China's Global Influence as a Major Trading Nation

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Abstract

This paper first provides a broad picture of China's presence in global trade. Based on existing studies, it then presents evidence on the impacts of China's trade on the Chinese economy and the world economy, respectively. Finally, it focuses on a special industry, rare earth element, to further examine the impacts of China's participation in the global supply chain on other countries' import and export. This paper serves as a background for further discussions on the global influence of China's integration into the world trading system.

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1. Introduction

China was a negligible player in the global economy before 1979. Since the beginning of the reform and opening-up, which took place in 1979, China has been increasing its integration into the global economic system. It has become a major player. In particular, it has become the largest exporter of goods and commodities. The rising of China is visible, and no one will dispute its great impacts on the world. However, what exactly and how much are the real influences that China has brought to the world? This is not an obvious question. This paper tries to explore this issue and stimulates further discussions. It focuses on the channel that links China and the rest of the world through international trade.

When we talk about China's impact on the world through international trade, there are two angels to look at this issue. On the one hand, China moves from a relatively closed economy to a more open economy. This is equivalent to examining gains from trade when two countries move from autarky to free trade. Trade policies in China will affect China itself and other countries by changing trade structures, terms of trade and others. On the other hand, there is high productivity growth in China due to economic reform and so given that China is trading with the rest of the world, the question is equivalent to how productivity growth in China affects the rest of the world. This paper looks at the issue from both angels.

The paper is organized as follows. It first provides a broad picture of China's presence in global trade. Based on existing studies, it then presents evidence on the impacts of China's trade on the Chinese economy and the world economy, respectively. Finally, it focuses on a special industry, rare earth element, to further examine the impacts of China's participation in the global supply chain on other countries' import and export.

2. China's Presence in Global Trade

China started its economic reform and opening-up policy in 1979. Since then, both the growth of its international trade and the growth of domestic economy (GDP) have increased rapidly. Table 1 shows the trade performance at the macro level in the recent 15 years.

Some observations are in order. First, China achieves high growth of trade, both import and export. There is more than 20% annual growth in most of the years. Second, China maintains high

degree of openness, measured by trade to GDP ratio. In many years, trade to GDP ratio is higher than 50% and export to GDP ratio is more than 30%, which is extremely high for a larger economy.

Turning to the relative performance of China's foreign trade, we observe that China's merchandise trade as the share of global trade has increased from around 1% before the opening up of the economy to more than 11% in 2012. Since 2009, China's foreign trade has been ranked the 1st in the world in merchandise trade.

As for the products of China's trade, Figures 2 and 3 show that capital goods takes the largest share of China's import as well as export. In contrast, consumer goods is the second largest product group of China's export and raw materials is the second largest product group of China's import. This reflects the fact that China is the world production factory, importing materials and intermediate goods, turning them to consumption goods, and then exporting them. This structure and pattern has been maintained for many years. As domestic demand increases and China's labor cost increases, the emphasis will eventually switch in the future. Table 3 gives the distribution on more detailed classification of products. Half of China's export in mechanical and electrical Products are high-tech products in 2012, and is expected to rise in the future.

The geographic configuration of China's export has been changing. Table 4 presents a snapshot of 2012. Overall, non-OECD countries have taken over as China's primary export market. As for suppliers, domestic Chinese firms have overtaken FIE as the dominant exporters from China.

3. Impacts of China's Trade on China

I have recently done a literature survey on research output about China's foreign trade. Let me report some of results here. For more information about each reported item below, please refer to my review article for the original references. To save space, I do not list those references in this paper.

Based on data of 1979-2000, it is found that on average, a 10% increase in China's exports will bring about 1% increase in GDP. Thus, given that China's export growth is about 20% per annum, 2 percentage points of China's GDP growth, which is about 10% on average, comes from exports.[1]

[11] He and Zhang (2008) find that in China export stimulates economic growth mainly through supply side (raising productivity) rather than demand side.

Using time-series data over 1995-2007, it is found that both ordinary trade and processing trade significantly promote China's economic growth, but the contribution of ordinary trade is much more than that of processing trade. Moreover, processing trade significantly stimulates employment.

Regions with more open economy (trade to GDP ratio) experience faster growth in GDP.

Researchers also study the impact of export sophistication level of Chinese provinces on their per capita GDP growth from 1997 to 2009. Controlling for regional income level, export sophistication is found varying substantially across Chinese provinces. Regression results from both cross-section and panel fixed effects models show that export sophistication of Chinese provinces significant stimulates GDP per capita growth rate, controlling for initial income level and other determinants of economic growth. China's economic gains are mainly driven by improved technology embedded in ordinary exports of domestic firms. In contrast, processing trade and exports of foreign-owned firms seem to make less contribution.

