World Geostrategic Insights
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Rare Earths' Global Geopolitical and Economic Importance

19 March 2025

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Geopolitics refers to political and military alliances or clashes between countries, regions or nations based on geographical, historical, cultural, religious and other factors. Geopolitical competition among major powers manifests itself as a state of political confrontation, containment and even war, with the aim of gaining dominance and control over territory, resources and other living conditions and development space. Since the end of the *Cold War*, the world model has evolved from a unipolar world dominated by the United States of America in the later period to a multipolar world, and the original geopolitical strategic relationships have undergone new differentiations and combinations. The National Security Strategy of the United States of America defines the global competitive relationship with emerging powers, emphasizing that in the areas of economics, science and

technology, military, resources, finance, and international order, one must not find adversaries capable of comprehensively challenging the United States of America. Complete control of major industrial chains and strategic alliances to contain yes said adversaries under the generalization of national security are not only the two main weapons of the containment bloc, but also the two most important features of global geopolitical competition. This situation of geopolitical competition is reflected in a concentrated way in the reconstruction of the total chain of the rare earth industry.

Rare-earth elements (REEs: *Rare-Earth Elements*), also called rare-earth metals or rare earths, and sometimes lanthanides or lanthanoids (although scandium and yttrium, which do not belong to this series, are usually included as rare earths), are a collection of 17 almost indistinguishable silvery-white shiny soft heavy metals. Compounds containing rare earths have various applications in electrical and electronic components, lasers, glass, magnetic materials and industrial processes.

In recent years, the accelerated energy transformation of major countries has stimulated demand for rare earths. Major rare earth materials are even more related to the global path of clean energy and the new low-carbon green economy. Among them, rare earth magnetic materials, widely used in

energy conservation and carbon reduction, have a highly concentrated global supply. Currently, about 90 percent of production capacity is still supplied by China, and the U.S. dependence on imports of rare earth magnetic materials from China is more than 90 percent. Based on the highly concentrated supply market structure, the United States of America views the excessively unique supply of key raw materials as a security risk to its development of clean energy and emerging industries such as electric vehicles. Some U.S. politicians argue that "rare earths are the bottleneck of the U.S. economy," causing the issue of rare earth trade to become increasingly politicized. As the development and utilization of rare earths play a key role in advanced production and global economic transformation toward clean energy, the United States of America has joined forces with Japan and other key parties in the global rare earth industrial supply chain to intensify the promotion of "de-territorization" of clean energy technologies, resulting in the "de-dynonization" of the supply of key rare earth materials, which has had a profound impact on the international supply and demand pattern of rare earths and the configuration of the rare earth industrial supply chain.

The United States of America has taken the reconstruction of the global rare earth industrial chain as one of its geopolitical competition goals. By promoting the "decoupling" of rare earths between China and the United States of America, they have continuously used the global trading system they dominate as a weapon to limit or even attack their competitors.

In recent years, attention has continued to be paid to the "decoupling" of the rare earth industry supply chain between China and the United States of America and its geopolitical impacts. Based on international trade theory, the United States of America has turned the Sino-US trade war into a technological war, which demonstrates the underlying logic of geopolitical competition. For a long time, Western system-world theory has classified freedom of navigation on the high seas, infrastructure and related institutions as geopolitical issues. The decoupling between China and the United States of America reflects the incompatibility between the development model of the emerging powers and the existing international rules dominated by the established powers. Ultimately, the world economic order described by the Raúl Prebisch (1901-86)-Hans Wolfgang Singer (10-2006) hypothesis-that the entry of underdeveloped countries into world trade would lead to the deterioration of the international terms of trade to the

benefit of the countries in the center-that is, the system of industrial division in which developed countries such as the United States of America control the high value-added links in the global value chain and developing countries supply low-cost primary products, faces the challenges posed by the digital economy and the construction of new infrastructure in the 21st century.

However, even if the traditional international structure is undergoing drastic changes, geopolitical struggles between the great powers are not inevitable. The decoupling between China and the United States of America and its impact need to be analyzed in the context of world imperial history: first, the understanding of globalization by the United States of America and the West has not yet freed itself from the shadow of the Roman Empire model, that is, the attempt to transform and govern politics, culture, finance, trade and law of the regions visited through trade and investment; second, it is necessary to understand the essence of the Roman Empire model underlying the global strategy of the United States of America. Considering that they have long pursued hegemony, there is no doubt that the United States of America has the political and diplomatic will to build an invisible empire. This model of the Roman Empire originated from the United States of

America's continued strengthening of its control over base capitalism and its U.S.-style democratic political transformation of sovereign states, thereby establishing a national alliance centered on the United States of America and a so-called common universal value system, and then building a solid imperial base through the globalization of science, technology, economics, finance and cultural concepts. With this structure of government, the allies of the United States of America actually play a role similar to that of the provinces of the Roman Empire, but without direct proconsuls. Once a country's regime refuses to accept the transformation of the U.S.A. or is deemed to have undermined the empire's interests-especially if it may pose a challenge to the international order it supports-the U.S.A. will inevitably join forces with its allies to sever the underlying capital ties in the economic, technological, financial and cultural sectors, even at the risk of engaging in military conflict. Therefore, we should be aware that today's internationalization is a rules-based order centered on the United States of America, rather than the United Nations and international law.

Joe Biden's U.S. government successively passed the *Infrastructure Investment and Jobs Act* (Nov. 15, 2021), the *CHIP and Science Act* (Aug. 9, 2022) and the *Inflation Reduction Act* (Aug. 16, 2022) hereafter referred

to as the *Three Major Bills*), and used this trio as the domestic legal basis to promote the reconstruction of the global supply chain of the rare earth industry, attempting to decouple from China's strategic resource supply. The basic rationale of its strategic layout is still the model of the Roman Empire, which aims to maintain the central position of the industrial supply chain of the United States of America, ensure the security of its internationalized industrial supply chain led by Washington and its allies, and cut or even break ties with China's economy, science, technology, finance and culture at various levels.

Energy transformation is the top priority for the neutralization of coal, and the clean energy sector is becoming an important direction for the new cycle of scientific and technological revolution and industrial transformation. In the next ten years, the 5G market and the infrastructure construction market will amount to about US$13 trillion (one trillion=1 followed by twelve zeros), while clean energy is expected to reach a market size of US$23 trillion. The sum of the two is about 1.5 times the GDP of the United States in 2022. This means that the rapid development of the new generation of information technology and clean energy industry will add a new economy to the world within a decade: its market size can reach the sum of the GDP

of the United States of America, Japan, Germany, France and other countries combined. In the face of the great strategic importance of energy transformation and the enormous market benefits it has generated, major developed economies such as the United States of America, the European Union and Japan have gradually enacted special laws to increase financial subsidies in an attempt to control the international competitive landscape of clean energy and guide the reconstruction of related industrial supply chains. However, under the current global climate *governance* mechanism, the Western-dominated international climate negotiations have exacerbated the division of global geopolitical relations, and developed countries have to pay a considerable cost for the climate agreement. Indeed, in order to implement the greenhouse gas emission reduction agenda and achieve the temperature control goal, countries must gradually abandon the traditional petrochemical energy industrial system established through years of investment and trade accumulation, and instead carry out large-scale energy infrastructure renewal. The clean energy economy requires new capital investment and technology transfer. To this end, the United States of America and its allies, while accelerating the development of its own clean energy industries, have taken measures such as eco-labeling of products,

border carbon adjustment mechanisms and direct sanctions on non-compliant developing countries to reduce the cost of negotiating and complying with international climate agreements for Western countries. It is necessary to emphasize that the United States of America and the West are reinforcing global carbon emission reduction targets and that behind this is a desire to limit the economic growth and capacity advantages of emerging manufacturing powers. Once developing countries accept the capital injection for clean energy and the U.S.-controlled technology ecosystem, this could usher in a new era of impero-global economics, technology and finance. By examining the strategic configuration of the United States of America in areas related to clean energy transformation, we can clearly see the two main means by which the United States of America initiates geopolitical political competition and their salient features.

