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## **From Resource Advantage to Economic Superiority: Development and Implications of China's Rare Earth Policy**

Daniela Lackner and Susan McEwen-Fial

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## **From Resource Advantage to Economic Superiority: Development and Implications of China's Rare Earth Policy**

### **Abstract**

Rare Earth Elements (REE) have become the new strategic economic weapon for the modern age. Used in the manufacturing of products ranging from mobile phones to jet fighter engines, REEs have become the new “oil” of today in terms of economic and strategic importance. Currently, 95% of REEs mined globally are mined in China, giving China a monopoly on the industry. Deng Xiaoping foresaw the importance of REEs in 1992 when he commented: “as there is oil in the Middle East, there is rare earth in China.” Recently, China temporarily stopped exports of REEs to Japan, the EU and the US as an unofficial response to varying political and economic issues. This stoppage raised concerns as to the dependability of China and REE exports. Using the theory of neo-mercantilism, this paper analyzes China's actions in the REE market and its subsequent economic and political implications. It concludes with a look at how countries are trying to position themselves away from a dependency on China.

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## Introduction

Rare Earth Elements (REE) are widely unknown to the general public, but have enormous strategic importance. They feature unique chemical properties that are crucial for many high-tech products such as mobile phones, laptops and semiconductors, as well as for key green-technologies such as windmills and photovoltaic batteries. They are also required for most sophisticated military technology and defense applications. What increases the strategic importance of rare earth elements even more is the lack of adequate and efficient substitutes (Haxel/ Hendrick/ Orris 2002: 1f.). So despite their “invisibility,” it is no exaggeration to say that today’s world is very dependent on those elements.

But what exactly are rare earth elements? First of all, the term “rare earth” is a misnomer. Rare earths are a group of 16 or 17<sup>1</sup> metals that are 200 times more common in the upper continental crust than gold. In short, rare earth elements are neither rare nor earth (Haxel/ Hendrick/ Orris 2002: 2f.). But unlike most other metals, rare earth elements display little tendency to occur in concentrated deposits (ibid.). Hence, they are mined out of complex compounds – which makes extraction both time and cost intensive (Hurst 2010: 4-5). As a consequence, developed countries moved gradually out of REE mining during the past few decades. Today, over 95 percent of all rare earths mined globally are mined in China (Liedtke/ Elsner 2009:3). Due to the strategic importance of REEs, the economies of virtually all developed countries are dependent on REEs and therefore dependent on China.

China recently stopped exports of REE temporarily to Japan, the European Union and the United States. Although not officially sanctioned, it stopped exports to Japan and indirectly to the EU as a consequence following a territorial altercation concerning the disputed Diaoyu/Senkaku Islands. At the same time, China also stopped exports to the US as the Americans filed an official WTO complaint regarding China’s green energy policies. All three stoppages lasted only ten days but have had long term economic and political implications. These stoppages were not official embargoes and the Chinese government claimed that they were for inspections rather than as a response to political and economic issues. However, the timing was undeniable.

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<sup>1</sup> Depending on whether Yttrium is included or not.

The stoppages had both short and long-term effects. In the short-term, the stoppages created economic difficulties for affected Japanese industries, such as the auto industry. More importantly, it created a general feeling of unease among the affected actors about the dependability of China in the future. Furthermore, China's use of this economic monopoly in its territorial conflict with Japan seemed to demonstrate a willingness on China's part to use its economic power for political gain. This paper uses the theory of neo-mercantilism to analyze China's actions in the REE market and its subsequent political implications. This theoretical approach emphasizes that a state's political power is derived from the relative capacity of its respective economic sector. Accordingly, this paper argues that China's long-term strategy in REE policy has had an impact on its stance in international conflicts. The analysis is fundamentally based on both government and private assessments of the growth of Chinese REE industry and its relation to Chinese industrial policy. An understanding of China's behavior in such a strategic market is important as the debate over China's impact on world politics continues.

The paper is divided into several sections. First, the paper will give some background to the global REE industry. Then, the development of the Chinese monopoly as well as the political situation mentioned above will be outlined. In the subsequent section, key concepts of neo-mercantilism will be presented in order to provide a theoretical framework for a more sophisticated analysis of the situation. The following section will primarily focus on two key aspects, namely the Chinese industrial policy that enabled the establishment of the monopoly on the one hand as well as on the effect of the latter on countries and companies dependent on rare earths on the other hand. Finally, potential alternatives to the Chinese supremacy in the REE industry will be assessed.

### **Development of the Chinese REE Industry**

From the discovery of REEs in 1787 by a Swedish Army officer until the mid 1960s, no significant amounts of rare earth elements were mined due to both a lack of access to deposits with a substantial concentration of REEs as well as a lack of potential applications (Haxel/ Hendrick/ Orris 2002: 3). It was not until the first color televisions were commercialized in the mid 1960s that the demand for REEs increased (ibid.). In order to meet this unprecedented demand, efficiency of mining processes increased

rapidly (Hurst 2010: 10). Subsequently, availability of REEs increased and researchers were able to explore new applications (ibid.). During this time, the world's demand in REEs was mainly satisfied by a single mine in Mountain Pass, USA (Haxel/ Hendrick/ Orris 2002: 3). However, having been the largest producer of REE until the mid 1980s, Mountain Pass was shut down in 1998 due to increasing environmental difficulties which resulted in regulatory problems (ibid.). As mining of REEs easily leads to environmental degradation such as radioactively contaminated residues or acidic waters, regulatory problems persisted (Hurst 2010: 16). Additionally, rising costs and sinking market prices have made mining even less profitable (Haxel/ Hendrick/ Orris 2002: 3). Since then, no new REEs are mined in the USA although the mine continues to produce insignificant amounts of REE from raw material stockpiles (Long/ Van Gosen/ Foley/ Godier 2010: 15).

