

CICC Research, CICC Global Institute

The Belt and Road Initiative at Ten

From Macro, Financial and Industrial
Trends

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CICC Research, CICC Global Institute
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Preface: Belt and Road Initiative's Role in Promoting Development and Cooperation Under New Circumstances

The year 2023 marked the 10th anniversary of the Belt and Road Initiative (BRI). Since 2013, China has signed more than 200 BRI cooperation documents with 151 countries and 32 international organizations¹ covering investment, trade, science, technology, and culture. China and these countries collectively account for about two-thirds of the world's total population and around 40% of the global GDP. Over the past decade, the BRI has led to nearly US\$1 trn worth of investment, facilitated over 3000 cooperation projects, created more than 420,000 jobs in BRI countries, and helped lift almost 40 mn people out of poverty. The BRI has brought about many remarkable accomplishments such as fostering connectivity, cooperation, and development among China and BRI countries, and has become a widely welcomed international public good and platform of cooperation.

Profound changes have taken place in the global environment over the past decade. The once-in-a-century COVID-19 pandemic had wreaked havoc around the world, the post-pandemic economic recovery has been unbalanced, and long-term scarring effects are still emerging. New constraints and changes such as geopolitics, industry chain adjustments, and the green transition have also had far-reaching impacts on economic fundamentals and global governance mechanisms. Under these new circumstances, the BRI and other forms of international cooperation are confronted with new challenges and problems that require proper handling and practical solutions.

The CICC Research Department and CICC Global Institute collaborated to produce an in-depth report titled *The Belt and Road Initiative at Ten—From Macro, Financial, and Industrial Trends*. The report sheds light on the achievements of and challenges facing the BRI from a wide range of perspectives, including the macroeconomy, various sectors, the real economy, finance, as well as domestic and international conditions. In addition, the report discusses future opportunities for BRI

¹ On June 12, 2023, Honduras became the 152nd country to sign BRI cooperation documents with China. Unless otherwise specified, the data for BRI countries in this report is as of May 2023, which covers 151 countries.

development and related public policies. In this preface, we offer our thoughts on BRI cooperation and development from a macro perspective.

Infrastructure Development: How to Internalize Externalities

The BRI consists of two parts—the “Silk Road Economic Belt” and the “21st-century Maritime Silk Road”. The “Belt” stands for the inland economic belt that starts from China and connects Asia, Europe, and Africa through railway and road transportation along ancient Silk Road trading routes. The “Road” refers to the maritime trade network that connects China with Southeast Asia, South Asia, and Africa. The BRI covers a wide range of areas such as trade, investment, finance, education, and culture and tourism, among which infrastructure development has been the most influential and has drawn the greatest attention. Infrastructure development started in inland Asian and European BRI countries and expanded to Southeast Asia, Africa, South America, and Pacific Island countries, serving as a key platform for the new model of development and cooperation between China and other countries.

BRI infrastructure development drives local economic development through industrialization and urbanization as it covers not only traditional sectors such as transportation, energy, and telecommunications, but also public services and new infrastructure such as schools, hospitals, green facilities, and cultural services. In the transportation sector, the BRI has facilitated the construction and operation of major international transport corridors, including the China–Europe Railway Express and sea-rail intermodal services. In the energy sector, the construction of power as well as oil and gas projects under the BRI effectively meets growing energy demand in BRI countries and regions. Meanwhile, the development of satellite communication and fiber optic projects facilitates information exchange and connectivity among BRI countries and regions. In addition, numerous hydro projects such as the Nam Ou River Cascade Hydropower Project in Laos have helped improve the development and utilization of local hydro resources.

Infrastructure development requires investment. The fact that developed countries usually have high-quality infrastructure raises the question of whether there is a causal link between economic growth and infrastructure development. We think the causality works in both directions: Infrastructure development drives economic growth, and economic growth in turn drives infrastructure development. Nevertheless, infrastructure is to some extent a public good, which means public policies can also help boost its development. Infrastructure has the characteristics of public goods, which means that some of the benefits from infrastructure are enjoyed by society as a whole rather than benefiting only the individual projects in question. Infrastructure's characteristic as a public good is also visible in its spillover effect. For example, the development of road and related infrastructure can help boost automobile production and sales. However, given that it is a public good, infrastructure's externalities

are likely to result in insufficient investment from the private sector, which makes public investment and policy guidance necessary. Many BRI countries suffer from a significant lack of sufficient investment in infrastructure development, and this has been a major impediment to their economic development.

Characteristics of public goods are often associated with economies of scale as increasing user numbers reduces the unit cost of public goods. Over the past few decades, China has invested heavily in infrastructure development, leveraging the country's enormous markets, immense population, abundant funding based on high savings rates, as well as government spending and guidance. As a result, China has accumulated extensive experience in infrastructure development and has achieved constant technological progress in this area. For example, China already has some of the world's most advanced technologies for the construction of bridges, tunnels, expressways, high-speed railways, and urban rail transit systems. The country has also developed strong capabilities in engineering and independent innovation. China's competitive advantages in these fields provide a solid foundation for cooperation with BRI countries.

As BRI countries' demand for infrastructure matches China's ability to supply (i.e., build) infrastructure, cooperation on infrastructure development should bring mutual benefits. However, infrastructure's characteristics as a public good pose obstacles to international cooperation on infrastructure development since commercial returns from individual infrastructure projects are lower than their total contribution to the whole economy. Within a single country, such externalities can be corrected with fiscal measures or public policies. In other words, the government can act in the interests of the public to enhance investment in infrastructure development while dealing with potential externalities. However, this sort of fiscal adjustment mechanism does not exist between countries. This has led to doubts about the feasibility and sustainability of transnational infrastructure investment.

Apart from the BRI, a few developed countries have also proposed in recent years schemes of cooperation with developing economies. For example, the US launched in 2021 the Partnership for Global Infrastructure and Investment, while the EU announced in the same year the Global Gateway, an infrastructure cooperation initiative similar to the BRI. These programs are usually viewed as rivals to the BRI. However, the amount of investment proposed in the US and European programs is low, and as such, their assistance to developing economies is limited. Finding a way to internalize externalities of transnational infrastructure investment remains a difficult task, and developed economies have yet to find a proper solution.

In BRI countries, the number of infrastructure development projects has declined from the highs recorded in the first few years of the initiative. This is attributable to impacts from the COVID-19 pandemic and the changing geopolitical situation. Another reason lies in the progress of investment projects—many of them have been completed and are already in operation. Overall, we should view BRI infrastructure projects as an investment portfolio, and thus understand that it is normal for a small number of them to miss expectations on returns or benefits. In fact, most of these projects have played positive roles in driving local economic growth and boosting trade between China and BRI countries, thus helping BRI countries achieve common

development along with China. As BRI cooperation is an innovative model of development, the analysis of internalization of externalities should take into account many other factors besides infrastructure.

A New Development Model

Over the past four decades, the Washington Consensus has been the mainstream economic policy framework in global development. It stresses that free markets can effectively allocate resources, and that the globalized world is a unified market with more similarities than differences between various regions. Nevertheless, this framework pays little attention to the dual economy of developing countries, i.e., the coexistence of traditional and modern economic sectors within a single country. The Consensus also does not pay attention to the establishment of a win-win mechanism between core and peripheral countries. As a result, the globalization model adopted over the past four decades has had rather limited effects on boosting developing economies. In fact, some developing countries have suffered from worsening imbalances and have fallen further behind, instead of catching up with, developed economies.

Meanwhile, developed economies also suffer from widening wealth gaps. Internal economic polarization has, in turn, led to the resurgence of protectionism in trade relations. Coupled with impacts from the changing geopolitical landscape, these trends have posed severe challenges to the globalization model adopted in the past. A number of developed countries have increasingly prioritized their domestic goals and adopted unilateral policies in the areas of trade, industries, and green transition. For example, there are signs that the WTO, the most iconic international organization for global governance in the era of globalization, is being marginalized, which makes it more difficult for developing countries to boost economic growth through international trade.

Against such a backdrop, the BRI provides opportunities to explore and create new models of economic development as well as international economic cooperation, especially in the following areas:

1. The BRI can boost total trade volume as it facilitates international trade and investment by enhancing connectivity and reducing transaction costs, notably the cost of transportation. UN Comtrade data shows that China is the top trading partner of 35 BRI countries, up from 18 countries a decade ago. In contrast, the US and Germany are top trading partners of 11 and 16 BRI countries at present, and these numbers were 15 and 12 a decade ago, respectively. This clearly indicates China's growing share of the global economy and the BRI's role as an important driving force behind the expansion. The growing size of potential markets in BRI countries not only enhances the demand for exports but also helps improve the efficiency of resource allocation through competition, which bodes well for the sustainability of economic development.

2. The BRI also helps ensure balanced development. In the past, connections with maritime and waterway transportation routes were key symbols of the industrial economy. Many well-known port cities have emerged and grown into modern economic hubs. Typical examples include New York, London, Singapore, Hong Kong SAR (Guangdong-Hong Kong-Macao Greater Bay Area), Shanghai, and Tokyo. These cities have benefited from globalization, for which they have also played important roles. A key innovation in the BRI is the “Silk Road Economic Belt”, which strengthens interconnections among inland areas in Asia and Europe, especially economies in Eastern Europe and Central Asia. Thus, the BRI fosters the development of land ports and helps drive economic growth in inland countries and regions, including central and western China.
3. The BRI can help participating countries better respond to climate change by exploring new areas of cooperation and capturing new opportunities for development. The green transition has so far focused on the demand side, aiming to boost demand for renewable energy with green subsidies and carbon pricing, e.g., with the introduction of carbon taxes and carbon trading markets. This has led to concerns about the rise of “climate protectionism”. For example, some green subsidies require related products to be produced domestically, while some countries plan to impose carbon border taxes on imports. In contrast, BRI cooperation can pay more attention to the supply side as many BRI countries have ample solar and wind energy resources. Low-cost renewable energy resources are valuable endowments that can support sustainable industrialization. Going forward, the matching of China's strong manufacturing capabilities with BRI countries' advantage in the supply of renewable energy resources will be a new growth engine, in our view. Infrastructure investment is a key precursor to success in this area.
4. The philosophy of development under the BRI also deals with the relationship between finance and the real economy. Cross-border capital flows have been the primary driving force behind the hyper globalization since the 1980s. Financial liberalization is a key component of the Washington Consensus under the premise that free cross-border capital flows would drive innovation, trade, and industrialization in various countries. This mechanism is an extension to, or a part of, the financialization of developed economies, and it attempts to boost the growth of less-developed countries through financialization. In contrast, the BRI relies on infrastructure connectivity as the foundation for international economic cooperation. In other words, the primary growth driver under the BRI is physical capital instead of financial capital, which reflects the view that the financial sector should serve the real economy. The financial liberalization proposed by developed economies has been of little help, or even counterproductive, to the growth of developing economies. Can the financial cooperation among BRI countries, which has just begun, stand the test of time?

Investment carries risks. In particular, externalities of infrastructure mean that market mechanisms are not always effective in matching risks with returns. Individual

projects usually begin to generate returns after the rise of debt-service obligations, and as such, it is normal for their debt-service burdens to increase for some time.

Externalities of returns from infrastructure assets indicate that their corresponding debts also show externalities. Justifications for infrastructure investment should be analyzed under a broad framework of development and cooperation. Similarly, the sustainability of BRI debts should also be viewed from the perspective of macro equilibrium, which covers not just coordination within one country, but also interaction and cooperation among different countries. Two issues are especially noteworthy: The effect of BRI cooperation on the balance of international payments, and the institutional arrangements or mechanisms of cooperation that have been adopted to correct the possible imbalances.