First, geopolitical competition has shifted to control of major industrial supply chains. The United States of America has approved the aforementioned *Three Major Bills* to impose restrictions on 5G communications, chips, clean energy, biotechnology and other fields in which third countries have strong yields. These strategic areas are exactly the main directions of major mining applications. Among them, rare earths

are one of the key minerals with greater resource advantages and are also widely used sources of strategic advantage in clean energy, advanced manufacturing, national defense and military industry. Rare earths are the mother of new materials. Among the many rare earth products, rare earth permanent magnetic materials have attracted much attention because of their applications in electronic components and equipment in the information sector and various motors and parts in the new energy field. Currently, rare-earth permanent magnetic materials account for about 35 percent of global consumption of rare-earth elements, but their value creation is 90 percent. Magnetic materials will play an important role in the future energy transformation. The global rise of new-energy and equal-vehicle industries in third countries has created real pressure on the United States of America and the West in terms of industrial competition and enforcement of such policies. As a result, the electric vehicle industry is becoming a key area of climate political economy and geopolitical competition. Promoting the transformation to clean energy is one of the main goals of the *Three Major Bills*, which provide legislative support and policy guarantees to rebuild the U.S.-centric rare earth and other key mineral industrial supply chains and accelerate the development of the new energy vehicle market.

First, the *Inflation Reduction Act* adopts market protection measures for key minerals, such as rare earths, related to electric vehicles. Global annual production capacity of electric vehicles is estimated to reach 20-40 million units by 2030. Rare earth-based permanent magnetic materials can help improve the efficiency of electric vehicle motors, which in turn can directly increase the range of clean energy vehicles.

In the name of "reducing inflation," the United States of America has arranged subsidies of up to $369 billion for its domestic clean energy industry. The subsidy covers not only the upstream supply side of rare earths, but also *downstream* companies (inherent activities that are in the concluding part of an exploration and production process) of demand-side electric vehicles that purchase rare earths and other raw materials produced in the United States of America, with a subsidy of $7,500 per vehicle. Second, the *Inflation Reduction Act* subsidies for electric vehicles radiate to related clean energy industries and infrastructure construction, covering many products and segments of the industrial supply chain, from clean energy production, lithium-ion batteries, solid-state batteries, battery management and analysis, vehicle manufacturing, grid technology, power generation facilities and charging infrastructure, and national clean energy

power grids; and form compatibility and legal interaction with the $1.2 trillion *Infrastructure Reduction Act.* Moreover as carriers and technical platforms of intelligent transportation, electric vehicles are inseparable from high-tech sectors such as communications and navigation. To this end, the *CHIP and Science Act* focuses on smart connectivity and networking in the automotive industry, and suppresses the industrial supply chain advantages of competitors. Based on the legislative orientation and selection of specific policy instruments of the three major U.S. bills mentioned above, it can be expected that global carbon neutrality and energy transformation of major countries will stimulate the reconstruction of the industrial supply chain of strategic resources such as rare earths, triggering the escalation of geopolitical competition in this field.

The United States of America has generalized the issue of national security and joined forces with its allies to contain third powers, attempting to achieve its goal of containment at the lowest cost. Among the allies courted by the United States of America, Japan has intervened in the competition and the game in various ways, including involvement in the geopolitical competition of the United States of America in the Indo-Pacific region to pursue its own interests in political, military and even in disputed and/or

claimed territories, which we have dwelt on several times. These actions by Japan have led to East Asia being one of the top five geopolitical risk areas in the world. Consequently, U.S. diplomatic strategy has always defined Japan as an important fulcrum for the White House's control of Asia. As U.S. economic and trade tensions extend to the field of science and technology, Japan, on the one hand, relies on the Japan-U.S. Treaty of Mutual Cooperation and Security (Jan. 19, 1960) to participate in the U.S.-initiated technological blockade against non-allied industries and strengthen mutual alliance in the technological and industrial supply chain according to so-called common values.

On the other hand, the Japanese government has also launched its own subsidies with the intention of implementing precise technological decoupling between non-allies and forming a global double-chain model with the major ally. The industrial chain arrangement implemented by Japan in cooperation with the United States of America has a particularly obvious impact on strategic resources such as rare earths. This is actually directly related to Japan's role in the global rare earth supply and demand pattern and its position in the rare earth industrial chain. Although Japan is extremely lacking in rare earth resources, Japanese companies still occupy a dominant

position in the *downstream* supply chain of the rare earth industry due to their patented technologies and long accumulated research and development capabilities. These companies can even greatly influence the future direction of the development of rare earth functional materials and energy-saving motors. As inventors of the key rare earth material (neodymium magnet type: NdFeB) and owners of related patents, it is unlikely that Japanese companies can fundamentally jeopardize their competitive advantage of the rare earth industry supply chain in the short term. In terms of the total number of patents in clean energy fields such as hydrogen energy and battery technology, Japan also ranks first globally. The U.S.-Japan alliance has strengthened Washington's technological control over the global supply chain of the rare earth industry. Japan's deep involvement in geopolitical games has undoubtedly brought more uncertainties to the extension of atre competitive rare earth industry supply chains and, to some extent, has also exacerbated the risk of geopolitical conflicts in the Asia-Pacific and Indo-Pacific regions.

Production capacity and market expansion in areas such as clean energy, electric vehicles and energy-saving engines continue to spur growing demand for rare earths. To cope with the impact of rare earth supply and

demand constraints and unstable market expectations supro duction and business operations, and to reduce dependence on rare earth resources, *downstream* companies have increased their investment in research and development and are trying to develop various alternative technologies, such as processes and products for reduction, recycling, and substitution, thereby reducing the use of key metals such as rare earths. The rationale behind reducing the use of rare earths in the clean energy field of the industrial supply chain is also reflected in the following aspects.

First, price expectations are unstable. Over the past two decades, prices of key rare earth elements have fluctuated widely and widely, and this may continue in the future. Price fluctuations are further exacerbated by stimulating market demand growth and increasing geopolitical risks. To avoid risks, rare earth application companies are promoting *de-rare earthization* (rare earth reduction) in technology to achieve geopolitical *de-risking.*

The second is the need for low-carbon and environmentally friendly production. The environmental costs of rare earth production are enormous. It has been found that large amounts of greenhouse and harmful gases are produced during the production of rare earths and magnetic materials. As

part of the goal of carbon neutrality, reducing the use of key metals has become a voluntary choice for more and more *downstream* companies to fulfill their *environmental, social and corporate governance* (ESG) responsibilities. Of course, even at this stage, ESG-related standards are dominated by Western countries.

Third, car manufacturers reduce the cost of raw materials. Currently, the cost of using permanent rare-earth magnetic materials in each electric vehicle motor is about $300. Taking *Tesla*'s economy passenger car as an example, rare earth magnetic materials account for only about 0.5 percent of its total selling price. When rare earth prices fall, the percentage is even lower. Therefore, attributing cost control as a direct financial motivation for the company's *de-rare earthization* has limited explanatory power.

