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The determinants of Chinese nonferrous metals imports and exports

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ABSTRACT

This study investigates the determinants of Chinese nonferrous metals imports and exports using 40-country/region panel data during the period 1995–2014. The paper extends the standard gravity model to identify the factors that affect Chinese international nonferrous metals trade. The results can be summarized as three main findings: (1) Chinese nonferrous metals imports are mainly associated with market size, geographic proximity, ore resource endowment, a high degree of economic openness, a high level of political risk, and a well-developed seaport transportation system of trade partners; (2) Chinese nonferrous metals exports are mainly affected by market size, ore resource scarcity, a high degree of economic openness, and a high level of political risk; and (3) exchange rate, i.e., the price of currency, has a significant positive effect on export flow, but it is not the determinant of Chinese nonferrous metals import flow at the present stage of Chinese economic development.

1. Introduction

Over the past few decades, Chinese international trade in nonferrous metals has been gradually expanding in parallel with the restructuring of global industries (Fig. 1), and it was stimulated especially by its accession to the World Trade Organization in 2001. As the processing center for global manufacturing, China has become the world's largest importer and consumer of nonferrous metals since 2009. In 2014, Chinese nonferrous metals' import value accounted for 13.86% of the world's total. At the same time, China is also an important nonferrous metals exporter, and the total export value in 2014 amounted to $25.43 billion, ranking China second in the world. Fig. 2 shows the percentage values of the top 10 importers and exporters in 2014. In terms of single products, the Chinese import value of copper has ranked first in the world since 2007, and the export value of its aluminum has also ranked first since 2011 (Fig. 3).

China is the world's leading producer of nonferrous metals. For more than 10 years, China has led in the production of several nonferrous metals, such as primary aluminum, lead, and zinc (Shao, 2015). Meanwhile, China has continually provided a large amount of raw materials and intermediate nonferrous metals to other countries, especially those developed countries, thus making China a vital influencing factor on global supply and demand patterns as well as commodity prices of nonferrous metals. Therefore, to guarantee the healthy and sustainable development of the global nonferrous metals market, research on Chinese international nonferrous metals trade is meaningful and necessary. In addition, nonferrous metals, as indispensable materials of modern industries and national defense technology, are particularly important for China itself, which is the largest economy in the world but also a developing economy.

Figs. 4 and 5 illustrate the top 10 partners for Chinese nonferrous metals imports and exports, respectively. As both figures show, the rankings are time-variant. For example, United States, the third largest exporter of nonferrous metals to China in 1995, was replaced by Australia in 2014. The dynamic evolution of country and region rankings reveals that many factors may have an influence on bilateral nonferrous metals trade.

Hence, in order to properly understand the Chinese international nonferrous metals trade, it is essential to undertake a formal empirical analysis, which takes full account of the main factors and helps us understand which factors may affect and to what extent they affect the export and import flow.

As Figs. 2–5 show, China has huge volumes of both exports and imports of nonferrous metals, and the trading structure of them are significantly different. It is mainly due to the development stage of China's economy, its international trading policies, and technologies adopted in the nonferrous metal industry. First, the trading partners of both exports and imports are relatively concentrated. For exports, the trading partners mainly include developed economies, such as the United States, the Republic of Korea, Japan, etc.; while for imports, the

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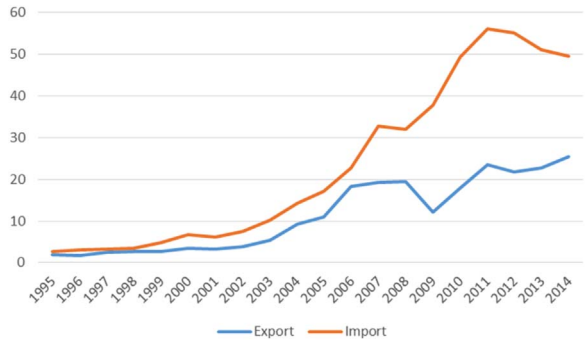

Fig. 1. Export and import values of Chinese nonferrous metals (in billions of dollars). Source: UNCTAD STAT. The United Nations Conference on Trade and Development STAT.

trading partners mainly include a few traditional mineral producers, such as Chile, Australia, India, etc. Second, there exists a price imbalance between exporting products and imported products, usually with a higher price for the imported products due to a relatively competitive technological level. Along with the steady growth of national economy, the volume of imported refined metals is gradually increasing, while the exporting volume is decreasing overall, which results in a worse trading situation for China.

Therefore, in this study, models and discussions of exports and imports are separated. The main focus of this study is on the determinants of Chinese nonferrous metals trade. Through this study, we can also discover and summarize problems that exist in the present development stage of the Chinese nonferrous metals industry, which could serve as a foundation for international trading policy making and also contribute to the production and management decision-making processes of individual companies.