Macroeconomic and Financial Balances

The macroeconomic equilibrium of cross-border capital flows can be examined from three perspectives:

1. The real economy: A country's trade surplus represents the transfer of resources outside of the country at present in exchange for external assets, i.e., claims on future resources, while a trade deficit represents the opposite. Excessive accumulation of net external assets or liabilities may reflect macroeconomic imbalances and could be unsustainable. For example, the market was concerned about implied risks in the US's persistent trade deficits before the outbreak of the global financial crisis in 2008.
2. The financial sector: An inappropriate amount and structure of financing could also lead to problems regarding sustainability. Although Europe's trade surplus with the US was low before 2008, large amounts of two-way capital flows between Europe and the US fueled the accumulation of subprime mortgage risks.
3. Governance mechanisms: The international monetary system affects measures to correct imbalances in the real economy and the financial sector, as well as the results of these corrective measures.

Looking at the macro equilibrium in terms of physical resource allocation, we can see that trade surplus is the only way for a country to accumulate net external assets. Let's assume that private institutions' investment in foreign countries drives up demand for foreign exchange. When this happens, the country would face two possible scenarios: (1) There is no capital inflow to offset the outflow. Thus, the demand for foreign exchange would exceed supply, the local currency's exchange rate would depreciate, and the country's trade surplus would rise after some time. (2) The country happens to receive capital inflows (i.e., an increase in external liabilities) to offset the capital outflows in the private sector (i.e., an increase in external assets). As such, the country's foreign exchange demand and supply would remain balanced, and there would be no change in the local currency's exchange rate, the country's balance of trade, or its net external assets. Overall, trade is balanced from a global

perspective—trade surpluses in some countries mean trade deficits in other countries. At any given point in time, some countries accumulate external assets while others accumulate external liabilities.

The ideal level of a country's net external assets is determined by its demographics, resource endowment, and technological progress, among other factors. Over the past three decades, China's persistent trade surplus was partly attributable to the high savings rates due to its demographic dividend as the country's young and middle-aged population were accumulating assets, including external assets, to prepare for their retirement. In contrast, most BRI countries have young populations, relatively high cost of childcare, and low savings rates. Therefore, a reasonable choice for these countries is to boost domestic investment by taking on external debts, which is reflected in their trade deficits. For countries with abundant natural resources (e.g., energy and minerals), a good choice is to mine underground physical assets and convert them into financial assets through exports, which diversifies these countries' asset portfolios and brings trade surpluses.

What are the BRI's effects on cross-border resource allocation? To answer this question, we examined China's balance of trade over the 10 years before and after the proposal of the BRI. We found that China's average trade surplus with the rest of the world (as a percentage of China's GDP) after the proposal of the BRI was 0.4 ppt below the level before the proposal. Meanwhile, China's 1% trade deficit with BRI countries before the proposal turned into a 0.5% trade surplus after the proposal. The decline in China's total trade surplus is attributable to its diminishing demographic dividend, while the changing regional distribution of trade surplus is attributable to the BRI. China provides a considerable part of the financing for BRI infrastructure projects, which are used to import capital goods and intermediate goods from China. Related investment has boosted economic growth in host countries, benefiting all trading partners. As the world's largest manufacturing center, China naturally becomes a major beneficiary.

How should we analyze the sustainability of debts incurred in net resource transfers? A key factor to examine is whether the transferred resources (i.e., imported goods) are used for investment or consumption. Debts borrowed to fund investment projects under BRI cooperation are sustainable since these investment projects expand infrastructure and public services, boost local industrialization and urbanization, and bode well for long-term economic growth. In contrast, debt sustainability is low if the raised money is used to fund consumption. History shows that many developing countries, and even a few developed economies, borrowed external debts to fund consumption, which eventually proved to be unsustainable. A typical example is the debt problem in some Southern European countries over a decade ago.

The approach and structure of financing are also key variables that determine whether the current transfer of resources (i.e., savings) can be effectively converted into investment. Over the past four decades, financial liberalization has led to the growing importance of capital markets relative to the banking system around the world. The main channel of cross-border capital flows also shifted from bank lending to capital markets. As capital market participants lack sufficient patience and interest in infrastructure investment, this shift in the financing structure means that developed

countries provide only limited support to infrastructure development in developing countries. In contrast, BRI financial cooperation primarily takes the form of bank lending, which combines development finance's focus on development with commercial finance's focus on financial returns from individual projects. This is appropriate since most BRI countries show strong demand for financing to fund infrastructure development, but their financial markets are underdeveloped. On the other hand, China's financial system is dominated by indirect finance.

As cooperation under the BRI progresses, sufficient attention should also be paid to problems and risks resulting from one-way capital flows and to reliance on one single financing approach. The financial system is procyclical. When people have positive expectations, their investment and financing increase, and the subsequent economic growth fuels stronger optimism. This boosts financing further, and the economy prospers further. However, procyclicality also means more severe downside risks in the case of exogenous shocks. It is worth noting that the procyclicality of capital markets is different from that of bank credit. Generally speaking, bank loans require collateral, including some type of credit guarantee, to address the problem of information asymmetry. Changes in the value of collateral and credit expansion reinforce each other, making bank credit strongly procyclical. In contrast, capital markets are less procyclical than bank credit. Investors in capital markets are more sensitive to new information, and asset price fluctuations can absorb impacts from exogenous shocks in a timely manner, which means the economy is less likely to overshoot in one direction. Therefore, we should adopt additional approaches to financing and employ various capital market instruments to make the financial system less procyclical, as well as to diversify away risks and enhance the sustainability of BRI financial cooperation.

In its early days, the expansion of financial cooperation under the BRI benefited from China's adjustments to the structure of its existing external asset portfolio. With a large trade surplus and a relatively inflexible renminbi (RMB) exchange rate, China accumulated an enormous foreign exchange reserve, which topped US\$4 trn at one point. As US Treasuries offered low returns at that time, China increased its investment in emerging markets and developing economies, providing these countries with the infrastructure and industrial investment that they lacked. This also helped China diversify its investments and enhance investment returns.

Looking ahead, the decline in China's trade surplus means it has less room for one-way investment (i.e., resource transfer). Meanwhile, China has largely completed adjustments to its existing external asset structure. Where can we find new room for growth in financial cooperation under the BRI? A reasonable and logical answer lies in two-way capital flows. As a large economy with a strong ability to withstand risks, China could provide safe assets and invest in risk assets, creating a closed loop. This could be a new direction of cooperation under the BRI, although a few questions remain: What mechanisms are needed to create demand for safe assets? Should demand drive supply or be created by supply? This has something to do with the governance of the international monetary system. BRI cooperation not only requires support from the international monetary system, but also affects the evolution of the system. In particular, the internationalization of the RMB merits special attention.

Implications for the International Monetary System

The international monetary system evolves as the world economic and political environment changes. A century ago, the gold standard crumbled under dual shocks from the 1918 influenza pandemic and the First World War. After the Second World War, the US became the world's most powerful country in military, economic, and financial terms. The Bretton Woods System, which was crafted with the US at the core, remained relatively stable for more than three decades until 1973, when it succumbed to impacts from the Vietnam War, the Middle East Oil Crisis, and other geopolitical events. In the ensuing four decades, the international monetary system has been dominated by the US dollar.

The US's share of the global economy has shrunk to about 25% at present from 40% in the early 1960s, but the US dollar's share in global foreign exchange reserves has stayed at about 60%. Over the past four decades, globalization and financialization have served as cornerstones of the international monetary system dominated by the US dollar. The perfect example of globalization is China, which integrated into the world economy through reform and opening-up. After its accession to the WTO, China has played an increasingly important role in global industry chains and has grown into the world's largest manufacturing and export hub for finished products. The perfect example of financialization is the US. Financial liberalization has made finance more important in domestic economic activities, which strengthened the US's superiority in the international financial system.

Under the macro policy framework with inflation targeting and floating exchange rate as two pillars, economic theories count on floating exchange rates to fix deficits or surpluses in the balance of international payments, but the effect of floating exchange rates is limited in practice. Instead, equilibrium in the balance of international payments depends to a large extent on the US dollar's status as an international currency. The US supplies safe assets and commercial financing, while economies with trade surpluses (e.g., China, Japan, and energy exporters) purchase US Treasuries and other financial assets as safe assets. On the other hand, economies with trade deficits, such as energy importers, rely on US dollar financing to cover deficits in their international payments.

However, globalization and financial liberalization have encountered challenges in the changed global landscape. Financial regulation has tightened and trade frictions have increased since the 2008 global financial crisis. The recent COVID-19 pandemic and the Russia-Ukraine conflict have further fueled deglobalization and definancialization in the world economy. Meanwhile, some countries have imposed various restrictions on other countries in the technology sector. As policymakers in various countries pay greater attention to industry chain security and stability, the adjustment to industry chains is also posing headwinds to globalization. Some countries have taken advantage of their currencies' status as international currencies to impose financial sanctions in geopolitical conflicts, which raised concerns from other countries about the existing international monetary system and prompted them to seek to reduce their dependence on a single international currency.

In this context, bilateral and regional economic and trade cooperation becomes increasingly important, and the importance of real assets also rises relative to financial assets. The decline in the US's competitiveness based on its financial advantages means fewer constraints on other countries due to their financial disadvantages. This presents new opportunities for the transition to a multipolar international monetary system. Although the US dollar will probably maintain its status as the world's No.1 currency for quite some time, its absolute dominance may wane. The US is no longer the largest trading partner of most BRI countries. Less reliance on the US dollar at the financial level could help these countries reduce volatility in the real economy.

First, we believe that bilateral, multilateral, and even regional currency cooperation mechanisms will play more important roles in payment. As real assets are usually of higher specificity than financial assets, we believe that money's payment functions will become increasingly heterogeneous as BRI cooperation progresses and trade among BRI countries rises, expanding the room for growth of various non-US dollar payment mechanisms and arrangements. For example, more than 70% of trade among member states of the Eurasian Economic Union is settled in local currencies, and China has established a number of non-US dollar payment arrangements with countries in Africa, Latin America, and other regions. We see solid growth potential in RMB-based non-US dollar payment systems as the economies of China and BRI countries are complementary to each other, and China clearly enjoys economies of scale as the largest trading partner of most countries in the world.

Second, an important function of international currencies is to provide safe assets, and China has the potential to fill the gap left by the decline in the US dollar's status. Tightening financial regulation has undermined the capacity of financial systems in the US and other developed countries to supply safe assets. Recent geopolitical events, especially related financial sanctions, have reduced other countries' demand for US Treasuries as safe assets. China's government bonds and other RMB liquidity instruments could play an important role in the global supply of safe assets. Other candidates for safe assets include strategic reserve cooperation agreements between China and commodity-exporting countries and currency swap agreements between the central banks of China and other countries.

Third, a number of new multilateral financial institutions were established in the past decade that support the development of BRI and other multilateral cooperation and serve as useful complements to the existing international monetary governance system. Examples include the New Development Bank and the Asian Infrastructure Investment Bank, both of which were established in 2015. In addition to China Development Bank and the Export-Import Bank of China, China has set up the Silk Road Fund to support financing for BRI-related projects.

From Economies of Scale to Innovation-Driven Development

After achieving remarkable accomplishments, the BRI has become an open, inclusive, and mutually beneficial platform for international cooperation. The global

environment has changed significantly over the past decade. The real economy faces increasing supply constraints. Costs are rising while potential growth rates are declining in major economies due to population aging, the green transition, the declining peace dividend, as well as adjustments to industry chains that changed their main focus from efficiency to security. Financial circumstances are also changing. Amid inflationary pressure, the rise in US interest rates is not entirely a cyclical movement, and US dollar interest rates are unlikely to return to their previous lows. Market risk premiums are rising due to geopolitics and other non-economic factors. As such, emerging markets face tightening financing conditions. Looking ahead to the next decade, what holds the greatest potential for further cooperation under the BRI?