In recent years, relevant foreign research has continued to focus on the supply-side risks of the international rare earth market in the context of the transition to clean energy, emphasizing the impact of other powers on the security of the supply chain of the rare earth sector. First, overall, the supply of rare earth products, represented by magnetic materials, is insufficient in the international market. Second, foreign research points to China's monopoly on resources and upstream production capacity as the cause of

global industrial chain risks. Compared with strategic mineral resources such as lithium, nickel and cobalt, China's rare earth resources and industrial concentration are clearly more advantageous. Third, the West should establish an independent industrial supply chain for rare earths. These representative papers and research reports from international organizations use quantitative methods to measure downstream countries' dependence on China's rare earth resource imports and production capacity. Most of them obviously conclude that heavy dependence on China's rare earth supply chain poses security risks. Hence, their policy implications equate "desinization" of the global industrial supply chain with risk reduction." The promotion by the United States of America to form a global "dual supply chain" of rare earth production, processing and trade is a path to achieve "risk reduction" and reduce the "vulnerability" of the rare earth industry supply chain.

It should be noted that the above views and judgments are limited by the advantages of production capacity, and the analysis of the global rare earth resource endowment, production conditions, and the security situation of the industrial chain is not sufficiently comprehensive and the conclusions are not objective. The current imbalance between supply and demand of rare

earths in the world is largely due to the national environmental regulations of Western countries. As a country with abundant rare earth resources, the problems of the United States of America with regard to rare earth supply are caused more by national environmental legislation, ecological protection and industrial chain adjustments than by the scarcity of rare earth resources. Both the United States of America and its ally Australia own the most important rare earth mines in the world, such as the Mountain Pass Rare Earth mine in the state of California and the Lynas Mt Weld rare earth mine in the state of Western Australia. Because the mining and smelting of rare earths will have serious impacts on the environment, both of the above mines have suffered serious pollution incidents. For this reason, Washington and Canberra have passed laws to restrict domestic rare earth mining and production for a long period of time, causing their domestic industrial chains to shrink and their supply chain systems to be damaged. Taking Australia as an example, the *Environmental Protection Act* (Jan. 1, 1972, and Dec. 10, 1986) clearly states that the following situations constitute criminal offenses: 1. causing harm to others and serious consequences from pollution, even if the source of the pollution is on the offender's land or facilities; 2. illegal discharge of pollutants, including discharge into natural

media or certain preset containers; and 3. environmental impacts include situations where pollution has occurred or where pollutants enter a natural medium and are expected to cause ecological harm. In 2018, Australia's official report under strict environmental regulations clearly showed that rare earths are no longer produced locally.

Western countries are asking China to play the role of a long-term supplier of rare earth raw materials. In fact, "rare earths are not rare at all" has gradually become a consensus. With the continuous discovery of new rare earth mines around the world and China's overexploitation of domestic rare earth resources over a long period of time, China's share in global rare earth resources has declined to about 30 percent and rare earth mining has dropped to less than two-thirds of the global share. In the case of rare earths, as far as the World Trade Organization is concerned, China has said that it has long taken on international trade obligations to supply the international market with rare earth raw materials, which are disproportionate to its resource endowment, given its limited resource availability. Indeed, Australia, Canada, Norway, the Republic of South Africa and the United States of America already had mining capacities in the 20th century. It may take time for these countries to fully master the process technologies and

production factors needed for the development of the rare earth industry, such as rare earth separation, metal production, smelting and magnet production, production line assembly, workers and capital in the metallurgical industry. However, in terms of the overall level of industrial development, the obstacles and thresholds faced in restarting the rare earth industry supply chain are not insurmountable.

From the perspective of international trade rules, some foreign studies have distorted the analysis and judgment on issues related to rare earth supply. Thinking back to the WTO *Rare Earth Case* Panel Report, the report confirmed the Chinese claim that rare earth mining and processing produces serious pollution, which partially acknowledged the Chinese government's need to take measures to address the environmental impact of rare earth mining and production and found that China has paid a high price for rare earth production. With the technology of the time, water pollution, radiation pollution and toxic gas emissions generated by rare earth mining and processing have caused various kinds of environmental pollution and ecological damage to resources and industry clusters. Since 2015, China has complied with the WTO ruling regarding the *Rare Earth Case* and lifted export trade control measures. This means that while China's production of

rare earths for others provides green and low-carbon magnetic materials for global electric vehicles and wind power, it is still responsible for greenhouse gas emissions and harmful pollution. It is worth noting that the international community has different standards for environmental impact and trade regulations regarding the mining and processing of rare earths . On the one hand, the United States of America has long ignored the reasonableness and compliance of the Chinese government's restrictions on rare earth mining in order to protect the ecological environment; on the other hand, the U.S. government has provided both upstream and downstream subsidies to rare earths and both supply and demand in its *Inflation Reduction Act*, and used legal certainty to increase investment confidence in the rare earths sector, thereby alleviating market concerns in the United States of America previously caused by the small size of the rare earths sector, great environmental damage and drastic fluctuations in supply and demand. As we all know, policy measures such as industrial subsidies and consumption tax subsidies are contrary to WTO rules, and the abuse of non-tariff barriers such as national security is a violation of fair trade obligations. Although France and other member states of the European Union have expressed dissatisfaction with the enactment of the *Inflation Reduction Act*, a

considerable amount of foreign academic literature and special reports from international organizations have not taken a WTO-like position on these U.S. practices of the *Inflation Reduction Act* but have directed the problem to China, which to some extent has contributed to the generalization of political and security factors in the evolution of the global rare earth model. Western countries are steadily promoting policies to reduce their dependence on rare earth imports from China; therefore, the West is accelerating the "desinization" of rare earths. Restructuring the rare earth supply chain is a long-term strategy of Western countries. Developed countries have comparative technological advantages in high-end rare earth applications. Once a rare earth supply chain system excluding China is established, China's international rare earth technology exchanges will be limited and the limited areas will gradually expand to key rare earth technologies, basic equipment, basic research and development, etc. The United States of America, as a large consumer of rare earths, is highly dependent on Chinese rare earth products economically, and politically regards China as a strategic competitor. Washington is concerned that China is using rare earths as a tool for bilateral games and sanctions against the

United States of America. This is the root cause of the Cause's focus on the security of its rare earth supply.

The importance of essential minerals such as rare earths, industrial supply chain reconstruction, and supply chain security has been highlighted in the context of great competition between powers, offering a more diverse perspective on these issues. Among them, the application of geopolitical theories and analytical methods can, on the one hand, make research on related issues address challenges and controversies in value judgments; on the other hand, it helps to expand the theoretical boundaries and methodological system of research. Inspired by the domestic and foreign literature, one can believe that the series of strategic agreements of the United States of America geared toward *de-risking* and "desinization" around the rare earth industry supply chain are no longer motivated by the desire to simply gain economic benefits such as strategic resource development and trade, nor do they simply require China to take responsibility for the balanced development of the global rare earth resource industry supply chain. Instead, they directly aim to win the fierce competition in the global clean energy transition and thus fully occupy the dominant position in the future clean energy economic system. To this end,

the United States of America has essentially abandoned the conventional practice of trying to maintain the security of its industrial chain and economic interests under multilateral systems such as the WTO. Instead, they implemented the aforementioned *Three Major Bills* to rebuild the strategic resource industrial chain controlled by the United States of America, and joined forces with their allies to integrate the technological backward advantages of the rare earth industrial chain in Western countries and use decoupling measures to coordinate with their allies to implement technological building blocks. Moreover, by exploiting technological decoupling, the United States of America and the West are trying to plunge China's industrial chain into a dilemma of low-quality development, leading to the deterioration of business conditions and the employment environment. Their ultimate goal is to drag Beijing and lock it into the division of labor and trade status of upstream suppliers of products such as resource extraction and primary processing of raw materials in the global industrial supply chain that they dominate: basically trying to treat it as an underdeveloped country.