Mining of rare earth elements in China developed rather late in comparison with the USA, despite having been explored in China as early as the 1950s (Hurst 2010: 11). Chinese production of REE remained insignificant until the mid 1980s. Beginning in 1978, the Chinese production of REE increased 40 percent annually until 1989 (ibid.). At the same time, more and more new applications for REE were being discovered, resulting in a rise in global demand and consumption. Despite this increase, Chinese supply exceeded the global demand in REEs, causing massive decreases in market prices (ibid.). As mining in China is not only cheaper in terms of labor costs, but also less strictly regulated (Haxel/ Hendrick/ Orris 2002: 4), mining of REEs in other parts of the world became largely unprofitable (Hurst 2010:11). Thus, since 2001, the Chinese market share in rare earth elements accounts for over 95 percent (Liedtke/ Elsner 2009: 3). Today, Chinese production of REE is responsible for nearly 97 percent of the world's supply, followed by India and Brazil that account for respectively 2 and 0.5 percent (Korinek/ Kim 2010:9). Other countries play an even less significant role in REE mining. However, according to the U.S. Geological Survey, China accounts for only roughly 35 percent of worldwide REE deposits<sup>2</sup> (Long/ Van Gosen/ Foley/ Godier 2010: 15). Recently, the Chinese Ministry of Commerce claimed that China's domestic rare earth deposits have dropped to approximately 30% of the world's known resources (Bloomberg 2010).

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<sup>2</sup> Figures regarding Chinese REE differ in literature and range from 30 percent (Korinek/ Kim 2010: 19) to 57 percent (Hurst 2010: 15).

Due to excess Chinese supply, REEs have been cheaply and more than sufficiently available on the world market from the late 1990s and until the early 2000s (Mason 2009). But since the establishment of ever stricter Chinese export quotas in 2004, availability of rare earth elements has become more difficult for other countries (Bradsher 2010c). To give a brief example, the total export quota for the second term of 2010 was 72 percent below the quota for the second term of 2009 (Manager Magazin 2010). Prices of REEs are therefore constantly increasing (Liedtke/ Elsner 2009: 3). Additionally, only 32 licensed enterprises – both Chinese and foreign-owned, are authorized to export REEs out of China (Hatch 2010; Bradsher 2010a). At the same time, due to technological progress and increased emphasis on high tech products, economies in developed countries like the U.S., Japan and Europe have become more and more dependent on rare earth elements, and subsequently dependent on China (Bradsher 2010c).

### **REEs and politics**

Recently, countries dependent on rare earths realized that the Chinese supply of REEs is not reliable at all: The Chinese government simultaneously cut all major developed economies off a key raw material (Bradsher 2010a; The Economist 2010: 4/11). As a response to a political conflict with Japan, China temporarily cut off supplies to Japan and Europe. At the same time, China also cut off supplies to the US in response to a US complaint to the WTO. Those related trade conflicts will be examined in detail below.

#### *Japan*

On September 7<sup>th</sup> 2010, the Japanese marine detained the crew of a Chinese fishing boat close to the Senkaku Islands (or Diaoyu Islands as they are called in Chinese). The islands in questions are at the center of a long lasting territorial dispute between China and Japan who both claim them to be within their respective exclusive economic zone (The Economist 2005: 5/10). This issue is especially critical as the area around the islands has huge gas and oil deposits (ibid.). The offshore claims in question are thus important issues in Sino-Japanese competition (Lampton 2008:199). Therefore, China's reaction to this incident was fierce (The Economist 2010: 4/11). China responded by cancelling meetings with Japanese officials (The Economist 2010: 2/12). Several

Japanese businessmen were arrested (The Economist: 2010: 2/12). Finally China stopped exports of REEs to Japan (The Economist: 2010: 4/11). Especially the latter had an important impact on this conflict (Bradsher 2010a).

The Japanese economy relies more heavily on rare earth elements than any other country. Since Japan's automotive industry is very dominant in hybrid technology, it is very advanced in permanent magnets for electronic engines (Bradsher 2010). Magnetic technology is one of the most important applications for REEs (Hurst 2010: 12). The other major field in which Japanese enterprises are active is the high-tech and semiconductor industry. Here, again rare earth elements are crucial raw materials for many applications (Bradsher 2010b). It is thus not surprising that more than 50 percent of REEs consumed outside China are used by Japanese companies. Therefore, the Japanese automotive industry was greatly affected by the Chinese embargo (FTD 15/1/2011).

Shortly after the stoppage, the Japanese government backed down quickly in the territorial dispute and released the crew on September 24<sup>th</sup>. China did not resume REE exports to Japan until two months later on November 19<sup>th</sup> (Bradsher 2010b).

It is important to note that there was no official embargo. The Chinese government claims not to have issued any regulations against exports of REEs to Japan (Bradsher 2010a). Instead, it was said that the stoppage resulted from a "spontaneous and simultaneous decision" of the 32 licensed exporting enterprises to stop exports to Japan because of their "personal feelings towards Japan" (Bradsher 2010d). Thus, there is no written proof for the stoppage and it is therefore unlikely that Japan would be able to challenge the Chinese action through the WTO (ibid.).

