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World trade in rare earths, Chinese export restrictions, and implications

Nabeel A. Mancheri¹

Institute of Environmental Sciences (CML), Leiden University, The Netherlands

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ABSTRACT

Export restrictions on metals and mineral products have been broadly applied by many countries with a view to securing domestic supply and addressing resource depletion. Export restrictions are designed to meet diverse policy objectives ranging from environmental protection and increasing fiscal revenue to the development of processing sectors. The global dependency on China for raw materials (particularly rare earth elements) is a contentious issue, as China imposes a number of restrictions on the export of these minerals. This study uses the case of rare earth elements to evaluate Chinese export restrictions, reviewing China's current monopoly over the industry and providing insights on how widely traded these minerals are and China's position in international trade in terms of both volume and value. The study investigates the various trade restrictions imposed by China and their implications, including the availability of materials to industrialized countries.

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1. Introduction

The concentration of rare earth element (REE) production in China and Chinese export restrictions has raised concerns in industrialized countries about the criticality of these materials (DOE, 2010, 2011). REEs are a critical component in many high-technology goods, such as mobile telephones, computers, televisions, energy-efficient lighting, and wind energy turbines. REEs are also critical to lasers, superconducting magnets, and batteries for hybrid automobiles. Despite the Chinese monopoly, there was sufficient supply to other markets until the last few years. However, China's expanding economy is posing a risk to supply of REEs worldwide, as growing consumption in China limits their exports and makes REEs more critical.

Export restrictions on metals and mineral products have been applied widely by many countries for securing steady domestic supply and for addressing the problem of resource depletion. Export restrictions are designed to meet diverse policy objectives that range from environmental protection and increasing fiscal revenue to the development of processing sectors (Korinek and Kim, 2010). Restrictions to trade include taxes and other legislation, such as tariff and non-tariff trade barriers (e.g., quotas).

There is no single General Agreement on Tariffs and Trade (GATT)/WTO article that exclusively addresses export restrictions; however, Article XI of GATT 1994 is a key provision regarding export

restrictions (WTO, 2014). It prohibits the use of quantitative restrictions regarding both imports and exports. Export duties are not subject to Article XI in principle and are thus not prohibited under this article, while quantitative restrictions are. Regarding quantitative restrictions (which are generally prohibited), the issue is whether these measures can be exceptionally allowed under Article XI: 2 (a) (critical shortage of foodstuffs), Article XX (General Exceptions), and Article XXI (Security Exceptions). Article XXI permit export restrictions on raw materials for long-term defense purposes, relating to fissionable materials or the materials from which they are derived; relating to the traffic in arms, ammunition and to such traffic in other goods and materials as is carried on directly or indirectly for the purpose of supplying a military establishment (WTO, 2014)

Article XI: 2(a) allows each member to apply export restrictions "temporarily" to prevent or relieve "critical" shortages of foodstuffs or other products essential to the exporting country. Article XX allows for exceptional quantitative restrictions toward policy objectives (e.g., conservation of exhaustible natural resources) and ensuring essential materials for the domestic processing industry under "certain qualifications" (OECD, 2010).

Prior to the 2008 global financial crisis, export restrictions were used by many countries to achieve diverse policy objectives. Piermartini (2004) noted that approximately one-third of the WTO members imposed export taxes. Economic analysis provides several motivations for using such taxes: (i) they raise the world price of exported products and therefore improve terms of trade; (ii) they reduce the domestic price of the taxed commodity and thus benefit the final consumers of this commodity (this element is especially important for food security); (iii) they reduce the

E-mail address: n.a.mancheri@cml.leidenuniv.nl¹ Marie Curie Fellow.

domestic price of the taxed commodity and benefit consumers of this commodity as inputs; (iv) they increase public revenue, which is beneficial in a country where fiscal receipts on a domestic basis are limited (Bouet and David, 2010). Our study finds that apart from (iv), these reasons may have prompted China to impose restrictions on exports of REEs, although China claims environmental degradation to be the main reason.

Recently, a number of scientific articles and policy reports from both governmental and private organizations have been published on these minerals, particularly after the 2010 incident of Chinese export restrictions to Japan over a territorial dispute. These studies have addressed a wide range of aspects concerning REEs, from assessing the criticality of individual minerals to the possible effects of future scarcity (Hedrick, 2010; Hurst, 2010; Hoenderdaal et al., 2013; Wübbeke, 2013). They introduce a framework for measuring the criticality of raw materials by taking into account their economic importance, substitutability, the diversity of supply, the size of known resources and reserves, and the potential for recycling (Kleijn, 2012; Massari and Ruberti, 2013; Humphries, 2012; Morrison and Tang, 2012; Levkowitz and Beauchamp-Mustafaga, 2010; Grasso, 2012).