As we have seen in recent years, *downstream* manufacturing companies have increased their investment in research and development to reduce the

use of essential rare-earth materials in the electric vehicle and wind engine sectors. Currently, research, development and related investments are under pressure in terms of extending driving range, high temperature resistance of motors, coercive force of NdFeB magnets and other technical performance parameters. Indeed, dominant technology routes in fields such as energy-saving motors have become dependent on rare earth magnetic materials. NdFeB magnets still occupy an absolute dominant position in today's magnetic materials market and have energy density advantages that other magnetic materials do not. The energy density of iron-based magnets is less than 60% of that of similar NdFeB magnets. Due to different resource endowments, the *de-rare earthization* strategies adopted by different countries are not the same. Among them, the strategy to address the shortage of key rare earth resources proposed by the U.S. Department of Energy in 2021 is quite representative and can be summarized in three policy directions: promoting diversification of rare earth supply sources, developing rare earth substitutes and technological innovations, and promoting recycling and reuse of rare earths. The United States of America has rich resources of rare earths. Through industrial policy adjustments, U.S. rare earth companies are expected to gradually restore domestic production

capacity. U.S. electric vehicle companies will jointly build factories with upstream domestic rare earth producers to complete the vertical integration of upstream and downstream industrial chains. Compared with the United States of America, Japan and the European Union are lacking in rare earth resources and their downstream companies are more aggressive in *de-rare earthing*. Japanese and European electric vehicle manufacturers have pursued intensive technological innovation in rare earth reduction and substitution and have made some progress.

At the same time, technical indicators show that the overall performance of rare-earth-free or reduced-material permanent-magnet motors is still relatively poor, especially the power level of cruising range, a key indicator of electric vehicle performance, is not ideal. For example, the energy density of *Toyota* cars is only 1 kW/kg, and the energy density of the *BMW iX3* motor is only 2.5 kW/kg. This reflects the fact that the current rare earth reduction and replacement technology is not yet mature and the technical and economic feasibility is insufficient. As for the innovations frequently reported by Japanese companies in engine technology, due to the characteristics of Japanese technology and industrial transfer, the expectations for their release to the market are unclear, and it will be difficult

to create large-scale global production capacity in the short term. It is worth noting that drastic changes in rare earth market conditions and prices will also have a negative impact on the production and operation of Chinese *downstream* companies. Companies in the energy-saving and low-carbon sectors, such as new energy vehicles and variable frequency air conditioners, are eager to stabilize market expectations and also have the motivation to reduce and replace rare earths. Of course, in a world full of uncertainties, for *downstream* companies, although the agreement to *de-rare earthization* is based on considerations such as emission reduction, consumption reduction, cost control and technological innovation, its motivation does not exclude the factors of avoiding geopolitical risks and preventing politicization of the supply chain of rare earth magnetic materials.

The United States of America has weaved China a direct competitor and initiated a geopolitical competition against it, focusing mainly on the following three objectives. First, to ensure the absolute advantage of the United States of America over its competitors in key areas involving national defense and military, science and technology, important industries, culture, education, etc. The strategic move to meet this need is the

introduction of the above-mentioned *CHIP and Science Act*. The second is to ensure *supply* chain (*supply chain)* autonomy. In order to serve the transition to clean energy and meet the demand for key materials such as rare earths, non-market means such as government subsidies incompatible with traditional U.S. economic policies are adopted to promote supply chain diversification and capacity return and reduce dependence on risky external supply channels such as China. The relevant bill supporting this goal is the *Inflation Reduction Act*. The third is to ensure national economic security. The bills aimed at excluding Chinese products and services in areas such as information and communication infrastructure and power grids mainly include the Infrastructure Act.

Relying on geopolitical networks and strengthening cooperation with allies is not only an important means of achieving the three goals mentioned above, but also fully reflects consistent bipartisan U.S. political and diplomatic thinking. The White House calls on its allies to assume their respective responsibilities and seek maximum effectiveness in restraining China at the lowest possible cost. The *Inflation Reduction Act* subsidizes domestic production in the United States of America and restricts the import of raw materials, components and products from "hostile countries." At the

same time, it restructures the global supply chain with the United States of America as the center, upholds the banner of common values and induces Japan and the European Union to rely on the supply of key minerals from allies such as the United States of America, Canada and Australia, thus forming deeper technological cooperation and industrial chain interaction with the United States of America in the field of clean energy. In fact, as early as 2011, the United States of America, Japan and the European Union signed a strategic resource alliance agreement to ensure the security of the rare earth supply chain. In 2012, the United States of America, Australia, the European Union and Japan jointly invested in the production and processing of rare earths at the Lynas Rare Earths Processing Facility in Malaysia. In 2019, Japan participated in Lynas Corporation's investment restructuring and reached an agreement with shareholders from the United States of America, Australia and the European Union. The allies will give priority to guaranteeing the supply of rare earths to Japan, and the contractual agreement will be extended until 2038. The Ukrainian crisis and escalating geopolitical conflicts between China and the United States of America could accelerate the transfer of clean energy industry supply chains from Japan and the European Union to the United States of America, thus consolidating

Washington's dominant position in the global supply and demand structure of rare earths. In 2022 and to date, the United States of America has spearheaded the creation of the *Minerals Security Partnership* (MSP), incorporating Australia, Canada, Rep. of Korea (South), Estonia, Finland, France, Germany, Japan, India, Italy, Norway, Sweden, the United Kingdom, the United States and the European Union into this new international mining coordination mechanism, with the aim of strengthening the development and cooperation of the industrial supply chain in the fields of rare earths and other strategic resources. Because it intends to play a role similar to NATO in the field of key minerals, the MSP is called *Metal NATO*.

While clinging to its traditional allies, the United States of America has expanded its alliance-building goals through this cycle of restructuring the rare earth industry supply chain. The reason is that the current environmental regulatory system, environmental standards and public opinion in the United States of America and the West are difficult to accept because of the pollution caused by rare earth mining and processing. In the United States of America, there are always voices questioning the development of polluting industries such as rare earths. The *Inflation*

Reduction Act allows the production of rare earths in some areas of the United States of America, which has aroused opposition and resistance from minorities such as Native Americans and some states of the Union. Given the enormous environmental costs of rare earth production, some states have refused to connect to the rare earth industry supply chain, giving rise to the typical "not in my backyard" phenomenon. Opponents have attacked Biden's *Green New Deal*, saying it is nothing more than a veil for supply theory and that *the Inflation Reduction Act* has no direct relation to reducing inflation. In response to the domestic backlash, the U.S. government, on the one hand, strengthened cooperation with its allies such as Canada, Australia, the European Union and Japan in key minerals to establish a strong international *partnership* in the supply chain; on the other hand, it proposed to continue to coordinate cooperation in the industrial supply chain with developing countries, including Mexico, Malaysia, Vietnam and some African countries rich in mineral resources, to turn them into upstream production suppliers to reduce pollution.

These situations indicate that rebuilding and maintaining domestic production capacity in the United States of America is still strategic. The supply chain arrangement of the rare earth sector in the United States of

America could be concentrated in specific limited areas. Localized mining and production are mainly used to ensure the security of supply of rare earths for the military and defense enterprises of the United States of America. They also act as a political signal that influences market supply and demand and play the role of price leverage in the international rare earth market. From this it can be seen that the purpose of the restructuring of the rare earth industry supply chain by the United States of America is to take control of the global rare earth landscape in its own hands, while passing the highly polluting production circuits of rare earth processing to other developing countries outside of China. The European Union, which closely follows the United States of America, has also recently taken similar steps to transfer pollution within the industrial supply chain. Of course, there are some developing countries that are trying to seize this opportunity to improve their international influence in key minerals. For example, Malaysia has emphasized on many occasions its strategic goal of erecting itself as a global rare earth power.