Welfare is closely related to GDP. Some researchers examine the welfare impact of increasing import varieties in China. They find that the welfare gain due to new imported varieties from 1997 to 2008 amounts to 6.2% of GDP. It is equivalent to 0.53% of GDP in each year.

If we decompose 32 Chinese industries' total factor productivity growth into technology efficiency growth and technology progress growth, we can find that Chinese industrial TFP growth over 1998-2003 is mainly explained by technology progress growth rather than technology efficiency growth. Imports greatly boost TFP growth and technology progress for Chinese industries, but exports seem to have no significant effect on productivity growth.

One study examines how the two crucial trade liberalization shocks of China, namely Deng Xiaoping's Southern Tour in 1992 and China's accession to WTO in 2001, impact wage inequality in urban China. It divides China to high-exposure and low-exposure regions. Empirical results show that both South Tour and WTO accession are associated with widened between-region wage inequality, contrary to the theory. And China's accession to WTO significantly raises within-region wage inequality in exposed regions through generating more rapid real wage growth in the upper half of wage distribution.

One study estimates the employment contribution of Chinese exports and finds that for every 1000 US dollars Chinese exports in 2002 (2007), the effect on total employment is 0.242 (0.096). From

2002 to 2007, the contribution of export to employment dramatically declines. Non-processing exports lead to higher employment in all sectors than processing exports. Specifically, labor-intensive manufacturing exports, like textile and garment products, are found to generate higher employment than high-tech exports such as electric and machinery equipment.

4. Impacts of China's Trade on Other Countries

(4.1) On US employment

Many studies explore the impacts of China's increasing export on US employment. The key concern on the US side is: Are cheap imports from China steal jobs from American workers? The media reports are often emotional. There are many academic studies which take this hot topic seriously.

In a widely cited paper, Autor, Dorn and Hanson (2013 AER) rate every US county for its manufacturers' exposure to competition from China, and find that regions most exposed to China tend not only to lose more manufacturing jobs, but also to see overall employment decline. Areas with higher exposure also have larger increases in workers receiving unemployment insurance, food stamps and disability payments. They also calculate that import competition explains one-quarter of the contemporaneous aggregate decline in US manufacturing employment. Their data covers 1990 to 2007. Their baseline regression result indicates that a $1,000 exogenous decadal rise in a district's import exposure per worker is predicted to reduce its manufacturing employment per working-age population by 0.75 percentage point, and the instrumented result is smaller but still remains economically large and statistically significant, about (negative) 0.6. Autor et al. (2013 NBER) analyzes the adjustment cost at worker level and finds very uneven adjustment distribution. High wage workers tend to handle work adjustment better than low wage workers in the response to import shock.

In a related paper, Pierce and Schott (2013) identify a link between the sharp decline in US manufacturing employment since 2001 and US granting of Permanent Normal Trade Relations (NTR) to China. Using a difference-in-difference specification, they show that industries with higher NTR gaps experience larger employment declines, along with disproportionate increases in US imports from China, the number of US firms importing from China, the number of Chinese firms exporting to the US, and the number of US-China importer-exporter pairs. Their work indicates substantial effect of the NTR granting on US manufacturing employment. The baseline regression indicates the granting of NTR reduces the

employment growth of the average industry by 3.4% after one year, and the difference expands to 15.6% after six years.

Ebenstein et al (2011) finds that Chinese employment growth has been largest in industries with US employment declines, suggesting substitution between US and Chinese workers. They also document that US productivity increase is directly related to trade with China.

Biven (2013) has shown that low-skilled workers in the US lose from trade, while the gains from trade concentrate among college educated and nonproduction and supervisory workers, and in rising returns to capital. The US has experienced rapidly growing wage and income inequality over the past three decades. And growing trade with China, alone, was responsible for nearly one sixth of the increase in income inequality between 1979 and 2011.

On the other hand, Scissors et al. (2012) argues that import from China supports millions of US jobs, especially in apparel, toy and sorting industry. Liu and Trefler (2008) estimate that US outsourcing to China and India had minimal effect on changes of occupation, employment and earning of US workers.

But, in terms of the overall effect of trade, it is generally believed China's trade has a positive effect on the US economy (Biven, 2013; Hardley and Limao, 2013).

But, these papers do not compare the consumer gains and worker losses from trade with China, so they do not have any conclusion on the total welfare for the US.

(4.2) On US GDP

Harris et al. (2010) simulate the effect of China's increasing export and increasing skilled labor supply on US economy. In particularly, they find that China's export-biased growth is responsible for 3 - 4.5 percentage points of GDP growth in the US above its trend rate.