Since most of these studies deal with the micro level aspects such as looking at criticality of a single element or set of elements, recycle potentials, quantitative and forecasting, Chinese regulation policies and its impact on production or consumption, the present study intends to fill the gap in the literature where no study has previously touched upon, the international trade aspects, how these minerals have emerged from obscurity to considerable relevance and how China articulated its policies in concurrent with developments in global trade. The questions addressed in this paper are more fundamental, analyzing the Chinese rare earth industry with its downstream filaments and document its dominant position in the international division of labour, than the applied methodologies of many previous studies. Since rare earths are considered as strategic resources not only involving the firms in business but also the governments' direct policy interventions, a study on scrutinizing all these actors in a single paper is quite challenging. So it is essential to have an overview of all the issues involved and correlate each parameters and, our purpose is to generate an idea and advance clarity on these minerals based on the international trade and global value chain developments.

Following previous studies and assuming that these minerals are indeed critical, this study evaluates China's monopoly over the industry and provides insights on how widely traded these minerals are and China's positions in international trade in terms of both volume and value. The various trade restrictions imposed by China and their implications are investigated, including the availability of such materials to Western companies. Furthermore, the paper analyzes the Chinese ambitions to upgrade the industry towards higher value added products and the recent changes in Chinese domestic regulatory policies as a response to the WTO ruling on the illegality of quantitative restrictions and taxes on rare earth commodity exports. Hence, the paper may in many ways contribute to the growing academic literature on the global rare earth industry and the debate on mineral criticality. Some of the individual REEs are more essential than others on a demand and supply basis. Although China has been increasingly restricting the export of the most crucial heavy REEs, the study does not evaluate the criticality of individual elements and does not differentiate among them. Rather, REEs are taken as a whole for analysis due to the non-availability of data on individual REEs.

2. Methodology

This research is based on empirical and quantitative analysis of the information, available data, and literature collected from

various sources. Data are collected from both primary and secondary sources. The primary source involves interaction with stakeholders, subject experts, and procurement of official documents from government agencies. Descriptive statistics and time-series export and import data available in the public domain are used to analyze empirical issues (e.g., the United Nations Commodity Trade Database (UNCOMTRADE), which provides access to major international merchandise trade and descriptive statistics).

3. International trade in REEs and China's role

China was a small player in REEs prior to the 1990s and was an exporter of low-value rare earth concentrates during this period, but it became the world's leading producer and exporter of REEs in 2000. China has a monopoly over the resources, as no other country can match Chinese capabilities and resources in this sector (Hedrick, 1997; Humphries, 2012), and the country's imposition of export restrictions on REEs hinges on the domestic requirements for its clean energy and high-tech sectors. The government wants rare-earths companies to add value by making more technologically advanced products rather than merely exporting the raw material. Although there are many restrictions on mineral exports, there are no restrictions on exports of finished products (Seaman, 2010).

Fig. 1 shows the gross volume and value of world export in REEs from 1990 to 2014. The data is extracted from the UNCOMTRADE database and comprises two commodity groups classified as rare-earth metals, scandium and yttrium (HS-280530), and compounds of yttrium or of scandium (inorganic or organic) or mixtures of these metals (HS-2846).

Fig. 1 shows that the gross volume of global export in REEs grew from a mere 259 metric tons in 1990 to a peak of 111,373 metric tons in 2004. Global export in REEs is calculated as the sum of all exports of REEs of reporting countries, including China. Since 2004, the global export in these minerals has dropped considerably, hitting 82,000 metric tons in 2014. Furthermore, the gross export volume increased until 2004 and then gradually declined until 2012. A number of reasons can be attributed to this decline in trade; however, the sudden fall between 2007 and 2009 is traced to the lack of demand from developed countries during the global financial crisis that severely affected major REE-consuming countries, such as the United States, Japan, and European countries.

Fig. 1 also shows the growth in the gross value of the REE export from 1990 to 2014. Export in terms of total value also grew, reaching its maximum in 2011 of USD 4.24 billion from just USD 203 million in 1990. From 1998 to 2005, the annual average gross value of exports was about USD 420 million, and the annual average gross volume of exports was about 46,946.63 metric tons.

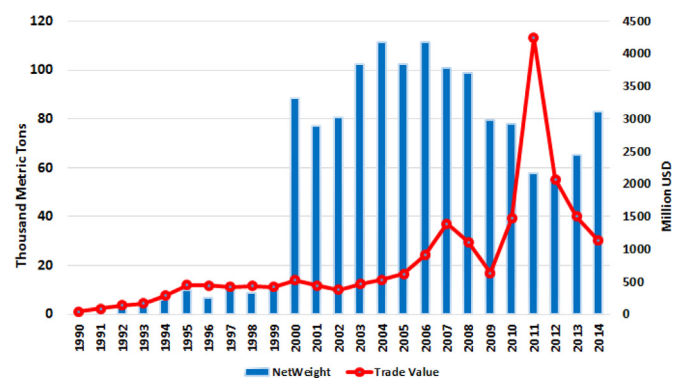


Fig. 1. Gross volume and value of REE exports from 1990 to 2014.

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