer responsibility for the environmental problems in China, most have focused on carbon footprints, water footprints, and energy consumption. Indeed, few of these studies have attempted to clarify the effect of waste management activities on the generation, transportation and treatment of waste. As a first step in investigating these issues, we examined how exports from China to Japan contribute to increased environmental loads in China. Specifically, we quantitatively clarified the economic and environmental relationships between China and Japan using a China-Japan interregional waste input-output (CJIRWIO) table for the year 2007.

In the CJIRWIO table for 2007, the goods and services sectors in China and Japan were compiled using "The Japan-China International Input-Output Table 2007" published by the Ministry of Economy, Trade and Industry (METI), Japan. However, the waste categories for China and Japan varied depending on the sources used for the statistics for each country; for the Japanese waste categories we used the "Industrial Waste Generation and Treatment Survey 2007" published by Ministry of the Environment, Japan, and for the Chinese categories we used the "China Statistical Yearbook on Environment 2008", the "China Classification Garbage Statistics" and the "China Statistical Yearbook for 2008" published by the National Bureau of Statistics of the People's Republic of China. In Japan, industrial waste is categorized into 19 categories, while in China there are only four industrial waste categories.

According to results obtained from the CJWIOT 2007, the difference in the scales of the economies of China and Japan is not as large as that in the amounts of waste generated. The GDP of Japan, including the activity of the waste treatment sectors, was 8.2 trillion US dollars, and that of China was 11.3 trillion US dollars in 2007. The waste generated by the industrial sectors in China is about 1.5 billion tonnes, which is about five times larger than that generated in Japan. In Japan, "Livestock excreta" from the "Agriculture" sector and "Construction waste" from the "Construction" sector are large. In China, "Mining", "Electricity gas, and heat supply", "Metals" and "Chemical products" are the predominant industries that generate large amounts of waste. The repercussion effects of final consumption by Japan on China induce large environmental loads, which are accompanied by considerable economic effects. The final demands of China and Japan induced almost the same production values in each country. The estimated production value induced in China by the final demand of Japan is about 244 billion US dollars, and that induced in Japan by the final demand of China is about 228 billion US dollars. However, the final demand of Japan induced about 215 million tonnes of CO<sub>2</sub> equivalent of GHG emissions in China, which is about four times larger than the final demand of China induced in Japan. The final demand of Japan also induced 50 million tonnes of waste in China, which is about five times larger than the final demand of China induced in Japan. So, final consumption in Japan brings about large economic repercussion effects in China, and these are accompanied by large environmental loads. Although there are issues with the Chinese statistics, the Chinese government understands that a large amount of waste is generated in the country. It is also very important for the governments of both countries to cooperate in order to reduce environmental loads.