The US China Business Council (2006) report has shown that the US GDP is 0.7 percent higher as a result of increased trade and investment with China since 2001. Output per worker also increases by about 0.7 percent, in which the main contributor is improvement in manufacturing productivity due to increased competition and price effect.

(4.3) On Asian Countries

Export products from China and those from other developing countries are potentially substitutes. Researchers have studied to what extent the rapidly increased export from China has replaced export from other countries.

Eichengreen et al. (2007) confirm that China's export tends to crowd out the exports of other Asian countries. Their regression results show that a 10 percent increase in Chinese exports to a particular market results in a 0.6 percent decline in the sales of the competing Asian country in that market. However, countries are affected very differently depending on their development level and whether they are mainly exporting in consumer goods or capital goods. The crowding-out effect of China's export only applies to consumer goods, whereas there is a complementary effect for capital goods and intermediate goods. Generally speaking, low-income Asian countries (such as Vietnam, Bangladesh) suffer from China's competition in exporting to the third country, while high-income countries (such as Japan, Korea) benefit from China's increase appetite for imported machinery and equipment.

(4.5) On Latin America

While most of the studies focus on the effect of China on nearby Asian countries, there are some studies looking at the Latin America.

Freund and Ozden (2006) use SITC 4-digit level export data to evaluate whether LAC (Latin American and Caribbean) exports to a given market declined or grew more slowly in the products where Chinese exports increased, controlling for country demand. They find that Chinese export growth has negative effect on the LAC countries' export to a third country and dampens the LAC export prices. Their regression results show that on average in a product with the average Chinese market share of 10 percent and Chinese export growth of 20 percent, LAC export growth would be reduced by 0.6 percentage point. The substitution effect is especially strong in industrial goods in North America. There is also evidence that greater imports from China also lead to lower prices from LAC. In particular, a 10 percent export price decline from China leads to a 0.4 percent price decline from LAC. The competition from China has led to quality upgrading in industry such as textiles, and Chinese export competes primarily on high-wage LAC products.

OECD (2006) calculates the competition index of Chinese export with some countries including major Latin American countries. The indexes are modified versions of the well-known coefficient of specialization (CS) and coefficient of conformity (CC). If the exporting structure between two countries is quite similar, then trade competition is more likely. Based on Figures 4 and 5, we observe that the export competition between China and Latin American countries is relatively low except Mexico.

(4.6) Global Impacts

Giovanni, Levchenko and Zhang (2013) examine the welfare impact of China's integration to the world economy through international trade. They compare the present situation with the hypothetical case in which China is in autarky. Their estimation/simulation indicates that some countries will lose while most will benefit. The mean welfare gain from adding China to world trade is 0.13%. China itself realizes gains of 3.72% relative to autarky. 9 out of 75 countries will experience welfare losses, the largest for Honduras (-0.27%) and El Salvador (-0.21%). Aside from China itself, the economies with the largest positive welfare changes are Malaysia (0.80%), Kazakhstan (0.78%), and Taiwan (0.63%). Among the OECD countries, Australia, New Zealand, and Japan gain the most (0.26% to 0.30%). The mean gain in the OECD is 0.13%, with a welfare change for the U.S. of 0.11%.

Chang-Tai Hsieh and Ralph Ossa (2011) examine the global impact of China's productivity through international trade. This issue is about the spillover effects of China's productivity growth. The literature of international trade theory points out two channels of spillovers. The first is the terms-of-trade effect and the second is the home-market effect. Based on the years 1995 to 2007, it is found that the cumulative welfare effect on individual regions ranges between -1.2 percent and 3.6 percent and only 3.0 percent of the worldwide gains of China's productivity growth accrue to the rest of the world.

Turning to the cumulative welfare effect on individual regions, it is found that it is between -1.2% for Russia and 3.6% for Asia (except Japan). It is 0.4% for the US.

5. China's Global Influence: A Special Case

In this section, we examine China's effect based on one particular industry's trade. Also different from the other works, we focus on the effects on other country's trade, rather than welfare, employment and others.

Rare earth elements (REE) are a group of 17 elements with 15 lanthanides elements plus 2 similar elements, yttrium (Y) and scandium (Sc). The 15 lanthanides are lanthanum (La), cerium (Ce), praseodymium (Pr), neodymium (Nd), promethium (Pm), samarium (Sm), europium (Eu), gadolinium (Gd), terbium (Tb), dysprosium (Dy), holmium (Ho), erbium (Er), thulium (Tm), ytterbium (Yb), and lutetium (Lu).

REE are important for many countries as they are critical and irreplaceable inputs for products of those important industries that are important engines for economic growth such as automotive industries, electronics industries, military industries and other newly emerged technologies.