A possible answer is economies of scale, i.e., larger scale leads to lower unit costs and higher efficiency. The traditional theory of comparative advantage holds that differences in factor endowments create demand for trade. Therefore, developed countries should focus on capital-intensive industries, developing countries should concentrate on labor-intensive industries, while resource-rich countries should mainly export resources. In reality, however, trade among developed countries often exceeds that between developed and developing countries. China's role as a global manufacturing hub has actually strengthened despite the significant increase in the country's labor costs. The combination of diverse consumer demand and economies of scale allows countries at the same stage of development to achieve economies of scale through division of labor and trade.

As China has an enormous population and is the world's second largest economy, the country's immense markets and strong manufacturing capacity form the largest cornerstone for cooperation with BRI countries going forward. We believe that China's scale advantages as a large country will become more prominent in the context of deglobalization. China's strong industries—such as textiles and apparel, home appliances and electronics, and renewable energy—can provide BRI countries with good-value-for-money finished products. On the other hand, many BRI countries have abundant natural resources and young populations, but lack the capital, technology, and management expertise to effectively integrate these factors of production. With its large industrial system, China can import energy, industrial metals, new energy metals, and other raw materials from BRI countries, and cooperate with these countries in mature sectors such as equipment production and light, heavy, and chemical industries. This enables China and BRI partners to complement each other's strengths. The industrial section of this report offers a detailed analysis of BRI cooperation in these areas.

In particular, infrastructure investment since the launch of the BRI a decade ago has built a solid foundation for economies of scale. Transportation costs compel producers to move closer to markets, and such costs pose an obstacle to the enhancement of economies of scale and inhibit further division of labor. Infrastructure development under the BRI reduces transportation costs and other cross-border transaction costs by improving connectivity among BRI countries and regions. This can facilitate further division of labor and extend industry chains to achieve greater economies of scale. In recent years, the growth of infrastructure investment under the BRI has

decelerated. Some have claimed that BRI cooperation's boost to economic growth has declined, but they just looked at the demand side. On the supply side, investment in the past has turned into production facilities, and it may take a decade or even longer for their boost to economic efficiency to become fully visible.

Moreover, economies of scale foster innovation, which is essential for the enhancement of efficiency and security. China has more than 200 mn people with higher education, exceeding that of India and the US combined. This gives China a clear advantage in the human capital required for innovation. China has become a global leader in renewable energy, including new energy vehicles. This is a good example of economies of scale boosting innovation. The advantage of scale is even more apparent in the era of the digital economy. The low marginal cost of digital products and services enhances both internal economies of scale (i.e., growth of individual companies) and external economies of scale (i.e., upstream and downstream linkages and cluster effects).

Over the past three years, the CICC Research Department and CICC Global Institute have released a series of in-depth reports on China's new development philosophy featuring innovative, coordinated, green, open, and shared development. These reports cover a wide range of themes, including the digital economy, carbon neutrality, technological innovation, the olive-shaped society, and industry chains in large economies. As a platform for cross-border economic cooperation, the BRI covers many aspects of the new development philosophy. This report presents our latest research findings on key trends in China's new stage of development, and we hope it will help facilitate analysis and discussion of related issues. We would be delighted to hear from our readers and would be grateful for any comments and feedback.

Wensheng PENG
Chief Economist, Head of Research Department
Dean of CICC Global Institute
China International Capital Corporation
Beijing, China

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This book is written based on the report “Belt and Road Initiative at Ten: Macro, Financial, and Industrial Trends”, originally in Chinese (“一带一路”新十年:宏观、金融与产业趋势) and published in 2023. The book analyzes the achievements and challenges of the Belt and Road Initiative (BRI) from the macro and industrial, real and financial, domestic and international perspectives, and explores the opportunities for future development and related public policy issues. The previous report had over 500 pages, which was then condensed into the current form, with 13 chapters focusing on major themes and core issues. The book, we believe, is a concise, coherent, and engaging narrative that will guide interested readers through the development of the Belt and Road Initiative amid a changing global landscape.

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English editors: Kenneth Ho (Lead Editor), Andrew Cheng, Prashani Rambukwella, Robert Parker, ZHOU Wanbo, Jude Niroshan Abeyaratne, Carol Keaty, Grant Surridge, Jonathan Barlow, and Michael Hoare

Translators: KONG Bin (Lead Translator), HUANG Jincheng, ZHANG Xinyue, ZHANG Yi, WANG Qian, LIU Bo, XU Ang, and LIU Jian

Introduction

CICC Research was founded upon the establishment of China International Capital Corporation (CICC), which is renowned for its emphasis on research. It was the first in China to establish a sell-side research framework, conducting research based on fundamental analysis and creating a cross-border research model of “One Team, Global Market”. With its extensive coverage, rigorous research methods, objective approach, and insightful forward-looking perspectives, CICC Research has positioned itself among the most influential research institutions and has garnered the reputation of being “Chinese experts” among its clients.

CICC Global Institute (CGI), established in November 2020, is positioned as a new form of high-level think tank that is oriented to serving public policy research and decision-making. It focuses on economic and financial research, striving to understand economic and industry trends and to establish a platform for communication between China and the world. CGI and CICC Research possess different sets of focuses and strengths, collaborating in their efforts to support China’s national strategy and to enhance CICC’s business performance and development.

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Chapter 1

Development is Key to Advancing the Belt and Road Initiative



Abstract The fundamental problems that the Belt and Road Initiative (BRI) aims to solve and the goals it is expected to achieve boil down to development. As the world's second largest economy, China is highly complementary to most other developing countries in terms of factor endowments and macroeconomic characteristics. Historical experience suggests that large economies can generate spillover effects in areas such as investment, trade, technology, and finance. The BRI is neither an initiative to create a new set of international economic and trade rules nor an attempt to solve various difficulties in economic development with a single development model. Instead, it is an open international platform that China and other countries build together to promote economic development.

We attribute the macroeconomic logic behind the BRI partly to the interaction between the positive externalities of China's development and the rebalancing of the global economy. Reform and opening up have greatly improved China's macroeconomic efficiency, and the country's high savings have successfully translated into strong domestic investment and large trade surplus. Developed countries' pursuit of trade balance has prompted China to pay more attention to trade with other developing countries, and China's outward investment has also become more balanced between developed and developing countries. Given that the economies of China and most BRI countries are complementary to each other, there is sizable room for cooperation between these parties.

Thanks to its large economic scale, China's development brings positive externalities that are reflected in four aspects: (1) Strong infrastructure construction capacity and proactive action promote cross-border infrastructure construction and provision of public goods. (2) Large market demand makes global terms of trade favorable to developing countries. (3) Fledgling innovation system helps drive technological progress in related countries. (4) Industrial adjustment boosts outward investment.

The BRI has gradually materialized from an idea and a vision into policies and action, and has progressed from "sketching the outline" to "filling in the details".

Author: ZHAO Yang, WU Ting.

Under the influence of investment and trade, the BRI has initially realized infrastructure connectivity (i.e., a general connectivity framework consisting of six corridors, six connectivity routes) and joint rule-making; boosted trade, investment, and employment in related countries; and played a notable positive role in the economic growth of related countries. However, there are also risks in the provision of cross-border public goods and outward investment. We believe that effectively promoting high-level opening up, including renminbi (RMB) internationalization, could help advance the BRI to a new level.

1.1 Belt and Road Initiative from a Development Perspective

1.1.1 *Echoes of History*

In 2013, President Xi Jinping proposed building a Silk Road Economic Belt and a 21st century Maritime Silk Road during visits to Kazakhstan and Indonesia.¹ The two initiatives are together known as the Belt and Road Initiative (BRI). As of May 2023, China has signed BRI agreements with 151 countries and 32 international organizations.² Countries that have signed BRI agreements (BRI countries) are located in Asia, Africa, Europe, North America, South America, and Oceania, with a total population of 3.7 bn, or nearly half of the global population.³

The Silk Road and the Maritime Silk Road were among the most important trade routes in the ancient world. As a leading economy in that era (Fig. 1.1), China played an important role in both trade networks. In the modern era, it has re-emerged as a leading economy and trading nation, allowing the country to again spread its economic reach along the ancient Silk Road and Maritime Silk Road. Echoing the spirit of cultural inclusiveness embodied in the Silk Road, the BRI aims to build a development-oriented, inclusive, and mutually beneficial platform.

Development remains the top priority of most countries. The 151 BRI countries had a combined GDP of only US \$21 trn in 2021, or less than a quarter of global GDP.⁴ By level of economic development, there are currently 135 developing countries in the BRI, and nearly 50% of BRI countries are low-income or lower-middle-income countries.⁵ President Xi stated at the Belt and Road Forum for International Cooperation in 2017 that “Development holds the master key to solving all problems. In pursuing the Belt and Road Initiative, we should focus on the fundamental issue of

¹ <https://www.yidaiyilu.gov.cn/xwzx/xgcdn/10908.htm>.

² <https://www.yidaiyilu.gov.cn/country>. On June 12, 2023, Honduras became the 152nd country that signed a BRI collaboration document with China. Unless otherwise specified, the statistics and data on BRI countries used in this book are as of May 2023, covering 151 BRI countries.

³ Source World Bank. Data for year 2021.

⁴ Source World Bank.

⁵ Source International Monetary Fund, World Bank.

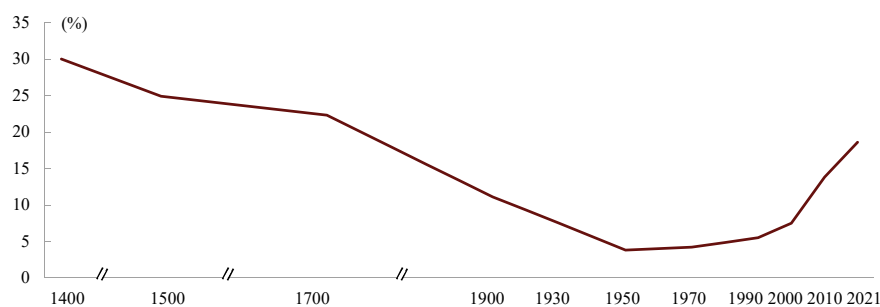


Fig. 1.1 China's percentage in world GDP. *Note* The figures above are calculated by GDP in international US dollars. *Source* Stephen Broadberry, Hanhui Guan, David Li, 'China, Europe and the great divergence', July 2014; TED data base, September 2015; Maddison data base, 2013; Macquarie Research, January 2017, World Bank, CICC Global Institute

development, unleash the growth potential of various countries, achieve economic integration and interconnected development, and deliver benefits to all.⁶

1.1.2 How Does History Begin?

The mechanism of economic development has been examined by a number of scholars and researchers. Since Joseph Schumpeter espoused the idea of development as innovation, economics has defined and understood development at the macro level. Walt Whitman Rostow believes that the main reason why China's traditional society during the Ming and Qing dynasties did not develop successfully was the lack of an effective national innovation system. But how can a country successfully develop a national innovation system? In his book *Economic Growth of Nations* (1971), Simon Kuznets examined nearly a century of historical data on developed countries and found that growth in developed countries was accompanied by the evolution of economic structure: There were always new industries expanding their share of the economy. However, Kuznets acknowledged that developed countries do not have a common pattern of long-term trends, and they provide no support for Rostow's take-off theory.

Although the World Bank, established after the Second World War, has done a lot of work and achieved some results in promoting global economic growth, the achievements in development of the world's developing countries are actually quite limited if specific countries such as China are excluded. The GDP per capita of low-income and lower-middle-income BRI countries is equal to only 3% that of the US, and this proportion has hovered at this low level since 1960 without trending upward

⁶ http://www.xinhuanet.com/english/2017-05/14/c_136282982.htm.