### *European Union*

From October 18<sup>th</sup> till 28<sup>th</sup>, 2010, China also stopped exports of REE to the European Union (Bradsher 2010a). This ban of exports basically originated from the territorial conflict between China and Japan described above. The ban occurred for two reasons: on the one hand, having also stopped exports to the EU and the US, the Chinese administration could easily justify the embargo to Japan by saying that virtually all REE shipments were delayed due to a close examination of the product (Bradsher 2010a). Thus, China publically invalidated Japanese accusations of unfair

treatment and “economic warfare” (Bradsher 2010a, 2010b). On the other hand – and probably more importantly – Japanese companies tried to bypass the Chinese embargo by buying REEs from European companies’ stockpiles (Bradsher 2010b). As these bypassing measures tended to render Chinese export bans less effective, the embargo to the EU was crucial in order to re-strengthen the Chinese position in its political conflict with Japan (ibid.).

European companies mainly buy processed<sup>3</sup> and no raw rare earth elements. Those processed REEs were neither subjected to the export quota system described above, nor were they affected by the export ban. Additionally, the European economies are less engaged in the high tech sector than the Japanese economy and are therefore less reliant on rare earth elements. Thus, the stoppage had significantly less influence on the European economies than it had on the Japanese (Bradsher 2010a). Nonetheless, the behavior of the Chinese had an immediate effect on the European economy (ibid.). Stock analysts for example recommended not to invest too enthusiastically in the REE intensive, domestic renewable energy sector as future prospects are not that good with respect to the potential lack of REEs (Zeit 8/5/2011).

#### *United States*

The issue between the U.S. and China concerning REEs is not directly related to the above conflict. On October 15<sup>th</sup>, 2010, the United States Trade Representative (USTR) opened an investigation into whether certain aspects of China’s green energy policies – namely subsidizing exports, restricting domestic market access for foreign firms, and the preferential treatment of domestic companies regarding access to rare earths required for green technologies – violated WTO rules (Chan/ Bradsher 2010). In an unofficial response to those investigations, China suspended exports of REE to the United States from October 18<sup>th</sup> – 28<sup>th</sup> (Bradsher 2010b).

Similar to the situation with the EU, the effect of the Chinese unofficial embargo towards the US was more symbolic as the United States also mainly relies on processed REEs that continue to be freely available on the world market (Bradsher 2010a). However, despite its symbolic nature, it created significant political consequences for relations between the US and China. As mentioned earlier, rare earth elements are

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<sup>3</sup> Processed REEs are compounds which went through a value adding process and consist to less than 50 percent of REEs.

critical in military and defense applications. REEs are required for sophisticated missile guidance systems, jet fighter engines, antimissile defense and many other military applications. REEs are thus closely related to important issues of national security (Haxel/ Hendrick/ Orris 2002: 3). Thus the stoppage was perceived as a threat by US American commentators (Kennedy 2010). Just like in the context of the stoppage towards Japan, Chinese officials emphasized that the Chinese government did not impose an official embargo on REE exports (Bradsher 2010d). Instead, the explanation for the stop of export with destination to Japan also held true for the export ban towards the United States and the EU (ibid.).

As outlined above, during ten days in autumn 2010 all major developed countries relying on REEs were simultaneously cut off from these crucial raw materials. As a result, REEs were in short supply globally. So, according to huge imbalances of supply and demand, prices for REE outside China increased dramatically until the prices for some REEs were up to ten times higher than before the embargo (Bradsher 2010b). Given the dependence of developed countries and their economies on rare earths, potential further Chinese export bans constitute a virtual ransom. China's use of REEs in this case can best be explained by neo-mercantilist theory.

### **Neo-mercantilism in international political economy**

Neo-mercantilism as a school of international political economy will be outlined in order to later on permit a more profound examination of the situation described above. The implications of neo-mercantilism for the international system as well as for export and raw material policy will be illustrated. Finally, the key arguments of neo-mercantilism will be summed up in order to serve as a base for a well structured analysis.

Neo-mercantilism (as well as mercantilism) is based on a realist understanding of the international system (Hansen 2007: 39). Hence, the realist key assumptions such as anarchy in the international system and the states' pursuit of *power* in order to grant national security are fundamental for the neo-mercantilist approach. Whereas realism does not consider economic dimensions within the states, neo-mercantilism serves as a complement to realism (Hay 2002: 17, 19).

According to neo-mercantilism, power is to a large extent derived from *wealth*. Thus, in the international system, power and wealth are closely interconnected (Oatley 2010: 8). In order to maximize wealth, the political authority on the one hand tightly coordinates economic action through a well-directed industrial policy that strengthens strategic sectors<sup>4</sup> (ibid.) and on the other hand guides resource allocation on the national level (Oatley 2010: 10-11). As power and wealth are interconnected, state intervention in economic means is dedicated to enhance the power of the state within the international system (Oatley 2010: 8). Because of the assumptions of anarchy of the international system and of the need to maximize power shared with realism, the focus of (neo-) mercantilism clearly lies on the *relative* (rather than the absolute) capacity of an economy compared to other economies (Bieling 2007: 30). Only a relative advance in economic capacity can assure a relative advance in wealth, hence in power (ibid.). As wealth is used to increase a state's power, economic means are referred to as instruments in power politics (Bieling 2007: 32). The economy in general is therefore strongly politicized (Hansen 2007: 113); the national interest in security and power dominates over economy and civil society (Bieling 2007: 32). Thus, neo-mercantilism gives impetus for politically motivated state intervention in the economy.