Production of REE only concentrates in several countries due to the resources distribution, mining technologies as well as environment considerations (Humphries, 2011). China is the biggest producer of REE, accounts for more than 95% of the world's production (Table 5). Many countries rely on importing REE from China[2], making China almost a monopoly status in REE supply in the global value chain.

The monopoly supply of REE of China in the global value chain makes countries heavily rely on China's exports and thus sensitive and vulnerable to fluctuations of REE production and exports of China. This leads a close attention of other countries on China's export policies on REE, the most direct way that would influence the amount of REE they can get from China.

Export policies on REE of China can be divided into two periods: 1995 to 2005 and 2005 to now. Since 1995, China began to implement export tax rebates on REE, which promoted export. In 2003, China reduced the rate of tax rebates on REE. And in 2005, the rebate policy was cancelled, indicating the end of period of tax rebates on REE (He, 2013).

After 2005, China began to introduce a series of policies to restrict production and exports of REE. Export duties of REE were introduced in 2006. Since then, export duties have continued to increase and duties on some elements reached 25% in 2012 compared with 10% in 2006 (He, 2013). Along with the

[2] For example, the use of REE of US has 100% relied on imports for the last 15 years and mainly from China (Humphries, 2011) and a report of USGS shows the exact number of the share of REE imports from China is 92% in 2010.

increased duties are production and export quotas. Export quota decreased from 61560 tons in 2006 to 30246 tons in 2012, only half of the 2006 quota. The most restrictive policy on export quota of REE was implemented in 2010, which was 30259 tons, further reducing 40% of the quota in 2009, which is 50145 tons (Table 6).

Reduction of REE supply from China as a result of the newly implemented export policies will directly reduce the production of related products and then indirectly affect related industries in the world. As most productions are not merely completely in one country, countries not importing REE directly from China, but importing related intermediate goods from other countries which importing directly or indirectly from China are also affected. The reduction of production of any stages and procedures because of less supply of REE will result in insufficient supply of these inputs in the global value chain, and thus exert negative impacts on the whole production chain, which in turn affect import and export of the related countries. The lack of substitutes for REE magnifies the negative effects (Hurst, 2010).

The series of policies implemented by China have directly changed the export volume of REE. These changes are not the economic results of global supply or demands and thus can be treated as an exogenous shock to the global market. Hence, it serves as an excellent natural experiment which allows us to evaluate the impact of China's participation in the global market on the global trade. Of course, this is a very special industry and we should interpret our result with caution.

To see how each country's import and export are affected by China's REE export, we estimate the following gravity model:

$$ly_{jwt} = \beta_0 + \beta_1 lREE_{cjt} + \beta_2 lGDP_{jt} + \beta_3 lGDP_{wt} + \beta_4 lGDPP_{jt} + \beta_5 lGDPP_{wt} + \beta_6 ltariff_{jt} + \beta_7 ltariff_{wt} + u_{jt}$$

To save space, we skip the description of the model, data and analysis. We present our findings below based on the baseline model (we also consider many other issues and find that the results are quite robust).

We first take a quick review of the top 25 exporting destinations of China's REE exports (Table 7:). Our empirical findings show that a 10% reduction of China's REE export will reduce an importing

country's total trade (import+export) by 0.458% to 0.518%, trade of related industries by 0.742% to 0.810%, total export by 0.486% to 0.502%, and export of related industries by 0.963% to 1.02%.

As this industry is very special, the above analysis can at most provide the upper bound of the impacts of China's trade.

6. Concluding Remarks

This paper aims to provide a background about the impacts of China's integration into the world trading system. It helps to stimulate further discussions on this topic.

It is evident that China's has risen quickly from a negligible player to one of the most significant players in global trade. There exist extensive and intensive researches on the effects of China's trade on the Chinese economy, such as GDP, employment, productivity and income inequality. However, studies on China's global impacts are few. Many of those existing studies focus on the impacts on individual countries. However, we are starting to see some analysis on the global economy.

Our in-depth analysis on REE may help to push this direction of research further and we hope to stimulate more research and debates on this topic.