Considering the projected timetable for the reconstruction of the rare earth sector supply chain by the United States of America in 2020, China still occupies a relatively important leading position in many links of the global

rare earth supply chain. Among them, rare earth mining accounts for 60 percent of the world total, while smelting and processing of rare earth metals and production of rare earth permanent magnet materials account for up to 90 percent. Regarding this supply situation, in the "post-epidemic era," the United States of America is promoting the so-called *de-risking* of the rare earth industry supply chain to realize the production of rare earth materials in the United States of America as soon as possible under safe conditions. Its essence is still "de-risking." To this end, the *Inflation Reduction Act* introduced strict regulations on the share of essential rare earth raw materials and other raw materials produced in the United States of America purchased by domestic electric vehicle companies, requiring this share to be at least 40 percent starting 2024 and then increasing by 10 percent each year until it reaches 100 percent before corresponding subsidies can be obtained. At the same time, the bill also proposes the concept of "qualified producer," meaning that *downstream* electric vehicle companies can only be recognized as "qualified" companies if they reach the purchase quota of rare earths, lithium batteries, and other raw materials produced in the United States of America as stipulated in the bill, and the electric vehicles produced by them will be eligible for national subsidies as said *supra*. In addition to

providing subsidies *to downstream* companies, the *Inflation Reduction Act* also clarifies key metal materials needed upstream in the industrial chain in the form of a legal list. Investments in the production of key metals in the list can enjoy long-term legal protection.

Under the guidance of *de-risking*, the package of plans by the United States of America to provoke geopolitical competition and promote the restructuring of the global rare earth industry supply chain will strain China's inherent rare earth resources and its advantages in production capacity in multiple dimensions. Specifically, the United States of America and the West have limited the space for independent expansion of China's industrial supply chain through technological restraint and worsened the business environment for China's strategic resources through legislation, forcing rare earth production capacity to move abroad, creating alternative competition against China in both resource and production capacity linkages, thus weakening China's current advantages in the middle and upper echelons of the strategic resource industrial supply chain.

Let's look at China's countermeasures and industrial chain effects. China is an important country for strategic metal resources, production, consumption and export. The triple advantages of resources, production capacity and

market provide China with strategic space and policy tools to cope with geopolitical competition in the field of strategic resources. In August 2023, China launched a new round of export sanctions, imposing export controls on gallium- and germanium-related items. This move was a heavy-handed countermeasure against the growing blockade and repression of China by the United States of America, Japan, etc. in semiconductor and other fields. It demonstrates China's stance and determination to safeguard national interests and industrial chain security and defend the right to development. It also bargains on the side of the key upstream raw materials, gallium and germanium, accurately identifying the pain points of the United States of America and the West and the shortcomings of their industrial chains; this behavior has impacted the global semiconductor and strategic resource chain. The United States of America, the West and major semiconductor manufacturers reacted strongly, and the impact was quickly transmitted to the *downstream* market. Gallium and germanium prices in the international market fluctuated, and the aforementioned companies responded to the crisis by collectively applying for import licenses due to concerns over insufficient reserves. It can be seen that leveraging the overall benefits of the supply chain to counter the reconstruction of the industrial supply chain and

the technological blockade by the United States of America and the West will have a more significant effect in the short term. At present, the impact and effectiveness of countermeasures on gallium and germanium exports have not yet been disclosed. In the long term, there is still uncertainty about the impact of China's overall tightening of gallium and germanium export controls. It should be noted that the United States of America has relatively rich resources of raw gallium and germanium and has the potential to rebuild production capacity, while the European Union and Japan hold a large number of technical patents for high-end applications and recycling of key metals. Once gallium and germanium prices continue to rise in the international market due to limited supply, it is possible to further force the United States of America and Western countries to seek suppliers of key mineral products outside China and accelerate the construction of a more diversified gallium and germanium supply chain, thus weakening the effectiveness of China's countermeasures to some extent.

From the perspective of geopolitical competition, Chinese export countermeasures can be classified as a "confrontational" strategy, the effectiveness of which largely depends on the "cards" and "reverses" of the two sides in the game. Therefore, it is necessary to deploy a series of

balancing forces in the global strategic resource structure, disrupt the pace of reconstruction of the U.S. and Western industrial chains, and divide the existing alliances of interests, thus reducing the pressure on major domestic industrial chains and gaining a reasonable development space. Facing a complex geopolitical situation, Chinese companies have increased their imports of rare earths from abroad in recent years and invested in establishing rare earth magnetic materials processing plants in Vietnam and other countries. Through overseas resource development and capacity transfer, they have dispersed the risks caused by industrial chain reconstruction and changes in the global supply and demand pattern. In the future, the design and implementation of countermeasures will require a comprehensive assessment of domestic and foreign market players' responses to geopolitical risks and adjustments to their investment set-up, as well as the innovation of geopolitical game tools to constitute a long-term deterrent.

Another of the main lines of geopolitical competition between China and the United States of America is the generalization of national security issues and joining forces with allies to contain China in the name of "common values" as we have already mentioned.

In the current international political and economic landscape, some traditional allies of the United States of America have positioned themselves as imperial powers, fueling the anti-globalization trend. First, the U.S. administration prohibits its own country's high-tech companies from investing and building factories in China and controls investment and technology transfer of U.S. companies to China. The *CHIP and Science Act* and related regulations set politically oriented thresholds for allied companies to invest and manufacture in the United States of America and obtain subsidies from the federal government. Not only must they comply with relevant U.S. laws, they also require *high-tech* companies not to invest in China. This has the effect of consolidating the U.S. "stranglehold" on China in the areas of basic technologies and key raw materials. Second, the geopolitical competition between China and the United States of America has become the direct reason for multinational companies to adjust their investment distribution in China, reduce their supply chain and even withdraw their investments from China. By 2021, Europe's investment in the United States of America was ten times that of China and India combined. Blocking or reducing investment in China and exports of high value-added technology products by developed countries could lead to a distancing and

cooling of bilateral trade and political relations between China and major developed countries. The United States of America and its allies are jointly promoting the "desinization" of major industrial supply chains, which will not only impact China's export-oriented exports and employment, but also affect technology transfer and innovation in China's manufacturing supply chain.

In the era of globalization, the interdependence model of the international industrial chain is being pushed by the United States of America toward interdependence turned into a weapon. For the rare earth supply chain, Japan plays a key role in the "desinization" strategy promoted by the United States of America. Japan is China's largest importer of rare earths, the country that has licensed the most technology patents to Chinese rare earth companies, and a major supplier of raw materials and components to U.S. industry. As a power in the rare earth sector, Japan is trying to achieve industrial chain security between its advantage as a world leader in advanced rare earth functional materials and its long-term industrial chain shortcomings limited by the extreme scarcity of local raw mineral resources. This is difficult and involves many uncertainties. While the strategic initiatives of the United States of America to restructure the global rare earth industry supply chain

are being implemented one after another, Japan's next direction has become increasingly clear. In contrast to the China-Japan industrial supply chain, which has fallen into a situation of short supply chain contraction, diversification, decoupling and differentiation, the link between the United States of America and Japan in the field of strategic resources is steadily strengthening.

Japan has always relied on the role of the Washington-Tokyo alliance to protect its strategic resources and business interests abroad. Taking the 2010 Senkaku/Diaoyu Islands incident on September 7, 2010 (administered by Tokyo, but claimed by both Beijing and Taipei) as an example, although China imposed a short-term embargo on Japan on rare earths, this had a profound impact on Japan's expectations regarding the development of the rare earths sector. Japan, with its scarce resources and frequent disasters, has always been very sensitive to risks and has a strong sense of prevention. In a relatively short period of time, it has reached a consensus on how to address Chinese restrictions on the supply of rare earths through both *top-down* and *bottom-up* approaches. In fact, after the Senkaku/Diaoyu Islands incident, Japan planned and, step by step, began to start *de-rare earthization* its technology and de-synthesize its industrial supply chain. In a sense, the

current operations of the United States of America targeting the rare earth supply chain can be said to be a continuation of the direction taken by China and Japan in the rare earth sector. At the geopolitical level, Japan takes full advantage of the Japan-U.S. security alliance to seek protection from the White House. Given the dependence of the United States of America on the supply of advanced materials and components from Japan, the United States of America has provided Japan with diverse economic, political and diplomatic support in the Sino-Japanese rare earth dispute. During the *Asia-Pacific Economic Cooperation* meeting held in the month following the "Diaoyu Islands incident," Japan held a bilateral summit with the United States of America and identified coordinated measures to address industrial supply chain security. At the same time, under the leadership of the United States of America, Japan's investment request for the Australian Lynas rare earths processing plant project in Malaysia was approved, thus alleviating the rare earth resources supply crisis. In 2011, the United States of America, the European Union and Japan formed a quasi-alliance for strategic resources; in 2012, the United States of America, Japan and the European Union filed a complaint with the WTO and jointly initiated the rare earth case against China.