#### *Neo-mercantilism and the international system*

As each state seeks to maximize its own relative economic capacity with a well-directed industrial policy in combination with subsidies and export as well as import quotas, interaction between states within the international system is not cooperative, but serves for the respective maximization of relative power (Bieling 2007: 31). Compared to mercantilism, neo-mercantilism at least accepts the prevailing interdependence within the global economic system. Self-sufficiency in resources is therefore not promoted by neo-mercantilism (Sell 2000: 26). However, states within the international system compete in order to attract strategically important key industries and are likely to become engaged in a distributional conflict regarding resources (Oatley 2010: 11). Free trade therefore only occurs if it serves a state's goal of wealth and power maximization which is not always the case (Hansen 2007: 40). In order to increase wealth, states continuously strive to gather a positive trade balance, thus to minimize imports and maximize exports. It is yet impossible for all economies to pursue a

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<sup>4</sup> According to neo-mercantilism, not all economic activities exert an equal influence on a state's wealth and power (Oatley 2010: 8).

strategy of account surplus over time; there has to be a “residual” economy that absorbs excess export capacities (Guerrierie/ Padoan 1986: 33). For those reasons, according to neo-mercantilism, trade conflicts and concurrences between states are likely to arise, but trade is not refused per se (Oatley 2010: 11; Okruch 200: 151).

However, some neo-mercantilist scholars argue that for developing industries, a protectionist trade policy can be more beneficial. This argument is mainly supported by historical facts: In order to modernize their economies and to catch up with the British industrialization, the newly founded United States as well as Prussia successfully promoted a protectionist trade policy (Bieling 2007: 32). Accordingly, protectionist measures could enable developing economies to more easily catch up with their developed counterparts (ibid.).

#### *Implications on export and raw material policy*

The direct implications of neo-mercantilism on raw material policy and export are somewhat ambivalent. On the one hand, an important feature of neo-mercantilism is the pursuit of a current account surplus which strengthens a state’s role in the international system by increasing the government’s international prestige (Guerrierie/ Padoan 1986: 30-32). This argument favors an open raw material policy as exports of raw materials contribute to a positive trade balance. But on the other hand, neo-mercantilism stipulates that the protection of national raw material resources is crucial in order to maintain economic competitiveness (Bieling 2007: 30). Thus, the export of raw materials is seriously limited by the need to be able to consistently meet the resource requirements of national industry.

The following section analyzes the impact of China’s industrial policy on the establishment of a monopoly in REEs. Afterwards, quotas and export taxes will be set into a broader economic context in order to examine whether their creation conforms to the neo-mercantilist assumption that trade will be hindered if it serves the maximization of a state’s power.

#### **Rare earth in China’s industrial policy**

As described earlier, within less than twenty years and starting from close to zero, China has pursued a well-directed industrial policy and thus established a monopoly in

both REE supply and research (Hurst 2010: 6, 11). Initially, this policy was very cost intensive, but it has paid off in the long term. As Chinese suppliers flooded the market with cheap REEs in the 1990s, the prices decreased dramatically, making mining no longer profitable for producers all over the world. Moreover, despite China's advantage through lower regulatory and labor costs (Hurst 2010: 11), the excess supply affected Chinese firms' profits, too. Given the fact that Chinese REE reserves are huge, but not endless, this market behavior has been both cost intensive and economically irrational (Mason 2009). Therefore, there seems to be clear evidence for politically motivated market behavior – thus market intervention via industrial policy which is in line with the neo-mercantilist approach.

It was not until almost all other companies (and accordingly countries) went out of REE mining that the Chinese policy started to succeed. In particular, the major Western economies in the United States and the EU were affected by China's rise in rare earths just as they were dealing with serious supply shortages (Nitschke 2009: 3). In Europe, the renewable energy sector which largely contributes to CO<sub>2</sub> reduction targets is most sensitive to REE supply shortages (Zeit 8/15/2011). For the U.S., interest in REE is primarily based on military and defense applications (Haxel/ Hendrick/ Orris 2002: 3). Shortage in REE thus hurts the EU as well as the United States in fields that are not only economically but also psychologically sensitive. As it is very time and cost intensive to (re-) open a rare earth mine, China will definitely maintain its (relatively) dominant position in REE at least during the next decade, being technologically and economically advanced (Hurst 2010: 26). The promotion of rare earth elements as a key industry therefore seems to pay off for China, granting it both a relative and absolute advantage over its competitors in this sector.

In addition to becoming the main source of REE supply, the Chinese government pursued another strategy, namely the promotion of research in the field of rare earth elements (Hurst 2010: 6). In 1999, Jiang Zemin, then President of the People's Republic of China, briefly described this ambitious and very neo-mercantilist strategy as the following: "Improve the development and applications of rare earth, and change the resource advantage into economic superiority." (Baotou National Rare-Earth Hi-Tech Zone). Thus, already in the 1980s, the Chinese government started to spend a lot of money on research in REE (Hurst 2010: 6). Those research efforts have largely been

included in the ‘National High Technology Research and Development Program’, dedicated to an overall modernization of the Chinese economy (ibid.). Several state laboratories and institutes are at the core of Chinese research in rare earth, leading to a high concentration of expertise and superiority in REE chemistry (Hurst 2010: 8-9). Today, there are only two publications globally that focus primarily on REEs – and both of them are Chinese run (Hurst 2010: 10). As a result of Chinese state driven research efforts, the long lasting U.S leadership in REE technology has ceased (Haxel/ Hendrick/ Orris 2002: 4).