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Table 1: China's Foreign Trade (value in billion RMB)

Year	Trade Value	Export Value	Openness	Export/GDP ratio	Export Growth (%)
1991	722.58	382.71	33.17	17.57	28.18
1992	911.96	467.63	33.87	17.37	22.19
1993	1127.10	528.48	31.90	14.96	13.01
1994	2038.19	1042.18	42.29	21.62	97.20
1995	2349.99	1245.18	38.66	20.48	19.48
1996	2413.38	1257.64	33.91	17.67	1.00
1997	2696.72	1516.07	34.15	19.20	20.55
1998	2684.97	1522.36	31.81	18.04	0.41
1999	2989.62	1615.98	33.34	18.02	6.15
2000	3927.32	2063.44	39.58	20.80	27.69
2001	4218.36	2202.44	38.47	20.09	6.74
2002	5137.82	2694.79	42.70	22.39	22.35
2003	7048.35	3628.79	51.89	26.72	34.66
2004	9553.91	4910.33	59.76	30.71	35.32
2005	11692.18	6264.81	63.22	33.88	27.58
2006	14097.40	7759.72	65.17	35.87	23.86
2007	16686.37	9356.36	62.78	35.20	20.58
2008	17992.15	10039.49	57.29	31.97	7.30
2009	15064.81	8202.97	44.19	24.06	-18.29
2010	20172.22	10702.28	50.24	26.65	30.47
2011	23640.20	12324.06	49.97	26.05	15.15
2012	24416.02	12935.93	47.00	24.90	4.96

Table 2: Relative Performance of China's Foreign Trade

Year	1948	1953	1963	1973	1983	1993	2003	2006	2007	2008	2009	2010	2011	2012
China's share(%)	0.9	1.2	1.3	1.0	1.2	2.5	5.9	8.2	8.9	9.1	9.9	10.6	10.7	11.4

Figure 1: China's Share of World Exports

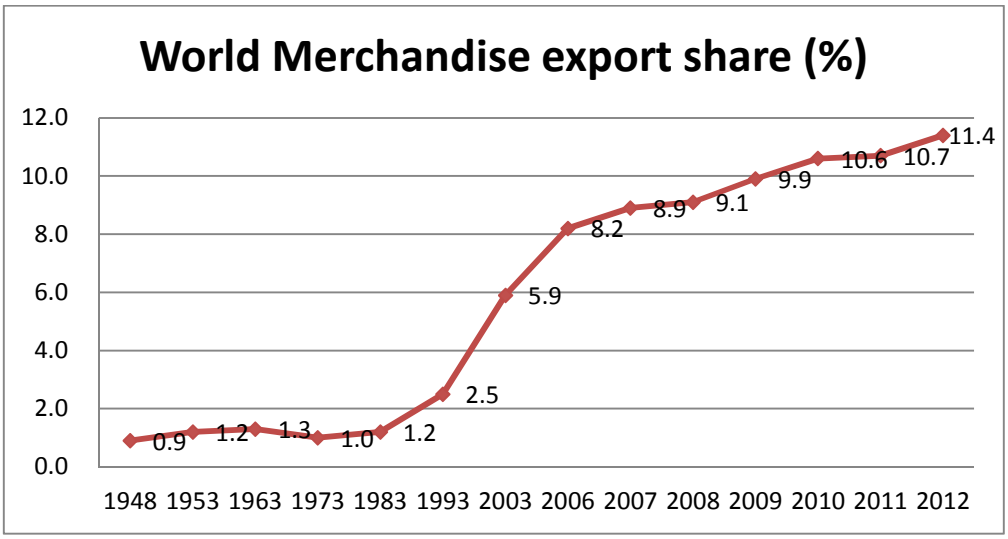

Figure 2: China's import classified into four products (2012)

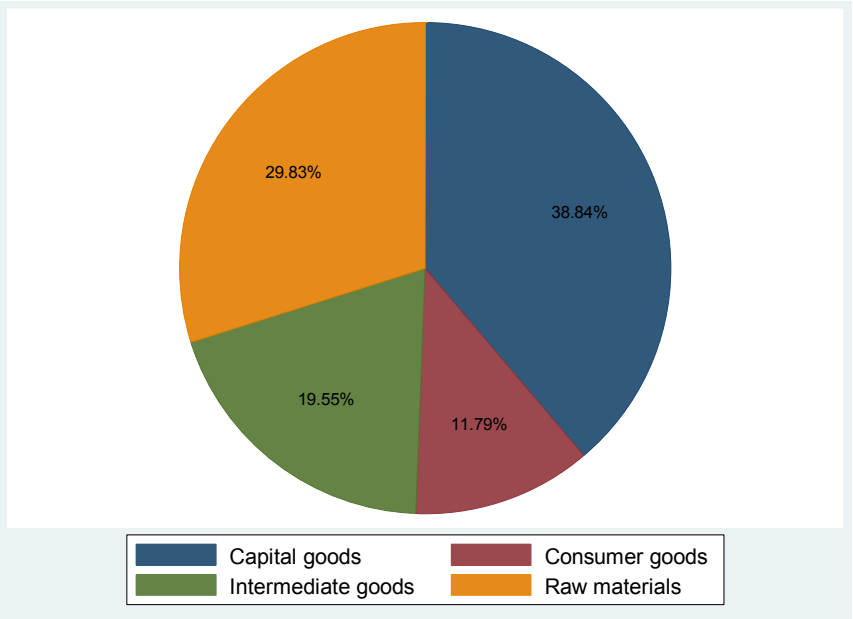

Figure 3: China's export classified into four products (2012)