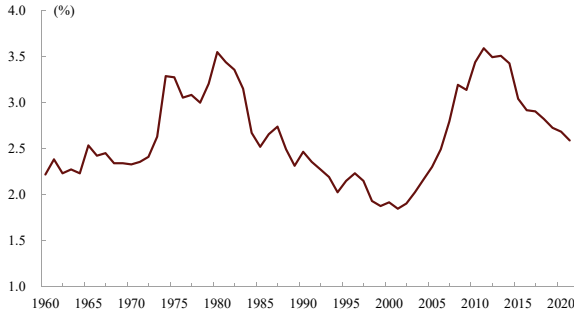


Fig. 1.2 GDP per capita of low-income and lower-middle-income BRI countries as a % of GDP per capita of the US. *Note* The GDP per capita of low-income and lower-middle income BRI countries is calculated by averaging the GDP per capita of each country. *Source* World Bank, CICC Global Institute

(Fig. 1.2). Admittedly, the post-war international economic system has not brought fundamental development to most developing countries.

It becomes even more embarrassing if we examine these facts in light of Schumpeter's understanding of development as innovation in a broad sense. Most developing countries are developing slowly, with an undiversified and rigid economic structure, little innovation activity, and no innovation system to continuously invest in innovation. On the contrary, developed countries are growing well, with innovations continuously emerging and economic structure changing dynamically. The history of developed countries is not over, and the question facing more developing countries is: How does history begin?

1.1.3 China's Role

As one of the most successful countries in global development in the past few decades, China offers development experience that is worth summarizing and learning. According to the United Nations, the number of people living in extreme poverty worldwide fell from 1.9 bn to 836 mn between 1990 and 2015.⁷ The main achievements in global development are concentrated in China. Through reform and opening up, China has lifted 850 mn people out of poverty, contributing more than 70% of global poverty reduction. Robert Zoellick, former president of the World Bank, praised China's poverty reduction results: "This is certainly the greatest leap to overcome poverty in history".⁸

⁷ https://sdgs.un.org/sites/default/files/publications/22212015_human_development_report.pdf.

⁸ http://english.scio.gov.cn/in-depth/2021-03/01/content_77259620.htm#:~:text=With%20absolute%20poverty%20eliminated%20in%20the%20world%27s%20most,history%2C%22%20said%20former%20World%20Bank%20President%20Robert%20Zoellick.

China’s successful development experience lies in its adoption of the universal principles of a market economy which match existing international economic and trade rules, as well as its characteristics in the state-owned economy and government participation which complement existing development practices of other countries. This dual role is also reflected in the practices of the BRI. The BRI is not intended to come up with a new development model, but rather to build a platform for international cooperation to help related countries create a new development paradigm.

1.2 Positive Externalities of China’s Development and Economic Rebalancing

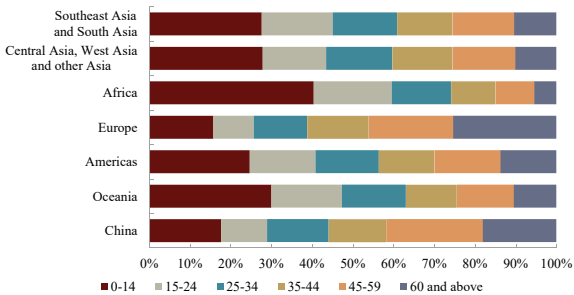
China’s reform and opening up has integrated the country into the global economy. The country has gradually emerged as an important economic force as its economy grows. Its economic development has started to generate positive externalities to the global economy.

1.2.1 China and BRI Countries Are Complementary in Factor Endowments

From the perspective of factor endowments for development, China and BRI countries complement each other in three ways. First, they have complementary population age structures. The overall population of BRI countries is large and young, and their labor force potential has not been fully realized. We see room for improvement in the quality of the labor force of BRI countries. The population of BRI countries reached 3.7 bn in 2021, of which people aged 0–14 and 15–24 accounted for 31% and 17%, much higher than the 18% and 11% in China (Fig. 1.3).

Second, most BRI countries rely on natural resources exports, complementing China’s status as a global manufacturing hub. According to the United Nations,

Fig. 1.3 Population age structure of BRI countries. *Note* Data from the year 2021. *Source* UN, CICC Global Institute



countries whose resource exports account for more than 60% of the value of their goods exports are resource-dependent countries. By this standard, 90 of the 151 BRI countries are resource-dependent. These countries are generally lackluster in industrial development and need to import manufactured goods to meet their production and consumption needs. Although most countries can earn foreign exchange by exporting resources, they collectively run a trade deficit.

Third, some BRI countries face capital constraints, while China has available capital to invest in these countries. The less developed BRI countries have low production efficiency that constrains economic development due to their weak capital formation capacity and insufficient technology and R&D investment. The capital stock per capita of low-income and lower-middle-income BRI countries were US \$3000 and US \$11,000 in 2019,⁹ about 2% that of the US and less than 8% that of Japan. China had capital stock per capita of US \$46,000, lower than developed countries but much higher than most BRI countries.

1.2.2 China's High Savings Rate and Macro Rebalancing Have Implications for the World Economy

In addition, China's high savings rate has implications for the world economy. China's savings rate has long stayed above 40%, much higher than the US, which has higher GDP and GDP per capita. With China's economy now the world's second largest, China's high savings rate means massive savings. China's share of global savings rose rapidly after its WTO accession, leaving Japan, the US, and the EU behind (Fig. 1.4), and the country accounts for nearly a third of global savings by 2020s.

A country with high savings usually runs a trade surplus, which means outward investment. For example, the US ran a large trade surplus after the Second World War, which laid the foundation for its European Recovery Program (commonly known as the Marshall Plan). With the Marshall Plan, the US established the US dollar as the world currency while assisting Europe with the post-war recovery. Japan experienced similar expansion of outward investment during the course of its development. Japan began to systematically increase its outward investment in the 1970s, especially in Southeast Asia, and yielded favorable results.

When China's savings exceed domestic investment demand, it needs to convert savings into trade surplus and net outward investment to achieve macro balance. For some time, China's main trading partners were developed countries, with the US being the largest source of China's trade surplus, and the US Treasuries being the largest single investment in China's foreign exchange reserves. However, after the global financial crisis in 2008, developed countries became determined to balance

⁹ Source IMF Investment and Capital Stock Dataset (1960–2019), World Bank. Capital stock consists of government, private and public-private partnership (PPP) sectors, and is measured in 2017 constant international dollars. Capital stock per capita is the average of countries in each income group.

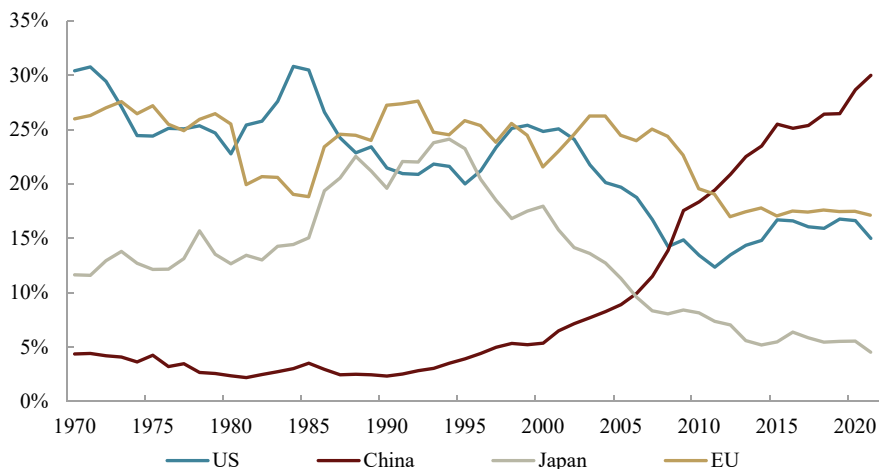


Fig. 1.4 Major economies' share of global savings. *Source* World Bank, CICC Global Institute

their economies. As the US pursued trade rebalancing in the past decade, trade frictions between the US and China increased. Developed countries are also seeking to adjust global supply chains amid the impact from the COVID-19 pandemic and the Russia–Ukraine conflict. Such adjustments in global supply chains are moves by developed countries to adjust their economic and trade relations with China, in our view.

As China faces a new global economic landscape, we believe that the country also needs to rebalance its economy. China strives to balance the gap between its savings and domestic investment by expanding both consumption and domestic investment. Meanwhile, we think it also necessary for China to rebalance both its trade surplus and outward investment between developed and developing countries. In a sense, the BRI reflects China's adjustment to its overseas investment focus—i.e., a shift in net outward investment from government bonds in developed countries to physical assets in BRI countries. We believe this is necessary for China to achieve equilibrium in balance of payments in the current international macroeconomic environment.

1.2.3 *Spillover from China's Economies of Scale*

The large size of China's economy is another of its distinguishing features. Past experience suggests that large economies can generate spillover effects in areas such as investment, trade, technology, and finance. Thanks to its enormous economic size, China's development has positive externalities that are reflected in four aspects.

First, China's strong production capacity advantages backed by economies of scale have enabled it to build world-class infrastructure in a relatively short period of time and become highly competitive in the international infrastructure market.

Second, China's large market demand makes global terms of trade favorable to developing countries. The country not only exports a large amount of manufactured goods, but also imports commodities such as energy and raw materials on an unprecedented scale. As a result, developing countries' terms of trade have improved.

Third, based on its domestic consumer market and export capacity, China has developed a technological innovation system consisting of the government, the market, companies, and universities. The country can leverage the system to drive technological progress in low- and middle-income BRI countries through investment and trade. Many of its technologies can be combined with the labor force and resources of low- and middle-income countries to achieve technology spillover and diffusion to such countries.

Fourth, the structural changes in China's factor endowments and technological upgrading achieved by its development have enabled Chinese companies to go global. In this process, China's financial capabilities have also expanded to countries in the supply chains.

1.3 The BRI in the Past Decade: Refining the Blueprint

In the past decade, the BRI has turned from a concept and vision into action and reality. The development of the BRI can be divided into several stages. In 2013–2018, the overarching plan was established. In 2018, China called for joint efforts to promote the high-quality development of the BRI and advanced results-oriented implementation of projects, similar to how an architect refines a blueprint.¹⁰ In 2021, with the global economy undergoing major changes, China attached more importance to risk management and sustainable development in advancing the BRI, and emphasized high-standard, sustainable, and people-centered progress.¹¹

1.3.1 China is Rebalancing Foreign Trade and Outward Investment Towards BRI Countries, and Facilitating RMB Internationalization

After the 2008 global financial crisis, developed countries have shifted to policies such as supply chain reshoring and trade barriers amid the relocation of manufacturing industries and the widening trade deficits with China. As US economic growth slowed, developing economies, notably emerging market countries in Asia, have grown rapidly and become new forces in the global economy. Against this backdrop, the BRI proposed in 2013 has created a new pattern of China's all-round opening up. An important development has been the rebalancing of China's foreign trade and outward investment from developed countries to BRI countries.

¹⁰ https://www.gov.cn/xinwen/2018-08/27/content_5316913.htm.

¹¹ http://www.news.cn/english/2021-11/20/c_1310321390.htm.