In addition to domestic endeavors, the Chinese government has tried to access REE activities all over the world (Liedtke/ Elsner 2009: 5). Thereby, the Chinese government aims at ensuring its control over the rare earth industry in the long-term, when its own resources might cease (ibid.). Nevertheless, this policy has proven to be less successful than the other attempts described above. In 2005, CNOOC (China National Offshore Oil Corporation) tried unsuccessfully to acquire Unocal (Miller 2010), a US oil company that owns Molycorp which in turn owns the Californian REE mine in Mountain Pass (Hurst 2010: 13). Only four years later, the China Non-Ferrous Metal Mining Co. wanted to purchase an Australian mining company called Lynas Corporation that holds the rights to exploit Mont Weld, Australia’s biggest REE reserve (Hurst 2010: 14; Mason 2009). Both attempts have been defeated by the governments of the United States and Australia respectively by emphasizing issues of national security (ibid). As foreign direct investment from China must be approved depending on the amount, it is evident that the illustrated attempts have been supported by the Chinese government (Miller 2010). Hence, they can be seen as a further branch in the industrial policy designed to strengthen China’s position in the REE market.

In conclusion, the findings described above are coherent with the neo-mercantilist assumption that states pursue well-directed industrial policy in order to enhance their economic capacity. The Chinese industrial policy clearly fits in this pattern and has been largely successful.

#### *Establishment of quotas and export taxes*

The following section refers to another key argument of neo-mercantilism, which holds that interaction between states is not cooperative and that free trade only occurs if

it increases a state's wealth and power. As already stipulated earlier, China does not pursue a free trade strategy regarding rare earths. On the contrary, export quotas and taxes have been rapidly increasing for several years, thus further restricting trade (Korinek/ Kim 2010: 21). The following section will analyze to what extent China benefits from those restrictions.

In 2004, the Chinese government established quotas on rare earth exports only a short time after the other major REE mine in Mountain Pass, USA ceased operating and China had gained a monopoly in REEs (Korinek/ Kim 2010: 21). Ever since, these quotas have been decreasing (Table 1), thus leading to a decrease in global REE supply (Hurst 2010: 21). As a result, prices for REE on the world market *increased* dramatically (ibid.). The most obvious benefit for China in establishing quotas was the possibility to increase the revenue of the REE business and to thereby eventually compensate the expensive industrial policy that was necessary in order to monopolize the REE market. Nevertheless, this effect has been partly counterbalanced by a decrease in non-Chinese demand (Table 1): However, the most dramatic downturn in estimated non-Chinese demand has been caused by the global economic crises and is therefore linked to a general decrease in industrial production. As use of REE in various technical applications continues to increase (USGS 2010: 129), the remaining reduction in non-Chinese demand can only be seen in context with manufacturers moving to China in order to cheaply access these crucial raw materials.

*Table 1 – Export Quotas and non-Chinese demand for REE*

Year	Export Quotas	Change year on year (in %)	Estimated non-Chinese demand	Tax on REE exports (in %)
2004	65609		57 000	
2005	65609	0	46 000	
2006	61821	-6	50 000	10
2007	59643	-4	50 000	10
2008	56939	-5.5	50 000	15-25*
2009	50145	-12	35 000 <sup>5</sup>	15-25*
2010**				25

\* Depending on type of REE

\*\* Data taken from Bradsher 2010a

Source: Korinek/ Kim (2010: 21, 28)

<sup>5</sup> Massive decrease in non-Chinese demand due to global economic crisis (Korinek/ Kim 2010: 21).

Other important aspects regarding export quotas are both the danger of exhausting resources (Korinek/ Kim 2010: 20) and the need to meet the requirements of domestic consumption (Hurst 2010: 18). As some sources indicate, Chinese REE deposits might be exhausted within the next 20-30 years, if mining continues at the current rate (Korinek/ Kim 2010: 20). Furthermore, the Chinese supply of REE could entirely be absorbed by domestic consumption as early as 2012 (Liedtke/ Elsner 2009: 3). In order to maintain its extraordinary economic growth rates, China has to secure access to strategic raw material reserves (Hurst 2010: 18). Thus, the sustainable protection of supply for domestic consumption can be seen as another way for China to benefit from export quotas. Both arguments illustrated here are perfectly coherent with neo-mercantilist assumptions regarding free trade and raw material policies.

A further reason stated by Chinese officials for the establishment of quotas on REE export is environmental protection (Bradsher 2010c; Zeit 12/2/2011). As illustrated in conjunction with regulatory problems in Mountain Pass, mining of REEs leads to acidic and radioactive contamination of soil and water and is therefore environmentally harmful. China argues that by mining fewer rare earth elements, less damage to the environment is done (ibid.). Especially after the serious trade conflict in autumn 2010, China started to put more emphasis on this argument. It is important to note that WTO rules allow export restrictions if they contribute to the preservation of natural resources, but only if domestic consumption is cut down simultaneously (Bradsher 2011). Thus, it is likely that China's shift in argumentation might be an attempt to strengthen its position regarding several WTO investigations like the one initiated by the Obama administration on October 15<sup>th</sup>, 2010 (ibid.).

Taxes on REE exports were established in 2006 and since then have steadily increased to an amount of 25 % today (see Table 1) (Korinek/ Kim 2010: 21; Bradsher 2010c). However, when entering the WTO in 2001, China agreed not to establish export taxes on rare earths at all (FAZ 20/10/2010). Those export taxes have had two main effects on the rare earth element market. On the one hand, as China first created a monopoly on REEs and consumers were therefore deprived from the possibility to change suppliers, the introduction of export taxes led to an (additional) increase in global market prices and thus to an improvement of China's terms of trade (Bouet/ Laborde 2009). On the other hand, export taxes strengthen domestic consumption of the

good in question as prices decrease in comparison to the global market (ibid.). What is important to note here is that export taxes only apply to *non-processed* REEs (Bradsher 2010a). Therefore, the Chinese government strengthens the competitiveness of the *Chinese* processing and value adding industry (Korinek/ Kim 2010: 21). This way of taxation is fully consistent with neo-mercantilism as it aims at providing domestic industries with a competitive advantage over foreign competitors. REEs that are processed inside China are thus cheaper than those mined in China but processed in other countries.