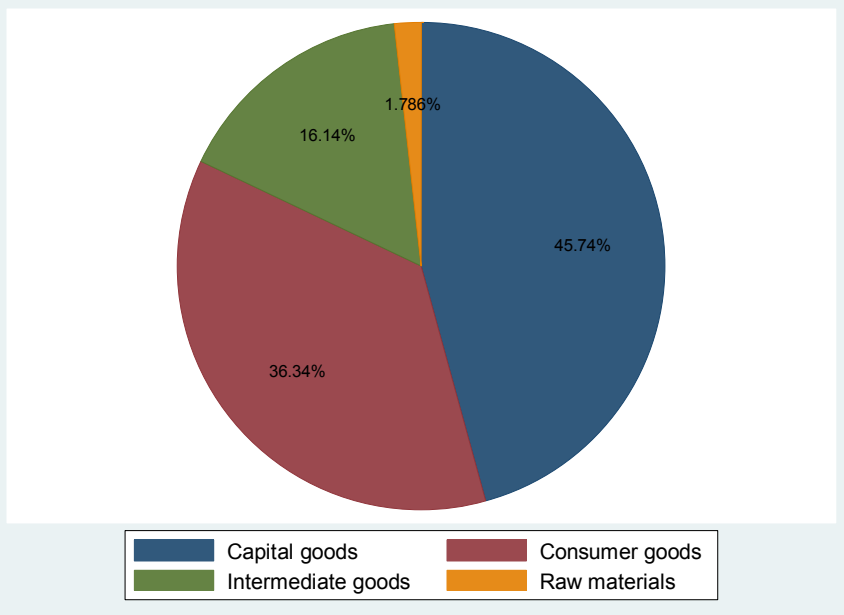

Table 3: China's Export and Import share by products (2012)

Product	Export %	Import %
Animal	0.76	0.76
Chemicals	4.61	6.43
Food Products	1.34	0.79
Footwear	2.87	0.12
Fuels	1.51	17.22
Hides and Skins	1.55	0.55
Mechanical and Electrical Products	42.09	30.76
Metals	7.28	6.12
Minerals	0.19	7.70
Miscellaneous	10.09	10.39
Plastic or Rubber	3.79	4.96
Stone and Glass	4.16	1.24
Textiles and Clothing	12.01	2.25
Transportation	5.29	5.01
Vegetable	0.89	3.59
Wood	1.58	2.13

Table 4: China's Top Trading Partners (in 2012)

countries/ regions	% of export	Growth (%)	% of import	Growth (%)
USA	17.17	8.4	7.31	8.8
EU	16.30	-6.2	11.67	0.4
HK	15.79	20.7	0.99	15.9
ASEAN	9.97	20.1	10.77	1.5
Japan	7.40	2.3	9.78	-8.6
Korea	4.28	5.7	9.27	3.7
India	2.33	-5.7	1.03	-19.6
Russia	2.15	13.2	2.43	9.2
Taiwan	1.80	4.8	7.27	5.8