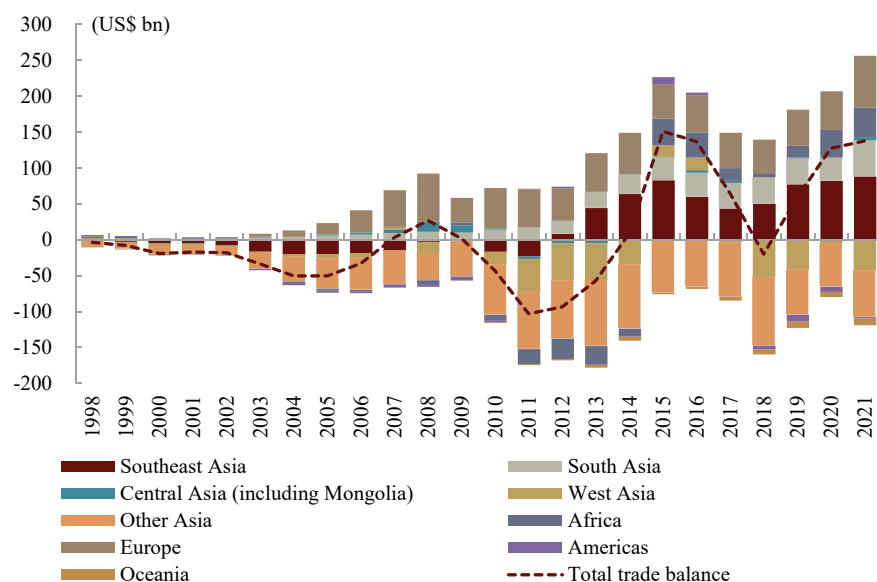


Fig. 1.5 Trade balance between China and BRI countries. *Note* Other Asia only includes South Korea. *Source* Chinese Ministry of Commerce, Wind, CICC Global Institute

The rebalancing of China's foreign trade was first evidenced by the rapid increase in its trade with BRI countries. China's trade with BRI countries grew at an average annual rate of 6% from 2013 to 2021, about 1ppt higher than the growth rate of China's overall trade. China has gradually developed into an important trading partner of BRI countries. According to UN Comtrade, China was already the largest trading partner of 35 BRI countries in 2021.¹²

Second, China has expanded its trade advantage over BRI countries and turned from a trade deficit to a trade surplus with BRI countries (Fig. 1.5). BRI countries accounted for 20% of China's trade surplus in 2021, while the shares of the US and the EU in China's trade surplus have declined in the past two decades. From the perspective of trade structure, BRI countries remain an important source of raw materials for China, and trade in supply chains and manufactured goods has started to contribute to China's trade surplus with BRI countries.

Overall, China has formed a stable trade structure with BRI countries—it is a net importer of fuel and primary industrial supplies from BRI countries, and a net exporter of capital goods and consumer goods to BRI countries. Meanwhile, China's trade structure with different BRI countries varies. In 2019, China recorded trade surpluses with BRI countries in Southeast Asia, South Asia, Central Asia, Africa, and Europe, and trade deficits with BRI countries in West Asia, the Americas, and Oceania. China's trade surplus with Southeast Asia and Europe is mainly attributed to capital

¹² *Source* UN Comtrade. Some countries did not disclose trade data by country. Statistics here are based on countries that disclosed related data, with trading partners being single countries.

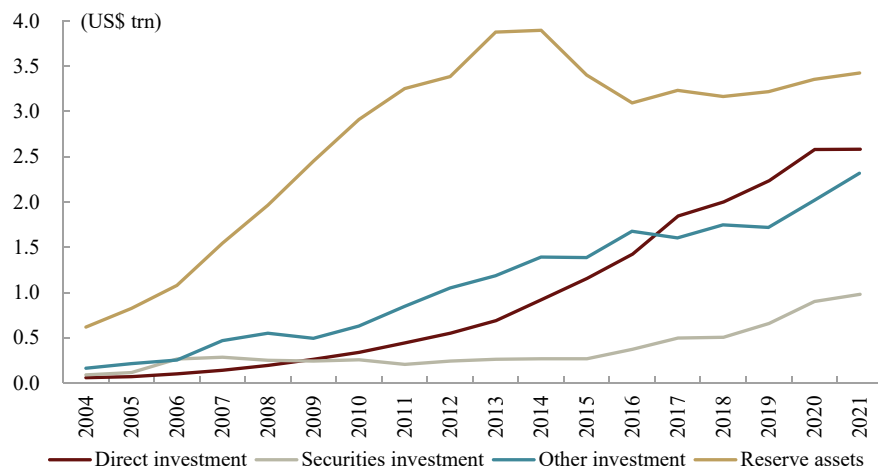


Fig. 1.6 Changes in China's outward investment assets. *Note* Since the dollar amount of financial derivatives is small, it is not shown in this figure. *Source* State Administration of Foreign Exchange of China, CICC Global Institute

goods (excluding transportation equipment). China cooperates closely with South-east Asia on production capacity, and machinery is a main capital goods category for China's exports to Southeast Asia. Electrical appliances and electronic equipment make up a larger proportion of China's capital goods trade surplus with Europe. West Asian countries and South Korea were the main sources of China's trade deficit.

China needs to convert its trade surplus into outward investment to maintain equilibrium in balance of payments. BRI countries are mostly developing economies whose financial markets are less developed and whose real economies urgently need to develop. China's outward investment has accordingly shifted from financial investment in developed countries to physical investment in BRI countries.

As China's outward investment shifts from financial investment in developed countries to physical investment in BRI countries, China's foreign exchange reserve assets held in US Treasuries as a percentage of its total outward investment assets have declined from 63 to 35% in the past decade, while the shares of foreign direct investment assets and other investment assets, mainly loans and trade credit, have continued to grow (Fig. 1.6). Foreign direct investment and bank lending have become the main forms of physical investment in BRI countries. As of end-2021, China's cumulative investment and financing in BRI countries amounted to nearly US \$1.3 trn. Most of the investment and financing took place after the BRI was proposed, with more than 70% being bank loans.¹³ China's annual new investment in BRI countries is equal to just over 1% of its GDP, still smaller than the ratio of its trade surplus to GDP.

¹³ *Source* Ministry of Commerce of China, State Administration of Foreign Exchange of China, Wind.

China's physical investment in BRI countries is based on its comparative advantages, focusing on infrastructure and industries. At least 58% of China's direct investment in BRI countries in 2013–2021 going to infrastructure construction (mainly transportation and energy infrastructure), and more than half of China's non-aid loans to BRI countries going to infrastructure construction-related industries. One of China's approaches to developing industries in BRI countries is building industrial parks, where countries can improve their business environment and reduce transaction costs to promote technological innovation and industrial upgrading. As of end-2021, Chinese companies had invested a total of US \$43.08 bn in the construction of industrial parks in BRI countries.¹⁴

The rebalancing of China's foreign trade and outward investment towards BRI countries also creates favorable conditions for RMB internationalization. As China's trade with and investment in BRI countries increase, infrastructure construction for facilitating cross-border RMB usage continues to advance. As of end-July 2022, China had made bilateral currency swap arrangements with more than 20 BRI countries and RMB clearing arrangements with more than 10 BRI countries.¹⁵ The RMB has become more commonly used under the BRI. Cross-border RMB settlement between China and countries along the Belt and Road reached Rmb5.42 trn in 2021, accounting for 14.8% of total cross-border RMB settlement in the same period.¹⁶ The strengthened economic cooperation and trade between China and Saudi Arabia as well as other countries since 2022 may increase RMB settlement and present further opportunities for development of RMB internationalization.

1.3.2 Provision of International Public Goods: “Hard Connectivity” of Infrastructure and “Soft Connectivity” of Rules

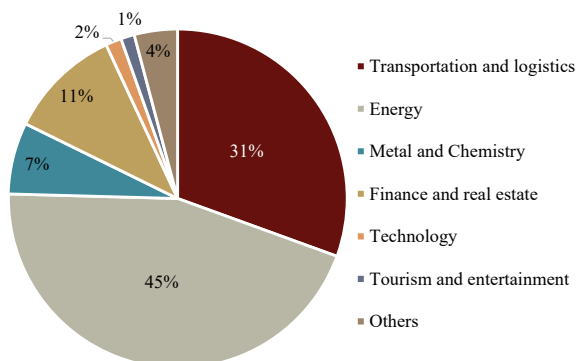
BRI countries' economic development faces constraints of “hard” infrastructure and “soft” conditions. For the constraints of “hard” infrastructure, some BRI countries' poor infrastructure leads to high trade costs and hampers industrial agglomeration and economies of scale. The constraints of “soft” conditions mainly come from the international environment. The existing international economic system does not fully take into account the interests of BRI countries. As a result, BRI countries could suffer a loss of efficiency under the existing international rules. The BRI, as a public good that China provides to the world, aims to enhance the connectivity of not only infrastructure, but also rules and standards, so as to reduce obstacles to the development of BRI countries.

¹⁴ <https://www.yidaiyilu.gov.cn/ydyjlzn.htm>.

¹⁵ <https://www.yidaiyilu.gov.cn/ydyjlzn.htm>.

¹⁶ <http://www.pbc.gov.cn/en/3688241/3688636/3828468/4601761/4720798/2022112414551596783.pdf>.

Fig. 1.7 Industry distribution of construction projects that China implemented in BRI countries. *Note* Calculated by dollar amount of construction projects. Time range from 2013 to 2021. *Source* AEI, CICC Global Institute



Infrastructure construction under the BRI focuses on “removing weaknesses” and “promoting connectivity”. In terms of removing weaknesses, China provides infrastructure leveraging its capacity and advantages in infrastructure construction. Transportation infrastructure and energy projects together accounted for more than 75% of the value of construction projects that China implemented in BRI countries over 2013–2021 (Fig. 1.7). In terms of promoting connectivity, the BRI focuses on building international corridors and strives to improve cross-regional and cross-border access so as to break through spatial constraints of factor endowments, facilitate cross-regional factor flows, and boost economic vitality along the Belt and Road. It has formed a main framework consisting of six corridors, six connectivity routes, and multiple countries and ports.

For “soft connectivity”, the BRI serves as a supplement to the current international economic and trade rules and governance system, and provides incremental global public goods in terms of rules and standards. It has brought together a wealth of cooperation platforms and mechanisms, and has been advancing under existing bilateral and multilateral international cooperation frameworks. The BRI adopts open and inclusive guidance through “soft laws” to accommodate differences among different countries and reach open cooperation intentions. The specialized cooperation initiatives formed under the BRI fully recognize the realities of development of each country, and help BRI countries build a system of rules according to their own interests in the international arena.

1.3.3 BRI Promotes Economic Growth of Participating Countries

Overall, we believe that the BRI has had significant positive effects on the economic growth of participating countries. The World Bank estimates that BRI transportation projects could increase trade in economies along the routes by 2.8–9.7%,¹⁷ increase foreign direct investment (FDI) inflows to low-income economies along the

¹⁷ The World Bank report’s analysis covers 71 economies.

routes by 7.6%, and increase real income by 1.2–3.4%.¹⁸ To be specific, the BRI promotes the economic growth of participating countries through investment, trade, and innovation.

Investment: On the supply side, the construction of infrastructure and industrial parks under the BRI directly stimulate economic growth. Infrastructure construction has a multiplier effect, and can drive growth of other industries. For example, the construction and opening of the Mombasa-Nairobi Standard Gauge Railway can boost Kenya's GDP growth by at least 2%.¹⁹ On the demand side, jobs created by the construction of infrastructure and industrial parks increase worker income, boost consumption, and drive economic expansion. As of end-2021, the industrial parks that China built in BRI countries created a total of 346,000 local jobs.²⁰

Trade: Infrastructure construction and the implementation of trade facilitation measures such as customs clearance under the BRI can effectively reduce transportation and labor costs and increase regional trade activity. According to WTO calculations, improved trade facilitation conditions could reduce the cost of trade among BRI countries by 12–23%. Analysis by Joanna Konings, senior economist at ING, suggests that if the cost of trade among BRI countries is halved, world trade could increase by 12%.²¹

Innovation: Innovation is the ultimate driving force for economic growth. BRI countries' disadvantages in R&D and innovation may further widen their "development gap" and "technology gap" with leading countries. China has accumulated experience in "catch-up" innovation over the course of its development, and it can provide useful experience for BRI countries so that they can leverage innovation to boost their economic vitality. As of end-2021, China had established scientific and technological cooperation relationships with 84 BRI countries, and invested a total of Rmb2.99 bn to build 53 joint laboratories in agriculture, new energy, healthcare, etc.²²

1.4 Reflections and Insights

Reaching its 10th anniversary in 2023, the BRI faces a more challenging external environment (e.g., deglobalization). How could China combine its advantages in capital and experience with BRI countries' population and resource endowments, leverage its positive externalities in terms of infrastructure construction and market size, and move the BRI to the next stage? We believe high-level opening up is necessary for advancing the BRI.