One can conclude that the establishment of export quotas and taxes has been beneficial to China in several ways. Free trade in rare earth elements, in contrast, seems therefore not to contribute to the maximization of China's wealth and power. Thus, those findings correspond to the neo-mercantilist key arguments. It is therefore not likely that China will abandon those restrictive measures in the near future.

### **Rare earth elements as an instrument of power**

Declaring that “there is oil in the Middle East, there is rare earth in China” (Baotou National Rare-Earth Hi-Tech Zone) Deng Xiaoping stipulated already in 1992 that China would be willing to use rare earth elements as an instrument to strengthen its position in international bargaining and to thereby increase its political and economic weight in conflicts with other countries. Such a policy is perfectly consistent with neo-mercantilist assumptions. The following section will examine how China uses REE as a political tool when dealing with both other states and foreign enterprises.

Until last autumn's incidents, China had been a reliable supplier of cheap REEs for the global market. Thus, the disruption in rare earth supply took the United States and the European Union by surprise. Having no national stockpiles (USGS 2010: 128), the U.S. suddenly realized its dependence on Chinese supply. Since China stopped providing REEs to the US only three days after the opening of an investigation regarding a potential violation of WTO trade rules, a linkage between both incidents is very likely (Bradsher 2010b). However, China did at no point claim a change in American behavior as a precondition for the resumption of REE shipments. Therefore, the way China used REE in its arising trade conflict with the US can be viewed as a sort of warning: China has proven willing to (ab)use the United States' dependence on

rare earth elements as an instrument to increase its power in international bargaining. The fact that Hu Jintao refused to mention REE during his visit in Washington although Obama wanted him to commit to continuously supply REE to the U.S. market (Bradsher 2011), further underlines the Chinese position.

In contrast to the Chinese attitude towards the United States, the EU trade Commissioner Karel de Gucht reported in mid December 2010 that Chinese officials had signaled a general willingness to provide sufficient REE for the European market. Nonetheless, it is important to note that the Chinese side did not make any binding and reliable commitments to the EU either (Zeit 12/2/2011). Since the European Union did nothing to willingly offend the Chinese government, the disruption of REE exports in autumn 2010 has caused a lot of trouble among the EU member states regarding the assurance of supplies for the European automotive, high tech and renewable energy industry (Dempsey 2010a). Consequently, the European Commission worked on a strategy to reduce dependency on Chinese rare earth elements by establishing more bilateral free-trade agreements with resource rich countries in Africa and Central and Latin America (ibid.). Similar to the U.S., EU officials perceive their dependence on Chinese rare earths as a strategic disadvantage when it comes to conflicting interests (ibid.). This, however, further states the importance of REE as an instrument in Chinese power politics.

In contrast to the aforementioned, Japan realized its dependence on Chinese REE supply early on. Therefore, Japanese companies and universities started ten years ago with their attempts to find more efficient substitutes and recycling options for rare earth elements and to thereby become less dependent on China (FTD 15/1/2011). Additionally, Japanese companies as well as the government have accumulated huge REE stockpiles in order to ensure their supplies (Bradsher 2010a; The Economist 2011: 20/1). Those measures illustrate that Japan has been well aware of the danger arising from its dependence on one single source for its REE supplies. Thus, the Chinese bargaining position in the territorial dispute regarding the Senkaku/ Diaoyu islands was temporarily strengthened due to the high degree to which Japan relies to REE.

### *Companies struggle to secure availability of supplies*

Rare earth elements are of course crucial to other countries' industries as a whole, but are also important to the individual respective companies. Due to export taxes and quotas and enhanced through the embargo in autumn 2010, global market prices for REE are significantly higher than prices inside China (Bradsher 2010a). Hence, companies that are relying on REEs and producing outside China have to face comparative disadvantages against their Chinese competitors. Especially before the major incidents in autumn 2010, Chinese officials stipulated openly that Chinese rare earth policies and their effect on prices is designed to force foreign companies to move to China in order to guarantee China access to high technology (Bradsher 2010c). Some industry executives even reported that Chinese officials had signaled to them to better invest in China so as to ensure not to be entirely cut off from REE (Dempsey 2010a). As China uses several channels such as foreign direct investment to seek for a certain degree of technology transfer from developed countries rare earths clearly serve as means to reinforce this policy further on (Miller 2010). China's export tax strategy that only applies to non processed REEs (Bradsher 2010a) is another way in which the pressure on the value-adding and processing industry is increased.

As a result of the Chinese REE policy, combined with low labor costs and additional subsidies, large parts of the US green technology sector have already moved to China (Bradsher 2010f). If this trend continues, the developed countries' economies will not only remain dependent on REEs from China but also face an increasing dependence on China regarding finished goods that rely on those raw materials (Hurst 2010: 21). Together with China's general advance in REE research and technology (Hurst 2010: 6), the use of rare earths to put pressure on foreign companies might therefore even strengthen China's overall advantage in the field of rare earth elements and thus increase its advance in economic capacity further on. Therefore, China's pressure towards foreign companies fits in its overall REE policy framework.

In conclusion, China's policy concerning the REE industry fits neo-mercantilism on many levels. It has established a virtual monopoly in the current market, affecting the overall industry. This monopoly has put China in a stronger bargaining position, at least temporarily, with countries dependent on China's supply. Moreover, China then used its monopoly for political gain.