The transition to a clean energy economy is another important motivation for Japan to actively engage in rebuilding the U.S. global supply chain of essential minerals. As a resource-poor country, the Japanese government has long been committed to promoting a diversified, multi-channel energy and resource security strategy. The acquisition of key mineral rights in key countries and regions is the main focus of Japan's global mineral resource exploration and development investment. Five of Japan's companies, according to Fortune Global 500: *Mitsubishi Corporation*, *Mitsui & Co.*, *Itochu Corporation*, *Sumitomo Corporation* and *Marubeni Corporation*, have invested in strategic resource provisions in Australia, South America and South Asia. As of 2020, Japan has acquired significant rights and interests in key minerals. For example, Tokyo holds 4.45 percent, 3.97 percent, 2.57 percent, 2.40 percent and 4.80 percent of global equity reserves of copper, bauxite, lead, zinc and molybdenum, respectively. Among them, the international rare earth interests of the top five trading companies mentioned above include *Mitsui* Group's interests in Australia, *Itochu* and *Mitsubishi*'s long-term investments in exploration and mining rights in South Asia, and *Marubeni*'s long-term operating interests in Kazakhstan. The *performance* of Japan's top five trading companies is

closely linked to trends in international metal and energy prices. Already in fiscal 2008, 63% of the net income of the top five trading companies came from mineral resources. After 2020, large Japanese industrial conglomerates (*chaebol*) such as *Mitsubishi* began to collectively engage U.S. strategic investors. In the international capital market, the U.S.-based *Berkshire Hathaway* Group will increase its stake in the above five groups to 9.9 percent. In addition, *Blackstone* and Japan's *Daiwa Securities* have issued bonds and are investing in the Japanese market, and the *Lincoln Fund* will also expand its operations in Tokyo. The series of deep capital interactions means that major Japanese financial groups and U.S. capital have reached an agreement on interest distribution. This close relationship reflects the underlying capital connection of empire-province.

In the past 1980s and 1990s, the semiconductor dispute between the United States of America and Japan ended with Japan's disastrous defeat, for which the latter paid a huge price by transferring key industrial chains such as integrated circuits to the Rep. of Korea (South) and Taiwan. Although a series of subsequent incidents planted a certain nail of distrust between the industrial sectors of the two countries, they did not shake the political foundations of the Japan-U.S. alliance. Having learned lessons from the U.S.-

Japan semiconductor dispute and the Plaza Agreement (Sept. 22, 1985), Japan has a deep understanding of the significance and impact of an attack on the other side's strategic industrial supply chain and real sectors in the competition between great powers. Overall, Japan's involvement in Sino-US geopolitical competition has strengthened the link between the strategic resource industrial chain and geopolitical conflicts. As an important ally of the United States of America in East Asia, the Japanese government actively collaborates with the United States of America to build a technological alliance that excludes China and limits the development of Chinese *high-tech* industries. For example, in response to China's rise, Japan has continuously introduced measures to contain China, including subsidizing *China Exit* and relocating its industrial supply chain, such as investing $75 billion in South Asia to balance Beijing's growing influence. Since 2020, the year of Covid-19, Japan and the U.S. have successively initiated institutional arrangements such as the *Japan-U.S. Global Digital Connectivity Partnership* and the *U.S.-Japan Competitiveness and Resilience Partnership*, established a *Commercial and Industrial Partnership*, promoted collaborative innovation in the digital economy and *high-tech* industries, deepened strategic cooperation in semiconductor, 6G, quantum

technology, decarbonization and other fields, improved industrial supply chain resilience, formulated advanced technology standards that exclude China and accelerated the aforementioned "technology decoupling."

Japan mixed its East Asian geopolitical strategy with the great-power game between China and the United States of America and adhered to the framework of the Indo-Pacific strategy of the United States of America -- causing the bilateral geopolitical competition between China and the United States of America to turn into total and continuous repression and containment of China by the United States of America and its allies. While cooperating with the strategy of the United States of America toward China, Japan also attempted to pursue its own security objectives. For example, it borrowed the concept of the U.S. National Security Strategy to define China as an "unprecedented strategic challenger" to the international order.

Japan's review of its national security strategy was also endorsed by the United States of America. The Japanese government of Shinzō Abe (2006-2007, 2012-2020) was the actual initiator and investor in the *Quadrilateral Security Dialogue* (*The Quad*) between the United States of America, Japan, Australia and India. Therefore, in the reconstruction of the industrial chain of global strategic resources in the context of the geopolitical competition

between China and the United States of America, Japan's role as a strong province without U.S. proxies is particularly evident and its influence is even more complex and changing.

In the field of clean energy, taking the more competitive electric vehicle sector as an example, compared with conventional vehicles, new energy vehicles have a higher demand for strategic minerals and involve more types of key minerals, including strategic resources such as lithium, copper, nickel, graphene, cobalt, rare earths and a longer industrial supply chain. The Japanese government has released a plan for the automobile industry, proposing to complete the country's 100 percent transformation to clean energy vehicles by 2035. It has also introduced a consumer subsidy policy of US$7,200 for each pure clean-energy electric vehicle. It should be noted that hybrid electric vehicles such as *Toyota* are not included in the consumer subsidies. That plan reflects Japan's intention to catch up with international competitors in the pure electric vehicle sector in the short term and enter the electric vehicle market in a big way. However, as mentioned earlier, the development of the electric-only vehicle industry relies heavily on key metals and requires support from key materials industries such as rare earths. Japan is resource poor and its long-term dependence on rare earth

imports is only a microcosm of the security situation of its manufacturing supply chain. In light of the historical issues between China and Japan and the impact of the Senkaku/Diaoyu Islands incident-when the United States of America demonstrated its willingness to rebuild the global supply chain of the rare earth industry, Japan's response to take sides was an inevitable choice and would have further reinforced Japan's dependence on the supply chain system dominated by the United States of America.

North America is an important foreign market for the development of Japanese companies, and Japan's direct investment in the United States of America has also strengthened the "empire's" domestic connections. Because of their deep technical expertise in fuel vehicles and the first-mover advantage in hybrid technology, Japanese automakers such as *Toyota* have long held a leading position in the U.S. hybrid vehicle market. Since Japan relies on China for imports of rare-earth magnetic materials, the development of hybrid vehicles can significantly reduce the use of rare earths, which is in line with the Japanese auto industry's technology substitution strategy. It is also more in line with the "politically correct" path of reducing China's dependence on rare earths in the Sino-US geopolitical environment. Not only that, the United States of America is a major oil and

natural gas producing country, and the transition and continuation strategies of Japanese automakers between gasoline and electric vehicles have to some extent satisfied the interests of American oil and gas giants.