¹⁸ <https://documents1.worldbank.org/curated/pt/448361569922674511/pdf/Main-Report.pdf>.

¹⁹ http://www.focac.org/zfgx/jmhz/202302/t20230216_11025770.htm.

²⁰ http://www.news.cn/world/2022-09/14/c_1129001397.htm.

²¹ https://think.ing.com/uploads/reports/Tradebelt_final2.pdf.

²² https://www.gov.cn/xinwen/2022-01/25/content_5670280.htm.

First, infrastructure is the basis for China's opening up to BRI countries and the development of related trade and investment. Regarding the sustainability of infrastructure projects, we believe China can focus on higher-quality projects, leaning towards projects with higher returns and strengthening public-private partnerships in the construction of industrial parks. Given the high risk premium of BRI countries, China can diversify financing risks and resolve debt problems through multilateral cooperation.

Second, China proposes to steadily expand institutional opening up with regard to rules, regulations, management, and standards. We believe this requires China to: (1) Further enhance its scientific and technological innovation capabilities and strengthen its technology spillover to BRI countries; (2) play a role in the formulation of international rules and standards and help BRI countries better cope with constraints on new development; and (3) attract high-end talent to China through institutional opening up, bring together innovative factors of production of BRI countries, and expand the scale and scope of innovation activities.

Third, China aims to be a highly active participant in the global industrial division of labor and cooperation. This requires the country to further deepen cooperation with the global economy through trade, investment, and supply chain integration on the basis of its comparative advantages. For example, China could cooperate with BRI countries in Southeast Asia with low labor costs and low tariffs in renewable energy industries such as photovoltaic and wind power. On the demand side, China could open up its large domestic market further and explore the potential of BRI countries' diversified markets.

Fourth, China proposes to maintain a diversified and stable international economic landscape and economic and trade relations. This requires China to maintain and improve multilateral mechanisms such as the WTO; actively develop regional plurilateral economic and trade rules; better integrate the BRI with existing international economic, trade and investment rules; and mobilize a wider range of international forces to participate in the BRI. China playing a greater role in the formulation and maintenance of relevant international rules could help strengthen its diversified economic and trade ties with BRI countries.

Finally, China aims to promote the internationalization of the RMB in an orderly manner. In the closed investment and trade loop between China and BRI countries (China investment—import of Chinese goods—export of primary goods to China), the circulation of currencies between them serves the circulation of goods, helping to reduce financing costs. This circulation is enhanced by the fact that China and BRI countries are complementary to each other in trade. When trade between a BRI country and China is large enough, the use of RMB in bilateral trade and investment reduces exchange rate risks compared with use of the US dollar. China can launch more RMB-denominated products, develop the function of the RMB as a store of value, and build a closed loop of investment and financing based on RMB settlement and denomination in cross-border trade, so as to advance the BRI in a steady and sustainable manner in the long term.

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Chapter 2

Establishing an Open and Sustainable Belt and Road Innovation System



Abstract Cooperation in innovation among China and Belt and Road Initiative (BRI) countries has not been a focus of the BRI so far due to an insufficient foundation in and relatively low demand for technological innovation in these countries. However, the fracture in the G-2 (US and China) innovation model has exposed the issue of a lack of endogenous growth momentum in the developing world, highlighting the necessity and importance of cooperation in innovation among China and BRI countries (i.e., G-N innovation model). Such cooperation will bring three major benefits to China and BRI countries, in our opinion. First, it could consolidate resources for innovation, and create innovation cycles. Second, it could enhance the intensity, cohesiveness, and sustainability of cooperation in innovation. Third, effective cooperation in innovation among China and BRI countries could pave the way for China to cooperate with advanced economies like Europe and the US, countering deglobalization and enhancing the openness of the global innovation environment.

The transnational innovation system (TNIS), a system wherein entities that focus on technological innovation (including governments, corporations, research institutions, and intermediaries) collaborate in conducting cross-border innovation, is indispensable to cooperation in innovation among China and BRI countries. A TNIS may be classified into four categories based on ways of knowledge creation and types of market demand. Restricted by their individual conditions and the external environment, BRI countries require strategies and tactics that will empower them to work toward set priorities when building the TNIS.

According to Binz & Truffer (2017), TNIS can be further divided into four categories based on the technological innovation dimension and the market demand dimension. “Footloose TNIS” refers to innovations that are science and technology driven (STI) and cater to standard market demand (i.e., market demand is homogeneous and there is no need to adapt to specific markets); “market-anchored TNIS” suggests that innovations rely on STI mode, but target customized market demand, meaning the innovations should be rooted in circumstances in a specific region or country; “spatially-sticky TNIS” refers to innovations that are entirely opposite to those in “footloose TNIS”, i.e., the innovations are categorized as learning-by-doing, using, and interacting (DUI), and they cater to customized market demand;

Author: ZHOU Zipeng, LIU Xinran, LI Zhiyuan, LU Qu, LIU Mengling, LI Na, XIONG Duwen.

“production-anchored TNIS” also focuses on innovations that are DUI-driven, but follow standard market demand. The four TNIS require different types of system to facilitate innovation, and we think it is of strategic importance that BRI countries initially prioritize footloose TNIS and spatially-sticky TNIS before embarking on production-anchored and market-anchored TNIS. This should help connect the BRI innovation system with the global innovation system, and prevent the formation of an isolated island in the field of technological innovation.

For footloose TNIS, we believe that governments of BRI countries could play a more important role in increasing investment in innovation. The intensity and diversity of stimulus policies on transnational scientific research should be enhanced, and innovation centers can be built to capitalize on the agglomeration effect, thus improving productivity, efficiency, and knowledge pooling. In addition, we think that institutional coordination among China and BRI countries can be strengthened to reduce friction in technological cooperation. While Western countries have long focused on frontier technologies, we believe that China and BRI countries should establish innovation cycles of R&D and commercialization for sub-frontier technologies.

For spatially-sticky TNIS, we believe that the innovation supply and demand in niche markets should be better matched. In our opinion, transnational intermediary businesses such as consulting, venture capital, and private equity can be encouraged to facilitate the consolidation of BRI markets, while production- and market-anchored TNIS may serve as a bridge between BRI innovation and global innovation. As the BRI innovation system improves, we believe that open and inclusive cooperation can help attract innovation entities from Europe and the US, boosting the inclusiveness of the global market.

2.1 From G-2 to G-N: New Challenges Facing the Global Innovation Model

2.1.1 Deglobalization is Challenging the G-2 Innovation Model

Over the past 20 years, innovations worldwide were mainly implemented under the G-2 model, in which the US developed frontier technologies and profited from the commercialization of these technologies. The US has been the global innovation center since the Second World War, and the global leader in R&D investment for decades. A well-established education system, strong innovation atmosphere, and enthusiasm for science contributed to continuous breakthroughs in basic science in the US, leading to its solid leadership in cutting-edge innovation. In the early twenty-first century, the US began to swiftly commercialize its innovations through the manufacturing systems and large-scale markets in developing countries like China. The profits, in turn, helped sustain innovation in the US. As part of this process, China also enhanced its own technological strengths. The G-2 innovation model not

only lowered the cost of using these innovations, but also propelled technological advances worldwide.

Nevertheless, the G-2 innovation model cracked under increasingly intense competition between the great powers. Europe and the US introduced restrictive policies on high-tech companies to curb the transfer of frontier technologies to other countries that were gaining on the global leaders. This has led to deglobalization in technological cooperation. In addition, as leaders such as Europe and the US attempt to bring manufacturing back home and reduce reliance on manufacturing imports from a single country like China, they are contributing to the creation of an “alternative” supply chain. Coupled with restrictions on exports of key components, we believe this has given rise to deglobalization in trading. Although China has strengthened innovation capabilities in basic science within fields such as high-speed railway and aerospace, it is still challenged by restrictions imposed on developing countries pertaining to most cutting-edge technologies. We believe that fields closely correlated with the mass market may be more affected.

2.1.2 Cooperation in Innovation with BRI Countries is an Option

With the G-2 innovation model no longer functional, the cross-border cooperation in innovation system needs restructuring. In the context of the challenges facing the G-2 innovation model, building an innovation system with like-minded BRI countries has become an option for China. We might call this structure the “G-N” innovation model. Its aim would be to facilitate the consolidation of human capital and scientific knowledge, expedite innovation and technological advancements, and help China avoid the middle-technology trap.¹ Moreover, the large-scale and multi-layered consumer markets of BRI countries may pave the way for the commercialization of innovation. Hence, we expect the G-N cooperation cycle to stimulate endogenous growth, and to enhance the sustainability of innovation in China and BRI countries, leading to mutual development (Fig. 2.1).

To begin with, the similarity in circumstances and core interests of China and BRI countries lays a solid foundation for establishing a new G-N innovation model. China and BRI countries face technological restrictions, setbacks in innovation, and a lack of endogenous growth momentum. They also share similar core interests as developing countries. This lays a solid foundation for G-N cooperation in innovation. We evaluate the similarity of national interests based on the results of 602 votes at

¹ The “middle-technology trap” describes a scenario in which developing countries benefit from industrial transfers due to their low-cost advantages, but face long-term economic stagnation when the advantages diminish, and developing countries face challenges to catch up with the core technologies retained by developed countries. Source <https://economictimes.indiatimes.com/news/international/world-news/china-faces-middle-technology-trap-warns-official-think-tank/articleshow/106065883.cms?from=mdr>.

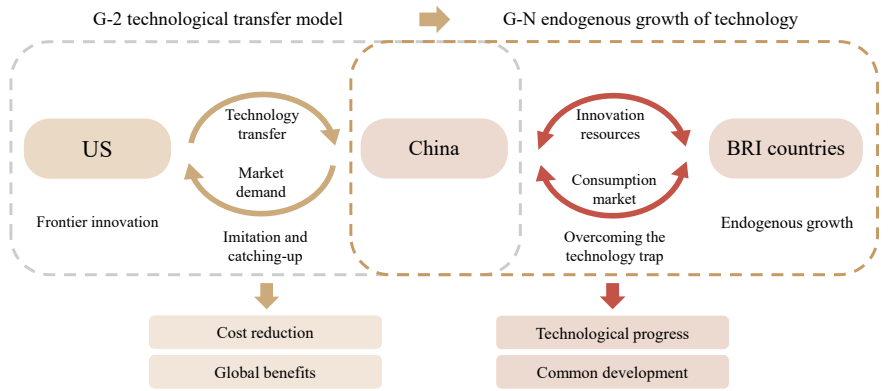


Fig. 2.1 Restructuring of cross-border innovations: From G-2 to G-N. *Source* CICC Global Institute

the UN General Assembly by the top 75 countries in terms of total GDP over 2016–2021 (Fig. 2.2). Overall, we believe that these results indicate that China has strong diplomatic relationships with BRI countries, making it easier to cooperate with them in innovation.