## Alternatives to the Chinese monopoly

As illustrated in the preceding sections, China pursues a clear neo-mercantilist oriented policy aimed at using its current monopoly in rare earths to increase its power in bargaining with both other states and foreign companies. However, there are several ways in which states dependent on REE exports from China strive to explore other sources. In the following section, those attempts and their implications for the near future will be examined.

The most obvious effect of limited Chinese supply in REE is a massive increase in prices which might result in mining becoming profitable again outside of China (Korinek/ Kim 2010: 22). Although the exploration of potential REE mines is related to high capital and regulatory costs (Korinek/ Kim 2010: 20), several investigations have already been undertaken into whether deposits outside China are profitable to exploit (Long/ Van Gosen/ Foley/ Godier 2010: 22). Two of these projects are considered as particularly promising, one being the re-opening of the REE mine in Mountain Pass, California which is planned for 2012. As this mine was operational until 1998, its infrastructure and technology is still in place and therefore ready for an immediate use. The other short-term worthwhile project is conducted by Lynas Corporation in Mont Weld, Australia. Despite starting from scratch, the mining of Mont Weld is anticipated to be remunerative because of highly concentrated rare earth deposits (Hurst 2010: 26). Yet, there are no other major mining projects at a comparable stage of development (ibid.). Nevertheless, since rare earth supply is perceived to become more and more unstable, a huge variety of new deposits might be explored within the next decade (Long/ Van Gosen/ Foley/ Godier 2010: 23). However, considering that experts estimate that the time required to establish a fully operational REE mine may amount up to ten years (ibid.), finding alternatives to Chinese supply seems to be rather a mid- to long-term solution.

Another consequence of increasing REE prices is illegal mining of REE *inside* China as well as smuggling. Already in 2008, approximately one third of Chinese rare earth exports were illegal (Hurst 2010: 15), making companies in developed countries indirectly dependent on those black market activities (Bradsher 2011). Thus, the Chinese government's only major competitors on the REE market are illegal mines within its own country (Bradsher 2010e). Rogue mining operations run by gangs

particularly in southern China are a lucrative business (Bradsher 2010e). Previously, local authorities have been in charge of administrative oversight but largely failed to combat illegal mining activities (Bradsher 2011). The illegal mining of rare earths demonstrates the blatant complicity of local authorities with organized crime, a phenomena noted by several scholars as extremely problematic for the CCP (Bergsten et al 2008: 95). As a result, smuggling could undermine the Chinese use of REEs as a strategic tool. Furthermore, those illegal activities increased REE supply and thereby lead to a decrease in market prices as well as to a faster reduction in available deposits (Hurst 2010: 15). It is therefore no surprise that Chinese officials now try to regain control over all mining activities within the country. Thus, the central authorities are monitoring the REE sector as a whole since the beginning of 2011. Additionally, the Chinese government has attempted to first reduce the number of mining companies and to subsequently nationalize the remaining ones (Zeit 12/2/2011). Thereby, control over REE mining inside the country should improve (ibid.). It remains to be seen whether Chinese authorities gain control over this situation. Otherwise, China's neo-mercantilist attempts to control the global REE market and to ensure the long-term availability of REE supplies for the domestic market might fail or at least be less efficient than intended.

#### *Attempts to cooperate internationally*

While the United States' rare earth policy clearly emphasizes the re-opening of Mountain Pass (Hurst 2010: 26; Long/ Van Gosen/ Foley/ Godier 2010: 23), Japan and the EU have no own REE deposits and therefore pursue a different strategy in order to decrease their dependence on China.

Among the European countries, Germany has been the most active in raising concerns about the economic impact of the EU's dependence on Chinese REE supply (Dempsey 2010b). Thus, the German government asked their French counterpart which currently holds the G20 presidency to place raw material questions in general on the G20 agenda for the first term of 2011 (ibid.). As a result, France made "commodity price volatility" one of the top priorities of its G20 presidency (Official website of the French Presidency of the G20 and G8). Additionally, rare earth elements are covered by the so called 'Raw Materials Initiative' launched by the European Commission in 2009. As an integral part of this initiative, the European Union seeks to maintain an

internally coherent raw materials diplomacy directed to both resource-rich and -dependent countries (European Commission: 2008).

Next to strengthening the EU's position towards countries restricting export – such as China – this policy aims at exploring new raw material sources – e.g. in Africa – as well as identifying common interests with other resource dependent countries – such as Japan and the US – that can be jointly pursued in multinational forums (ibid.). Thus, not able to compete with China on the raw material level, the EU seeks to maximize its power by finding allies with mutual interests. In this context, the European Union, supported by Mexico and the United States, requested WTO consultations with China regarding export restrictions on “various raw materials” (WT/DS395). The preliminary ruling has been essentially in favor of the complainants (ibid.). However, a similar WTO ruling is not to be expected regarding the major conflicts in autumn 2010. As indicated by European Commission experts, the existing rules are not adequate for dealing with measures in other than written form (Dempsey 2010b). And also export quotas are not illegal if it comes to specific circumstances such as the preservation of natural resources (Bradsher 2010c). Even though, the (joint) use of multinational forums can be considered as an option to diminish China's stance in REE in the short-term.