Figure 4: Similarity of Exports with LAC Countries

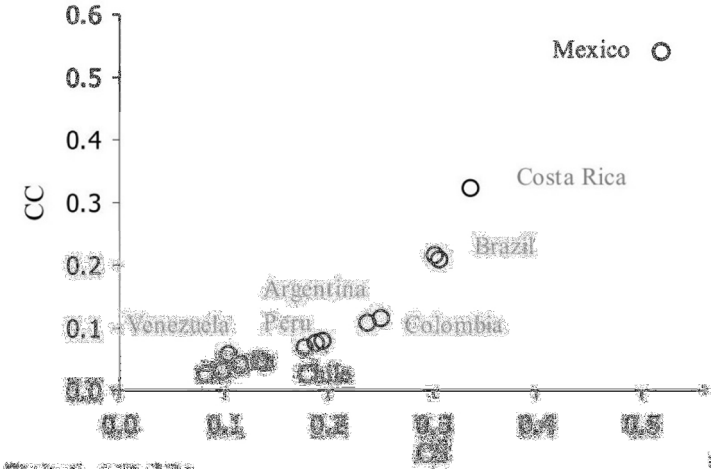

Figure 5: Similarity of Exports with Selected Countries

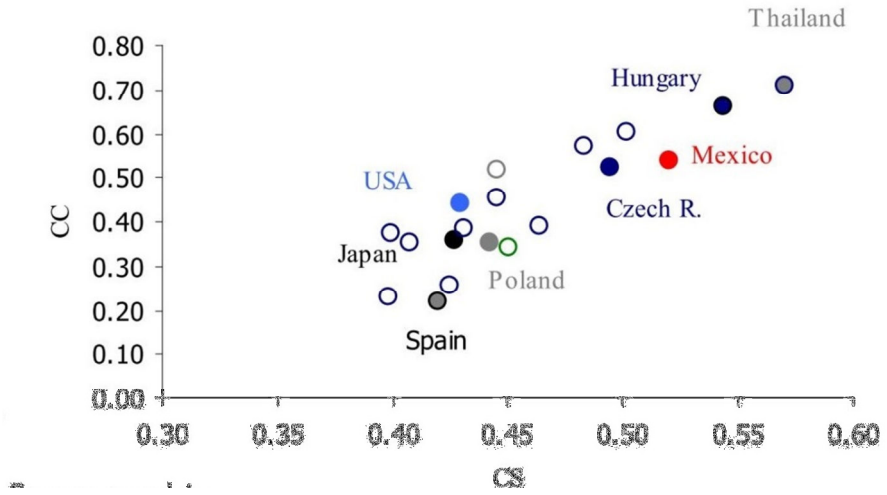

Table 5: World Production of Rare Earth, Tonnes (100% REO Content)

Country	2007	2008	2009	2010	2011
China	120,800	124,500	129,400	118,900	105,000
Russia	2,711	2,470	2,500	2,500	2,500
Malaysia	440	150	20	471	498
Brazil	760	540	200	160	188
India	35	22	16	0	0
Australia	0	0	0	0	2,188
USA	0	0	0	0	0
Total	124,746	127,682	132,136	122,031	110,374
China, share	97%	98%	98%	97%	95%

Source: Golev et al. (2014), who collect data from British Geological Survey.

Table 6: Production and export quotas of REE in China, 2006-2011 (metric tons)

	2006	2007	2008	2009	2010	2011
Official Chinese production quota	86,520	87,020	87,620	82,320	89,200	93,800
USGS reported production	119,000	120,000	120,000	129,000	130,000	112,500 (estimated by IMCOA)
Chinese export quota	61,560	60,173	47,449	50,145	30,259	30,246

Note: IMCOA is an Australia company who also produce REE.

Source: Humphries (2011), who collected data from China Ministry of Land and Resources. U.S.Geological Survey. Ministry of Commerce of China.

Table 7: Top 25 Exporting Destinations of REE Exports of China

Ranking	countryname	REE Export($)[1]	Ratio[2]	Accumulated Ratio
1	Japan	5523428026	0.534394	0.534394
2	USA	1463192879	0.141565	0.675959
3	France	882852941	0.085416	0.761376
4	Netherlands	469905078	0.045464	0.806839
5	Germany	469594240	0.045433	0.852273
6	Republic of Korea	426836853	0.041297	0.893569
7	Italy	173641971	0.0168	0.910369
8	United Kingdom	152359303	0.014741	0.92511
9	Canada	75851442	0.007339	0.932449
10	India	74151672	0.007174	0.939623
11	Viet Nam	64621899	0.006252	0.945875
12	Russian Federation	62835833	0.006079	0.951955
13	Belgium	61573082	0.005957	0.957912
14	Thailand	61532847	0.005953	0.963865
15	Austria	39490647	0.003821	0.967686
16	Brazil	37014521	0.003581	0.971267
17	Singapore	33476955	0.003239	0.974506
18	Spain	32542068	0.003148	0.977654
19	Malaysia	27823793	0.002692	0.980346
20	Mexico	25387317	0.002456	0.982803
21	Norway	24103867	0.002332	0.985135
22	Indonesia	20510141	0.001984	0.987119
23	Ukraine	12760511	0.001235	0.988354
24	Belgium-Luxembourg	12036930	0.001165	0.989518
25	Hungary	10731207	0.001038	0.990556