Second, we believe the market-driven cooperation in innovation among China and BRI countries (G-N innovation model) may leverage the “1 + 1 > 2” effect, with partnerships creating more value than the sum of the value generated by each participant. This could better connect supply and demand, as well as stimulate innovation cycles with endogenous growth (Fig. 2.3). On the supply side, BRI countries have innovation resources that are complementary to China to some extent, and we believe they will provide a foundation for technological R&D during cooperation in innovation. At the same time, BRI countries possess the necessary human capital

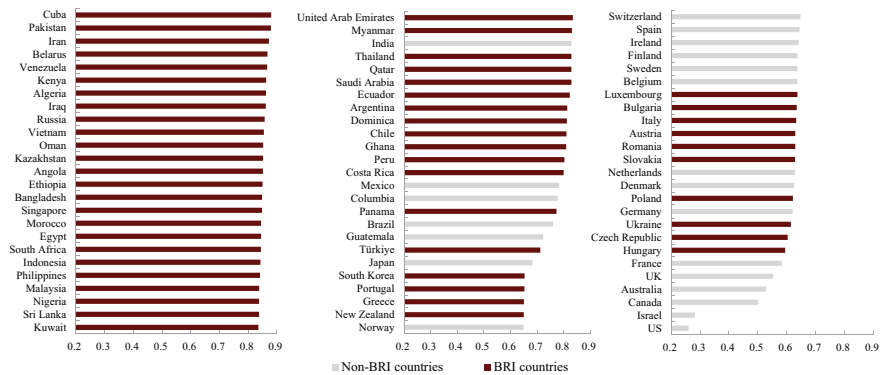


Fig. 2.2 Similarity of votes by China and other countries at UN General Assembly (2016–2021). *Note* Only 2019 data for top 75 countries by GDP according to UNCTAD (GDP over US \$63 bn) included to exclude the impact of COVID-19. *Source* Erik Voeten, etc. (2017), UNCTAD, CICC Global Institute

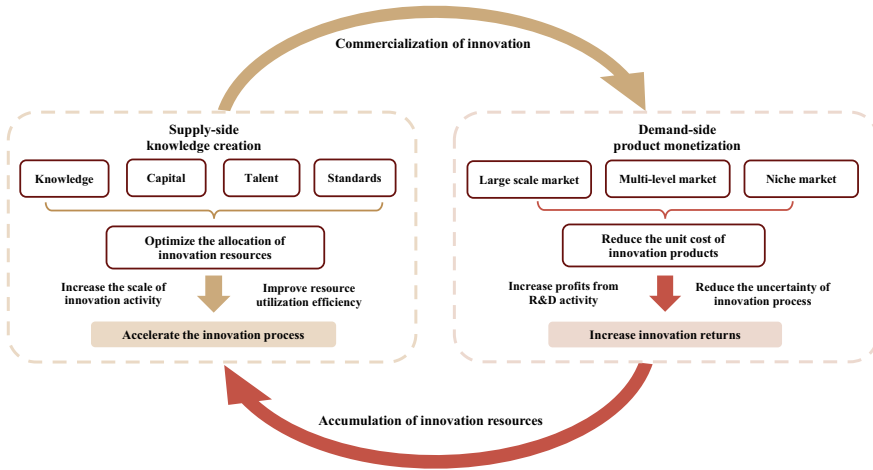


Fig. 2.3 Cross-border cooperation in innovation may be a better conduit for resources. *Source* CICC Global Institute

and scientific expertise to support technological R&D. As of 2022, China and BRI countries accounted for around two-thirds of the global population²; around 400 mn of people in China and BRI countries had received higher education, with the total number of those employed in the R&D sector exceeding 16 mn. BRI countries in different regions specialize in various scientific disciplines, complementing China's own resources in terms of human capital and scientific knowledge.

On the demand side, the broad and diverse markets of BRI countries may facilitate the commercialization of innovation. BRI countries mostly comprise medium-to low- level consumers, making them potential niche markets for the existing mature technologies in the G-N innovation model. Catering to market demand in BRI countries may help China expedite the commercialization of various innovations, and accumulate funding and knowledge for the R&D of more advanced technologies, in our opinion. Furthermore, BRI countries span Eurasia, with some in Africa and Latin America. The broad geographical distribution, diverse cultures, and differentiated levels of development create multi-layered market demand for innovation.

Third, intensity, cohesiveness, and sustainability of cooperation are likely to be enhanced. Unlike government-backed infrastructure projects, innovation activities involve multiple entities, require longer-term cooperation, and are more reciprocal. This helps enhance trust between different entities, and reinforces the cohesiveness and sustainability of cooperation among China and BRI countries. Compared to most BRI countries, China holds visible advantages in innovation, and also ranks higher in comprehensive innovation capability.³ Therefore, BRI countries are likely to improve their own levels of innovation by cooperating with China, and several

² <https://www.cfr.org/backgrounder/chinas-massive-belt-and-road-initiative>.

³ WIPO, Global Innovation Index 2022: What is the future of innovation-driven growth? <https://www.globalinnovationindex.org/gii-2022-report>.

projects have already been initiated. For example, a technology company in Vietnam imported several pieces of production equipment for solar water heaters from China via China-ASEAN Technology Transfer Center, and the Emirate of Dubai received a donation of 1 mn units of water-saving irrigation equipment via the China-Arab States Technology Transfer Center.⁴

Finally, we believe that effective cooperation in innovation with BRI countries may reduce obstacles to China's cooperation with non-BRI countries, hence countering deglobalization and enhancing the openness of the global innovation environment. Cooperation in innovation among China and BRI countries may expedite innovation in cutting-edge technologies, and technological advancements may help break the monopoly of Western economies such as Europe and the US. In turn, Western countries may consider it in their best interest to ease restrictions on these technologies. For example, China independently developed the high-performance computer Shuguang-1 in the early 1990s, driving Europe and the US to lift the ban on exports of computers capable of less than 1 bn calculations per second to China. The commercial value created from cooperation in innovation among China and BRI countries and the enhancement of their technological strength might weaken the impact of technological restrictions, thus attracting more European and US companies to join in the cooperation. As such, a more open and sustainable global innovation environment may become possible.

2.2 Lack of Support: Considerable Room for Improvement in G-N Model for Cooperation in Innovation

2.2.1 BRI Cooperation in Innovation Has a Short History, and Shows Path Dependency

The history of the BRI is nascent compared to that of international cooperation in innovation, and building an effective cooperation system between different countries takes time. The BRI was proposed in 2013, but it was not until 2016 that government departments, including the Ministry of Science and Technology (MOST), issued plans for cooperation in technological innovation among China and BRI countries.⁵ MOST launched the first 14 BRI laboratories in 2019, and another 39 in 2020 and 2021. These labs are new and few, and are mainly used for technical assistance and teaching purposes. Their major hurdles include limited scope for cooperation and insufficient coordination between industrial deployment, talent recruitment, and technological development.⁶

⁴ http://www.stdaily.com/guojishiidian/2020-09/14/content_1017872.shtml.

⁵ https://www.most.gov.cn/tztg/201609/t20160914_127689.html.

⁶ http://www.rmhb.com.cn/zt/ydyj/202209/t20220920_800307173.html.

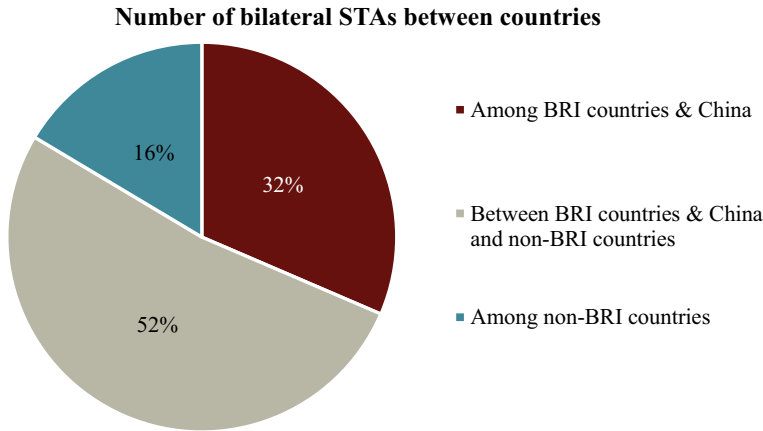


Fig. 2.4 Existing science and technology agreements between countries. *Note* Data between 2000 and 2020. *Source* WZB Berlin Social Science Center, CICC Global Institute

Cooperation in technological innovations among China and BRI countries is limited. The world’s top 76 economies signed a total of 591 bilateral science and technology agreements (STAs) over 2000–2020. Only 32% were signed among China and BRI countries, markedly lower than those signed between them and non-BRI countries (52%) (Fig. 2.4).

Moreover, BRI cooperation in innovation faces path dependency problems. Due to historical reasons, Europe and the US used to dominate cooperation in innovation among BRI countries, and global innovation still relies on the existing system built by Western countries, including organizational structure and talent exchange. Meanwhile, an effective system for the circulation of innovation resources and achievements is not yet available among BRI countries.

Judging by the overseas branches of research institutes, which are important for cross-border cooperation in innovation, non-BRI countries still play a dominant role in global cooperation in innovation. Of the existing 7,271 overseas branches of research institutes, only 332 or 5% are in BRI countries. In addition, the number of research institutes from BRI countries that have branches in non-BRI countries is also limited.

With Europe and the US dominating the intermediary agencies for cross-border innovation, the consolidation of innovation resources in BRI countries is also restrained. In 2022, over 80% of secretaries and project conveners at the International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) were from the 10 major standard-setting countries, and the proportion exceeded 50% at the International Telecommunication Union (ITU). Germany and the US accounted for the highest portion, while other countries with a large share were mostly from developed countries in Europe. China’s share of representatives at the three organizations was merely 10.4%, 6.1%, and 9.2%, and the proportion was lower for BRI countries.

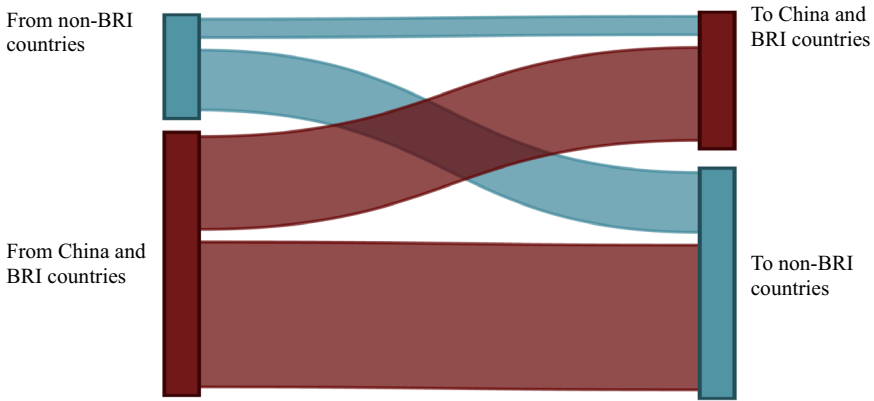


Fig. 2.5 Breakdown of overseas students by destination country (2022). *Note* Data as of 2021 for some countries. *Source* UNESCO, CICC Global Institute

Human capital, an important innovation resource, is flowing from China and BRI countries to non-BRI countries. As shown in Fig. 2.5, most overseas students in China and BRI countries prefer to study, work, and live in non-BRI countries, although the number of BRI countries is markedly larger than that of non-BRI countries. This indicates that BRI countries have yet to build a system for student exchange among themselves. Moreover, the exchange programs between China and BRI countries, mostly language-related or non-academic, still have room for improvement in terms of expertise and overall quality.⁷ This was mainly due to relatively weak capabilities for scientific research and teaching, and weak global influence in these countries.