Meanwhile, Japan's strategy to bypass Chinese supply of rare earths is somewhat different. Rather than concentrating on multinational forums and other cooperation in official frameworks, Japan tends to invest in neighboring countries with REE deposits. For example, Japanese investors have been running a REE mine in Vietnam (Mason 2009; FAZ 20/11/2010). Shortly after the export ban in autumn 2010, Japanese investors entered a contract with Lynas Corporation<sup>6</sup> that guaranteed up to 9000 tons of rare earth elements annually to the Japanese economy (FAZ 25/11/2010). Meanwhile, the Australian government affirmed to be a reliable source for REEs. Considering ongoing negotiations regarding a free trade agreement between Japan and Australia, this event is of particular importance: Already since the opening of negotiations in 2006, Japanese business groups were strongly in favor of a free trade agreement with Australia in order to secure raw material supplies for the domestic economy and to limit Chinese “resource diplomacy” (Yoshimatsu/ Ziltener 2010: 1069, 1080). Attempts to

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<sup>6</sup> Lynas Corporation owns the REE mine of Mount Weld.

guarantee reliable access to rare earth elements might thus enhance domestic pressure on the Japanese government and thereby accelerate the conclusion of a FTA with Australia. However, the focus of Japan's rare earth policy lies not solely on securing access to new sources but also on reducing consumption of rare earth elements. Those attempts will be further illustrated in the following section.

### *Reduced consumption*

More than a decade ago but largely unnoticed in other countries, Japanese companies invested in basic research regarding substitutes for rare earths (FTD 15/1/2011) – supported by massive state financing (The Economist 2011: 20/1). Recently, the European Union started to focus on encouraging research, too (European Commission: 2008.). Having been largely inefficient or not available at all in the past, substitutes might soon become ready for serial production, and thus should render the Chinese monopoly on REE obsolete one day (The Economist 2011: 20/1). Nevertheless, this will neither be the case in short-term (ibid.), nor is it likely that substitutes are available for all applications (FTD 15/1/2011). Therefore, Japanese and European basic research programs also focus on a second pillar, namely recycling (ibid.). As REE are essential ingredients to many high tech products, electronic scrap contains huge deposits of rare earth that are not yet significantly explored because recycling is still too cost intensive and not profitable (Elsner/ Melcher/ Schwarz-Schampera/ Buchholz 2010: 8). Even though this might change thanks to basic research, prospects for recycling are rather seen in the long term (FTD 15/1/2011).

Hence, an overall reduction of REE consumption will clearly contribute to a more efficient use of these raw materials. However, with regard to the EU's and Japan's attempts to reduce their dependence on Chinese supplies, reduction of REE consumption can only be beneficial as part of a mid- or even long-term strategy.

### **Conclusion**

First of all, it has to be emphasized that China's monopoly in REE is the intended result of a well-directed industrial policy. In line with neo-mercantilist assumptions, a politically motivated striving for leadership in this key strategic sector has become evident in dumping of global market prices that seemed irrational in the short term as well as in vast financial support for research in this specific field. The subsequently

achieved advantage in the global REE industry in both relative and absolute terms has been used as an instrument in Chinese power politics. One can distinguish two ways in which China uses rare earths in international bargaining on the state-to-state level: China has resorted to employing REE either as a highly symbolic gesture, perceived as a final wake-up call (as happened in its conflicts with the U.S. and the EU), or as virtual ransom in order to enforce its national interests (corresponding to the conflict with Japan). It is obvious that the latter constitutes an escalation of the former. The fight against black market activities within China can therefore be seen as an indirect attempt to strengthen its position towards the countries dependent on REE. Thus, in the short term, China is likely to continue to use its strategic advantage in the field of rare earth elements to support its national interests on the international scene. Since the major developed economies were not able to adequately respond to the recent ban on REE exports, this policy might continue. Due to the internal struggle for power in the current transition period, Chinese behavior might become even less reliable. So, the short-term implications of Chinese supremacy in rare earth elements for countries depending on REE are rather negative: Alternatives to the Chinese supply are not likely to emerge quickly. It is therefore difficult to counterbalance Chinese incentives towards companies relying on REE. As the dispute between Japan and China illustrates, rare earths cannot be regarded apart from the overall political and economic context.

In the medium- and long-term, alternatives to the Chinese supply of REE can be anticipated to become more significant. Recent mining activities outside China as well as attempts to develop new substitutes and recycling opportunities for REE stipulate that the Chinese monopoly will not be sustainable for several decades. It is therefore not astonishing that China tries to make the best use of it by now. In addition to ongoing mining and research projects in other countries, China faces the finiteness of its REE resources. Already today, in order to ensure domestic supply China creates huge national stockpiles in Baotou, Inner Mongolia. An amount of 40,000 tons of rare earths (which corresponds roughly to the amount China exported in 2010) is added to this stock annually (Zeit 12/2/2011). Hence, China already prepares not only for the certain end of its monopoly in REE but also for the end of its domestic resources.

As Michael Yahuda argues, the change in China's REE policy towards a more aggressive way of promoting its interests in international conflicts might be linked to the struggle for power within the Chinese Communist Party (CCP) with respect to the

change in government hierarchy that is to be expected in 2012 or 2013 (The Economist 2010: 4/11). Pursuing a hard line and referring to rare earths as an instrument in power politics therefore serves to strengthen both the Chinese position within the international system and the position of the respective politicians within China. It remains to be seen whether this more assertive tone is a definitive shift in Chinese foreign policy.

In conclusion, the paper uses the theory of neo-mercantilism to analyze China's industrial policy concerning rare earth elements. It argues that China deliberately set out to gain control of the REE industry and achieved this goal by the early 2000s. This dominance has given China not only economic bargaining power but also political bargaining power vis-à-vis other states. How long China will retain this edge is uncertain as countries and companies work to find alternatives to the Chinese supply. In the meantime, China has demonstrated a willingness to use economic might for political gain.

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