By 2040, the total number of fuel-burning vehicles in the United States of America will still remain above 50 percent. Hybrid vehicles, as an intermediate solution, help preserve the traditional ecosystem of the automotive industry and alleviate the pressure and impact of large-scale layoffs. In terms of technological diversity, Japanese companies see hydrogen-powered vehicles as a breakthrough for the future development of clean energy and the transformation of the automotive industry. The development of the hydrogen-powered vehicle industry also requires development and investment in the North American market. The *Infrastructure Investment and Jobs Act*, the *Inflation Reduction* Act and other U.S. bills have included new energy vehicles, such as high-efficiency hybrid vehicles, pure electric vehicles and hydrogen vehicles, in the government-subsidized clean energy category, providing legal and industrial policy support for the transformation and development of Japanese companies.

As an iconic product of Japan's manufacturing industry and a long-term pillar of the economy, Japan regards the automobile industry as the ultimate battleground of Japanese industry. However, in the North American market, Japanese automakers face the reality of competition, facing and adopting the *America First* principle of the electric vehicle industry under the *Inflation Reduction Act*.

America First refers to a populist political theory in the United States of America that emphasizes the fundamental notion of putting America first, which generally involves ignoring global affairs and focusing exclusively on domestic politics in the United States of America. This generally denotes policies of non-interventionism, American nationalism and protectionist trade policy. It has developed in three historical moments: the first in 1916 with Thomas Woodrow Wilson, the second in the period of World War II until the late 1950s, and the third in the era of the presidencies of Donald Trump, who has also used it as a political slogan.

So as mentioned earlier, the *Inflation Reduction Act* designed an application and approval system to "eligible entity" for electric vehicle subsidies. This provision is obviously an unfair market system that targets foreign automakers such as Japan. Through the implementation of this law,

domestic automakers such as *Tesla*, *Ford* and *General Motors* hope to capture the trillion-dollar renewable energy vehicle market in the United States of America. Based on this consensus, the aforementioned companies have intensified cooperation with domestic rare earth materials companies and completed vertical integration of the industrial supply chain. Changes in the industrial policy and market structure of the United States of America have provided market opportunities for Japanese companies, but they have also forced them to export investments and technologies in hybrid and hydrogen vehicles to the United States of America and integrate deeply into the clean energy system led by the United States of America. So Japan is a veritable province of the "Roman Empire."

Once again, the Big Three *Bills* set exclusive clauses and subsidy requirements to accelerate the formation of the "double chain" of strategic resources. The U.S. Department of Commerce has imposed additional tariffs of about 25-30% on Chinese metals such as lithium, cobalt and lithium batteries, and notably the *Inflation Reduction Act* has added a "*poison pill*" clause to subsidy regulations for electric vehicles, which means that key raw materials such as rare earths purchased by manufacturers must not come from "relevant foreign entities," which is equivalent to excluding rare earths

and other key metal raw materials produced in China. If Japanese automakers continue to import strategic resources and key raw materials produced in China, they will inevitably violate the provisions of the *Inflation Reduction Act* and will not be able to obtain subsidies from the U.S. government, which will put Japanese cars at a disadvantage compared to competitors in the North American market. Because of the U.S. government's strong intervention in the industrial supply chain, it seems inevitable that Japanese automakers will have to bow their heads and take sides.

Based on the above analysis, if Japanese automakers want to gain opportunities for non-discriminatory competition in the U.S. automotive market, they must increase their investment in the United States of America, thereby driving the transfer of rare earth application technology and key rare earth materials to that country and its dominant industrial chain. This is exactly the geopolitical goal pursued by the Big Three *Bills* of the United States of America: to promote production, R&D and capital repatriation and to comprehensively suppress competitors, thereby consolidating and enhancing the United States of America's position as a world leader in advanced manufacturing.

Of course, the United States of America has also made certain exchanges and concessions of interest in exchange for the cooperation of its allies. As of 2023, rare earths mined from the Mountain Pass mine in California were no longer exported to China for smelting and processing and then from China to Japan for further processing, but instead will be shipped directly to Japan's *Sumitomo Corporation*. What needs to be paid close attention to is that smelting and processing of rare earth concentrates in Japan has not been seen for many years in the history of rare earth production and industrial development in the country. It means that the global rare earth industry supply chain has been gradually divided and rebuilt, and China's absolute advantage in smelting and separation links of the rare earth industry supply chain is encountering challenges.

As a major player in the global rare earth landscape, Japan, in order to maintain its advantages in the final stage of the industrial supply chain, has strengthened its reliance on the U.S.-dominated industrial supply chain to reduce its dependence on rare earth imports from China, thus trading the higher costs of the supply chain for the "reduction of risks" of the rare earth sector supply chain and long-term access to major North American markets. As for the geopolitical pressure that Japanese government and companies

are under, their choice of which side to take is both a proactive and, to some extent, forced decision. This is not inconsistent with the historical *governance* logic of the empire's "strong province."

The security risks Japan poses to China's strategic resource industrial supply chain are not only reflected in geopolitical disputes. Japanese companies have a history of using patented technologies to interfere with China's industrial ecology. It has long been noted that Japan, as a late-stage industrial power, has adopted a different industrial and technology transfer strategy from early-stage industrialized countries. It usually follows the marginal industrial transfer model and supports the transfer of industries to Japan that are already or tend to be disadvantaged compared with countries at a lower level in the international division of labor system. The imposition of high patent barriers is an important means for Japanese companies to control the pace of technology transfer and industrial configuration and prevent technology diffusion. Examining Japanese technology patent cases, we find that the specific operations of patent restrictions are often uncooperative and even highly hostile in nature, such as increasing patent fees or even refusing the other party to use unavoidable patents, thus limiting the technological capabilities of the competitor. Taking the case of Chinese

patents on DVDs as an example, Japanese giants charged various forms of patent fees to Chinese companies, and the average total fee accounted for 50-60% of the selling price of each DVD, causing patent fees to completely crush Chinese DVD manufacturers. During the same period, Japanese companies allied with patent holders in Western countries to directly reject patent licenses and erected a high wall on patents, causing many Chinese companies to go bankrupt because they failed to obtain 3C patent licenses. Western countries such as Japan resort to extremely expensive licensing and refusal to grant licenses to build a high wall of patent barriers to prevent their industries from winning market competition. Even in the rare earth supply chain, Japan's patent strategy approach shows a clear opposing orientation. At present, Japanese companies still control the vast majority of major patents in the rare earth field, a considerable number of which are unavoidable patents. Chinese rare earth companies need to obtain their clearance for processing and production of key raw materials, which has created a major obstacle to China's extension of the rare earth industrial supply chain.

Patent restrictions imposed by Japanese companies on Chinese rare earth companies are mainly manifested in the following aspects: first, Japanese

companies use patent rejection methods to increase barriers to entry for Chinese rare earth companies. For example, in the case of *Ningbo Ketian Magnetics Co., Ltd.* v. *Hitachi Metals, Ltd.* for abuse of market dominance, *Hitachi* refused to grant an unavoidable Class 1 basic patent license, which seriously affected the production and export of *Ningbo Ketian* and its many subsidiaries. In 2021, the Chinese courts first initiated the compulsory license for Japan's unavoidable basic rare earth patents. The case has been appealed to the Supreme Court, and the rare earth patent dispute between China and Japan is still awaiting a final ruling. In addition, Japan exercises strategic control over China's production capacity for high-performance rare earth magnets. Currently, although *Hitachi* and other companies have licensed some advanced sintered magnet technologies to domestic rare earth producers, they continue to exercise strict control over production capacity and quality. The annual production capacity of more than 200 licensed companies in China is less than 1,500 tons, and only 4 percent of them are capable of producing high-performance sintered magnets. As a result, compared with China's huge production volume, which accounts for 87% of the world total, the production capacity of high-end magnetic materials accounts for less than 15%. The repressive patent strategy of Japanese