Many studies have analyzed the determinants of international trade, and the gravity model is one of the most common methods. Important empirical studies include Guo (2004), Subramanian and Wei (2007), and Yu (2009). However, research focused on international trade for the resource industry is scant. At present, only Al-Rawahi and Rieber (1991) studied embodied copper in imports and exports; Tong and Lifset (2007) used a block model from a network analysis in their characterization of the multilevel anthropogenic copper cycle to group countries according to their structural equivalence in the international trade networks related to copper, which can reflect the inherent structure of the world's system of copper production and consumption.

This paper contributes to related studies in the following two aspects. First, to our knowledge, this is the first empirical study on the determinants of international nonferrous metals trade, and it explores the idiosyncratic patterns of Chinese international nonferrous metals trade flow. Second, this study analyzes the explanatory power of the classic gravity model on the nonferrous metals industry and discusses the effects of several common factors, such as ore resource endowment, trade openness, cultural similarity, exchange rates and the political risk of trade partners, on Chinese international nonferrous metals trade, to test whether the conventional international trade theory can explain trading behaviors in the nonferrous metals industry.

The rest of the paper is structured as follows. Section 2 describes the theoretical framework of our study, including the gravity model and the determinants considered in this study; Section 3 describes our data and models; and Section 4 presents a detailed regression analysis to address the problems. Section 5 concludes this study.

2. Theoretical framework

2.1. The gravity model

The gravity model has been successfully applied in modeling general international trade flows. It was firstly used by Tinbergen (1962), and the most well-known application of the gravity model was implemented by Linnemann (1966). Feenstra (2003) highlighted the importance of the gravity model and commended it as a successful model to explain growing international trade. Later, Anderson and van Wincoop (2003) provided a theoretical micro foundation for the typical gravity model.

The basic form of gravity model is as follows:

$$F_{ij} = G(Y_i)^{\beta_1}(Y_j)^{\beta_2}(D_{ij})^{\beta_3}(X_{ij})^{\beta_4}u_{ij} \quad (1)$$

where F_{ij} is the trade flow from country i to country j;$Y_i(Y_j)$ is usually the nominal gross domestic product (GDP) in country $i(j)$, representing the market size of trading countries;D_{ij} is the geographic distance from the economic center of country i to that of country j, representing the general trading cost; and X_{ij} denotes any other additional factors that can either aid or impede trade between country i and country j. Also, G is a constant, and u_{ij} is a log-normally distributed error term with $E(\ln u_{ij}) = 0$.

The conventional approach to estimating Eq. (1) is taking logs of both sides of it, leading to a log-log form of the gravity model, as follows:

$$\ln(F_{ij}) = \beta_0 + \beta_1 \ln(Y_i) + \beta_2 \ln(Y_j) + \beta_3 \ln(D_{ij}) + \beta_4 \ln(X_{ij}) + \varepsilon_{ij} \quad (2)$$

where $\beta_0 = \ln G, \varepsilon_{ij} = \ln u_{ij}$.

In this study, we mainly address two issues. First, whether the general theory of international trade holds for resource products, i.e., nonferrous metals. Second, what the main determinants of Chinese international nonferrous metals trade are, based on international trade theory.

2.2. Determinants of Chinese international nonferrous metals trade

In this section, we review the determinants derived from international trade theory in existing studies, and formulate expectations of their ability to influence China's international nonferrous metals trade.

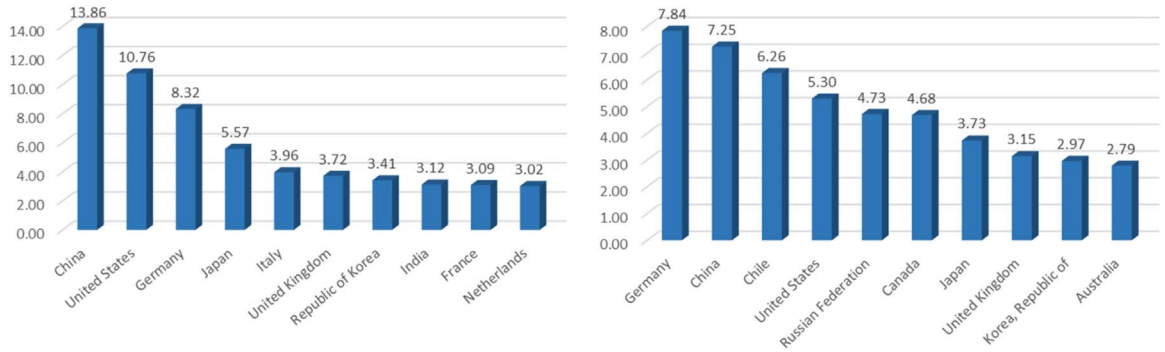

Fig. 2. Top 10 nonferrous metals importers (left) and exporters (right) in 2014 (as a % of the world's total value). Source: UNCTAD STAT.