Note: 1. Total value of REE exports from China to the country 1992 to 2012

2. Ratio of REE exports from China to the country over REE exports from China to world

Table 8: Impats of China's REE Exports on Related Countries' Trade

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Regression method	Pooled-OLS	FE	RE	Pooled-OLS	FE	RE	Pooled-OLS	FE	RE	Pooled-OLS	FE	RE
Dependent variable	*ltradew*	*ltradew*	*ltradew*	*ltradei*	*ltradei*	*ltradei*	*lexpw*	*lexpw*	*lexpw*	*lexpi*	*lexpi*	*lexpi*
lREE	0.0197*	0.0518*	0.0530*	0.0710***	0.0810*	0.0841**	0.0334***	0.0502	0.0505*	0.121***	0.102*	0.110*
	(0.0110)	(0.0267)	(0.0285)	(0.0130)	(0.0384)	(0.0417)	(0.00999)	(0.0285)	(0.0292)	(0.0156)	(0.0504)	(0.0586)
lgdp	0.490***	1.205	0.608***	0.502***	2.281	0.669***	0.401***	0.785	0.492***	0.372***	3.404	0.662**
	(0.0149)	(1.127)	(0.203)	(0.0177)	(1.608)	(0.209)	(0.0134)	(1.194)	(0.178)	(0.0259)	(2.608)	(0.317)
lgdp_w	0.947*	0.715	0.899	2.448***	0.663	1.125	0.724	0.754	0.832	2.371**	-0.227	0.521
	(0.537)	(0.909)	(0.660)	(0.717)	(1.296)	(1.084)	(0.519)	(0.976)	(0.701)	(0.995)	(1.869)	(1.597)
lgdpp	0.268***	-0.366	0.259***	0.181***	-1.342	0.271***	0.327***	0.0239	0.321***	0.363***	-2.216	0.505***
	(0.0299)	(1.094)	(0.0465)	(0.0396)	(1.581)	(0.0457)	(0.0296)	(1.188)	(0.0509)	(0.0579)	(2.638)	(0.0951)
lgdpp_w	-0.448	-0.376	-0.561	-2.278***	-0.477	-0.855	-0.235	-0.437	-0.501	-2.323*	0.163	-0.411
	(0.655)	(0.998)	(0.701)	(0.866)	(1.406)	(1.213)	(0.632)	(1.060)	(0.745)	(1.204)	(2.012)	(1.809)
ltariff	-0.0315	-0.00597	-0.00442	-0.0373	-0.00864	-0.00413	-0.0188	-0.00606	-0.00522	-0.0146	-0.0166	-0.00721
	(0.0208)	(0.00481)	(0.00393)	(0.0327)	(0.00604)	(0.00602)	(0.0185)	(0.00780)	(0.00678)	(0.0484)	(0.0122)	(0.0108)
ltariff_w	0.0213	0.00962	0.0101	0.00754	0.0134	0.0159**	0.0203	0.0116	0.0122	-0.00228	0.0139	0.0185
	(0.0169)	(0.00812)	(0.00781)	(0.0221)	(0.0100)	(0.00791)	(0.0171)	(0.00990)	(0.00951)	(0.0301)	(0.0160)	(0.0122)
Observations	210	210	210	210	210	210	210	210	210	210	210	210
R-squared	0.930	0.944		0.911	0.909		0.924	0.928		0.888	0.858	

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 9: REE-related Industries

Key words	Matched items	3-digit classification
magnet	737.3	737
	778.31 778.81	778
	813.12	813
	898.4 898.51 898.6	898
batter(y)	778.1	778
	813.12	813
	885.31 885.41 885.51 885.72 885.74 885.76 885.78	885
data-processing machine(computer/laptop)	752	752
Catalyst	598.8	598
	897.41	897
	554.3	554
glass(lens)	884.15 884.3	884
camera	881.1	881
	764.82	764
optic	773.18	773
	884.1	884
laser	737.3	737
Diode(LED)	776.37	776
Television(LCD/PDP)	761	761
Liquid crystal	871.9	871
plasma	731.1	731
Screen	881.35	881
lamp	778.2	778
	813.1	813
petroleum	333	333
	334	334
	335	335
	344	344
	575.96	575
Engine(wind turbine)	718.9	718
vehicle	781	781
	783.1	783
	784	784
	791	791
	792	792
alloy steel	282.2	282
	672.49 672.8	672
	675	675
	676.19 676.29 676.39 676.46 676.47 676.88	676
	678.2	678
	679.16	679
polish	554.35	554
phone	764.11	764
ceramic	778.65	778
defense applications	891	891

Note:

(1) All key words come from the end use or application of REE from Kingsnorth (2010),Humphries (2011) and Mancheri (2012); after search for each key word, the author checks the description of the matched item whether it is matched;
(2) Key words searched with no matched items are not listed;
(3) The 3-digit SITC REE-related industries including 35 industries: 282,333,334,335,344,554,575,598,672,675,676,678,679,718,731,737,752,761,764,773,776,778,781,783,784,791,792,813, 871,881,884,885,891,897,898
(4) The 2-digit SITC REE-related industries including 18 industries: 28,33,34,55,57,59,67,71,73,75,76,77,78,79,81,87,88,89
(5) Descriptions of related industries can be found in SITC Rev.3.