companies has hindered the improvement of efficiency in the utilization of rare earth resources in China and reduced the expansion space of China's rare earth supply chain. At the same time, Japanese companies such as *Hitachi* have segmented technology licensing, indirectly preventing China's NdFeB industry from forming a complete technology system and achieving independent innovation, forcing domestic industry leaders to choose to set up *joint ventures* with Japanese companies to secure patent licenses and maintain normal production and routine operations. In addition, it must be said that Japanese companies hinder the entry of Chinese companies into the international market through technology licensing. Patent licensing usually requires the agreed geographical area and domestic market scope of product sales. Exceeding the agreed scope constitutes patent infringement. The licensee can ask the court to issue an injunction, seal or prohibit the importation of the disputed product, or even impose a fine and pursue liability for compensation for infringement. When patent clearance is obtained from Japanese companies, Chinese rare earth companies often have to pay an additional fee in exchange for foreign export markets. Affected by such patent terms, currently, except for eight licensed companies in China, the vast majority of other rare earth companies can only

sell domestically or export after paying high patent fees. Japan has also jointly initiated the ITC Section 337 investigation of China's magnetic industry with the United States of America. The top ten Chinese magnetic materials companies have all been listed as targets of the investigation. During the investigation, they must obtain new licenses from the United States of America and Japan before they can continue to export and sell. Patent restrictions directly affect the cost structure of China's major rare earth materials. Patent fees paid by some Chinese companies to Japan account for up to 30 percent of their overseas sales of neodymium iron boron magnets.

To get rid of restrictions on Japanese companies' patents, in 2013, more than ten Chinese rare earth companies filed a class action against *Hitachi* in a U.S. court, claiming the invalidity of its rare earth patent. Each Chinese company paid up to $1.5 million in legal fees, but the outcome of this case was essentially the same as the case on the DVD patent. It can be seen that Japan's control over China's rare earth industrial supply chain through technical patents is very similar to previous practices in the DVD industry. The crux of the problem lies in who holds the dominant position in the industrial supply chain. One inescapable fact is that Japan is still the main

source of import of high-quality rare earth magnetic materials for China. Once Japan's rare earth-based magnetic technology is weaponized in the geopolitical competition between China and the United States of America, it will have a direct impact on the supply of essential raw materials for related Chinese industries, particularly those in high-end equipment and clean energy. At the same time, with the increasing dependence on the global supply chain of the rare earth industry dominated by the United States of America and the acceleration of its rare earth reduction and recycling process, the development and utilization of rare earth stockpiles in international mines will enter commercialization in the future. Japanese companies' dependence on rare earth imports from China upstream in the industrial chain will gradually decrease, which may further increase Japan's patent negotiation bargaining tokens, causing Chinese companies to be in a more unfavorable situation in acquiring rare earth patents.

In conclusion, by analyzing the typical facts according to which the United States of America has used the Big Three *Bills* as the focus, and the deepening of alliance cooperation as the "arme" to force the reconstruction of the global supply chain of the rare earth industry, it is found that the strategic arrangements of the United States of America in the geopolitical

competition between the great powers, in terms of the basic logic, still show the structure and context of the "Roman model" of transformations of the states equipped with high-tech structure in the guise of "strong provinces of the empire." Specifically, in the field of strategic resources, given the wide application of essential raw materials such as rare-earth magnetic materials in the clean energy industrial system, the U.S. promotion of the "desinization" of the rare-earth industry supply chain is not only aimed at getting rid of the passive security situation of the supply chain that has long relied on imports from China, but its more fundamental strategic goal is to try to gain full control of the dominance of the clean energy system in the face of the global coal neutralization issue and thus gain *leadership* in global climate *governance.* In the geopolitical disputes provoked by the United States of America, the reason why Japan plays the role of the "strong province of the empire" is not only due to the political foundation of the Japan-U.S. alliance, but also due to its traditional advantages and actual interests in rebuilding the global supply chain of the rare earth industry and the clean energy industry system. Japanese companies are helping to "desynthesize" the rare earth industry supply chain in the United States of America and the West through technological *de-rare earthization* by

making their supply chains more deeply and tightly dependent on the reallocation of global rare earth resources by the United States of America. In fact, they are trading higher costs for the benefits of strategic resource security and the North American clean energy market. Increasingly fierce geopolitical competition is accelerating the direction of global strategic resources toward a "double chain" competition model.

Through the analysis of its manifestations and impacts, it is believed that the competition for dominance of key minerals and important industrial supply chains is at the center of this round of geopolitical contest between great powers. The United States of America and its allies have weaponized the interdependence between upstream and downstream industrial supply chains through technological and regulatory decoupling and are trying to isolate China in the international system of division of labor they control, attempting to push China's strategic resource industrial supply chain into a development dilemma of contraction, low quality and fragmentation. One should be fully aware that under the blockade and forced containment of the United States of America and the West, the passive patent technology and high-end linkages controlled by others have exposed the shortcomings and weaknesses of China's rare earth industrial supply chain, reflecting the

reality that China's strategic resource advantages have failed to turn into industrial advantages and have brought risks and challenges to the security of the strategic resource industrial supply chain represented by rare earths.

For *de-rare* earthization the global rare earth industry and risk reduction of the industrial supply chain, the People's Republic of China should coordinate the strategic needs of development and security, strengthen high-level planning, build on the dual circulation development model, and promote the synergy of science and technology policies, industrial policies, trade policies and environmental policies.

First, it should seek to adhere to innovation-driven development, accelerate efforts to overcome core technologies and key commodity linkages that "choke" the industrial supply chain, encourage innovative development of strategic resources such as rare earths, support the development of diversified clean energy technology pathways, actively compare technologies and product standards of clean fuels, clean electricity, hydrogen energy and clean transportation in developed countries, improve the resilience of China's economy and shape a sustainable clean energy industrial ecosystem.

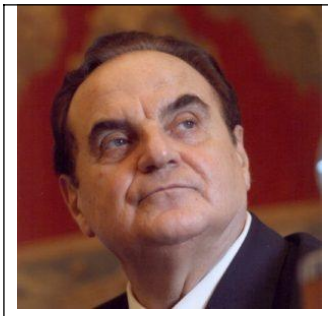
Second, it is necessary to adhere to green development, strictly control the environmental impact and ecological damage of strategic resource development, and support the construction of a clean energy industrial system with clean rare earths and other key metals.

Third, there is to adhere to open utilization, make the best use of rare earth resources, foster global energy transformation, maintain the multilateral system and combat the unilateral system, improve the business environment, perfect the legal system of intellectual property protection, respond to patent risks in the rare earth field in accordance with the law, and carefully manage the issue of compulsory licensing of international rare earth patents.

Fourth, it is necessary to take the initiative, make plans and actively resolve the risk of instrumentalization of asymmetric dependencies in the global industrial chain. One should exploit the advantages of the middle and upper tiers of the industrial chain, improve the ability to integrate global strategic resources, independently expand the industrial chain, find innovations in the mechanism of interest of the U.S. and Western alliances, rely on the *Silk Road* Initiative, deepen mining cooperation with participating countries, and explore the creation of an open, inclusive, mutually reinforcing and

integrated strategic resource industrial chain on the premise of maintaining the advantages of productive capacity and resilience of the industrial chain. Fifth, there is a need to take reasonable and effective countermeasures. The effects of adjusting the rare earth trade system and the use of the confrontation strategy in dealing with the Senkaku/Diaoyu Islands incident should be summarized in depth, so that the impact of gallium and germanium export controls can be closely followed.

Ultimately in order to cope with the reactions of the United States of America and the West, in order to conduct a systematic evaluation of the effectiveness of countermeasures, I think the range of countermeasures should be expanded, as well as reserve diversified strategic checks and balances in a way to address the global "double chain" structure, highlighting the international influence of the People's Republic of China as an important country in the areas of strategic resources and clean energy.



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(Text translated from Italian to English language by World Geostrategic Insights)