2.2.2 China and BRI Countries Have yet to Establish Effective Innovation Cycles

China and BRI countries have yet to create effective innovation cycles from the perspectives of both the output of cooperation in innovation and market consolidation. The number of academic papers co-written by authors from China and BRI countries is limited, while cooperation between China and non-BRI countries is significantly more frequent. Over 2016–2020, scholars worldwide published 4.42 mn academic papers via transnational cooperation, of which 398,000 papers (about 10%) were a result of cooperation among scholars from China and BRI countries, and 2.21 mn papers (over 50%) were between scholars from BRI countries & China and non-BRI

⁷ Wei, H., Yuan, R., & Lai, D. (2018). Research on Factors Affecting China’s Appeal to Overseas Students: Empirical Analysis on Bilateral Data in China and 172 Countries. *Educational Research*, No. 11.

countries. This suggests that China and BRI countries have the capability for cross-border academic cooperation, but currently cooperate more with non-BRI economies like the US and Europe, which have stable innovation systems.

Cooperation in patent applications among China and BRI countries is also limited. Of the 8.19 mn patents completed via transnational cooperation over 2016–2022, around 74,000 or less than 1% were developed among China and BRI countries, while less than 30% were between BRI countries & China and non-BRI countries, and over 70% were among non-BRI countries.

Furthermore, in order to materialize, innovations eventually need to be commercialized. However, the lack of market consolidation among China and BRI countries adds to the difficulty in realizing their value. As of 2020, the average cost of trade among BRI countries and China equals 313.12% of production cost, significantly higher than 193.73% for trading among non-BRI countries. This indicates higher trade barriers among China and BRI countries. The cost of trade between BRI countries and other countries is also high, making it hard for BRI countries to industrialize and sustain innovation.

2.3 Planning Ahead: Core and Structure of TNIS

Cooperation in innovation among China and BRI countries may lay a solid foundation for technological advances and organic economic growth. Nevertheless, BRI countries have yet to create an effective cycle of innovation, and it is imperative to build a system to better allocate the necessary resources. It is thus important to introduce the TNIS, and clarify how it should be built among BRI countries.

2.3.1 *What is TNIS?*

Simply put, TNIS is a system wherein entities that focus on technological innovation (including governments, corporations, research institutions, and intermediaries) collaborate in conducting cross-border innovation. We believe that an effective TNIS will facilitate the circulation of innovation resources across countries, including knowledge, human capital, funding, market opportunities, and technology standards, thus creating a more efficient cycle between innovation demand and output.

The core of TNIS lies in the structural coupling of innovation entities at the transnational level, i.e., the interaction and integration of market opportunities and innovation resources through cross-regional linkage of internationally influential innovation entities. For example, multinational corporations can establish subsidiaries in various global regions to apply technologies and knowledge to specific market segments, while research institutions can build networks through international conferences. In addition, mechanisms to exchange technical expertise and that promote innovation

synergy and knowledge diffusion can be established, and standardization organizations can develop globally applicable technical specifications and product standards that provide a basis for division of international labor and cross-border trade. Finally, international financial institutions or consulting firms can collaborate with local counterparts to provide services for local companies. These are all examples of structural coupling of innovation entities at the transnational level.

TNIS for different fields of innovation activities, in which innovation entities coordinate in different ways, can have different characteristics. Innovation can be generally categorized into two types, STI and learning-by-doing, using, and interacting (DUI) innovation. STI is based on theoretical scientific breakthroughs, and is mainly circulated via papers, patents, and reports. The barriers to knowledge spillover are low. In contrast, DUI is based on experiential knowledge accumulated during production and from the interaction between producers and users. The barriers to knowledge diffusion and flow are high. From the perspective of market demand, innovations cater to standard demand (which means there is no need to adapt to specific markets and the homogeneity of value creation) and customization (which requires adaptation to various user preferences and production standards in different markets). The customization-based innovation should be rooted in circumstances in a specific region or country to satisfy user-specific heterogeneous demand.

A TNIS may be classified into four types depending on the characteristics of innovation and market demand⁸: (1) “Footloose TNIS”, which hinges on STI and operates within the standardized market (e.g., artificial intelligence, medicine, microchips); (2) “market-anchored TNIS”, which relies on STI, but targets niche markets (e.g., farm animal breeding, precision equipment, sewage treatment); (3) “spatially-sticky TNIS”, which is predicated on DUI and localized markets (e.g., pipeline valves, handcraft); and (4) “production-anchored TNIS”, which capitalizes on DUI and standardized markets (e.g., automobiles, clothing, furniture, Fig. 2.6).

2.3.2 Initial Priority for Footloose and Spatially-Sticky TNIS

We believe that BRI countries will need to decide whether to synchronously develop all four types of TNIS or to prioritize certain types. Judging by the external environment and internal conditions of BRI countries, we believe it is imperative to build footloose and spatially-sticky TNIS before embarking on market- and production-anchored TNIS.

The fracture in the current G-2 innovation model has exerted a greater impact on industries corresponding to footloose and spatially-sticky TNIS, and it is therefore more urgent for BRI countries to restructure these two types of TNIS. A common feature of footloose TNIS industries is rapid technological advancement, and the US is more likely to pose restrictions on such industries due to security concerns.

⁸ Binz, C., & Truffer, B. (2017). Global Innovation Systems—A conceptual framework for innovation dynamics in transnational contexts. *Research Policy*, 46(7), 1284–1298.

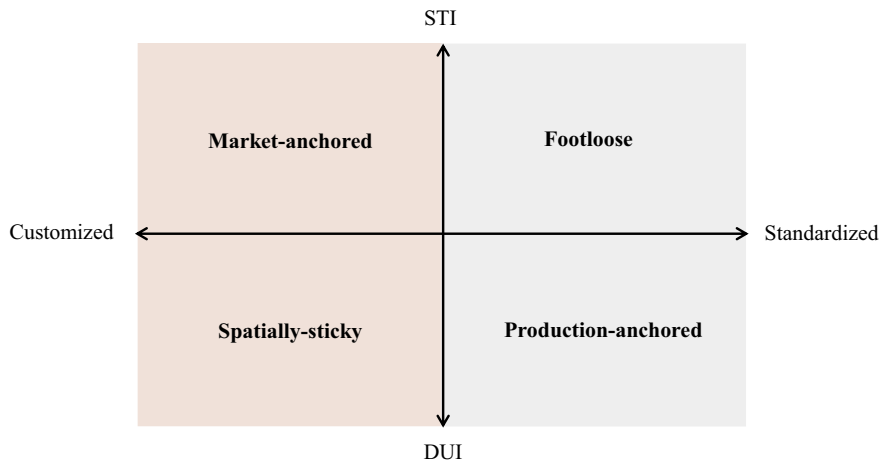


Fig. 2.6 Four types of TNIS. *Source* Binz & Truffer (2017), CICC Global Institute

Spatially-sticky TNIS industries have less impact on the US economy, but may also be restricted by the US. Hence, it is of strategic importance for China and BRI countries to develop a G-N innovation model that focuses on footloose and spatially-sticky TNIS.

In addition, we believe that strategic patience in constructing market-anchored and production-anchored TNIS may help build a more open transnational innovation system and put global innovation resources to better use. Production-anchored TNIS mainly involves sub-frontier industries, and the production technology is mature. Chinese companies enjoy advantages in production scale, technology, and cost, and China’s leading position in these industries makes it economically costly for the US to decouple itself from China in the innovation system. Market-anchored TNIS mainly targets specific niche markets, and poses limited challenges to the technological position of the US. We think market-anchored and production-anchored TNIS industries may pave the way for global cooperation in innovation, and prevent absolute isolation from the frontier of technologies.

2.4 From Strategy to Tactics: Priorities for the Construction of the BRI Innovation System

2.4.1 Focus on Sub-frontier Innovations in the Building of Footloose TNIS

For footloose TNIS, we believe that cooperation within the G-N innovation model can focus on the sub-frontier of technological innovation. Footloose TNIS emphasizes innovation in cutting-edge technologies, which is time-consuming, requires heavy investment, and has a high risk of failure. Since it may be difficult for BRI countries to develop the necessary capabilities for developing cutting-edge innovations over a short period of time, we suggest that they focus on the sub-frontier of technological innovations, which has a clearer path to development and implementation. Moreover, the market resources in BRI countries are highly complementary to China's technological strength, underpinning the construction of footloose TNIS for sub-frontier innovations.

At present, BRI countries generally do not allocate adequate resources for innovation such as human resources and capital toward the development of sub-frontier technologies, and the barriers to the flow of resources are high. The BRI innovation system is not yet capable of effectively concentrating human capital, and the number of overseas students majoring in the sub-frontier fields of technology in China is relatively small. The proportion of overseas students from BRI countries that study in China is currently not high, and nearly half of them major in liberal arts.⁹ A survey of overseas Ph.D. graduates in China from BRI countries¹⁰ shows that only 6.3% of them chose to work in China.

We believe that government investment in funding for this sector may be currently inadequate, and policies encouraging investment in scientific research are limited to some degree. Judging by direct capital input, China and BRI countries do not have a high budget for cooperation in innovation. For example, in 2013–2023, China's spending on scientific research under the BRI framework totaled less than Rmb3 bn. Policies in China that were favorable toward foreign investment in technological R&D mainly focused on tax reduction and exemption, such as a 10% cut to the income tax rate for high-tech companies, and the deduction of 175% of R&D expenses from pretax revenue. The stimulus is relatively weak and limited in scope compared with the various policy incentives adopted in Europe and the US (e.g., cash subsidies, loans, tax allowances, and patent boxes).¹¹

The barriers to the flow of innovation resources among China and BRI countries are high, and we believe that the institutional difference may hinder the agglomeration effect. China's cooperation with BRI countries remains at the early stage of removing

⁹ <http://edu.people.com.cn/n1/2018/0330/c367001-29899384.html>.

¹⁰ Li, Y., & Wu, D. (2022). Research on the Boost of Belt and Road Construction to Overseas Students in China. *China Scholars Abroad*, No. 9.

¹¹ Worldwide R&D Incentives Reference Guide, 2022.

“hard” barriers. As of June 2023, China had announced joint statements with 49 BRI countries in fields such as legal cooperation and intellectual property rights,¹² stressing the synergy between basic law and the regulatory system. However, without a multi-lateral cooperation framework and authorized entity, related disputes between BRI countries still pose a challenge.¹³

We believe that governments can centralize scientific research resources and increase input in public goods and incentives for scientific research as they seek breakthroughs in the sub-frontier of major technologies. Sub-frontier technologies still fall into the category of “scientific innovations” and have strong positive externalities. We believe that companies and research institutions may lack the willingness or capability to develop sub-frontier technologies, which is both time-consuming and expensive. Hence, we think governments may play a leading role in this aspect.

To expedite the supply of sub-frontier technologies, we think the government can set up scientific innovation centers in countries or regions with higher levels of economic openness. The agglomeration effect can be strengthened through division of labor and knowledge spillover, e.g., by establishing close connections among colleges, research institutions, and sci-tech companies in BRI countries, and providing funding and infrastructure facilities for the development of sub-frontier technologies like semiconductors and artificial intelligence.

Moreover, we believe the government may acquire and retain skilled personnel by launching special talent selection programs or scholarships and grants and introducing policies like preferential tax and residence permits. Considering the cultural and institutional differences between BRI countries, we believe a unified technology standard should be set to coordinate intellectual property protection, and digital technology can be used to expand the scope of cooperation.

2.4.2 Spatially-Sticky TNIS Matches Supply with Demand in Niche Markets

We believe that the spatially-sticky TNIS G-N innovation model should focus on niche markets in BRI countries, enhancing the efficiency of aligning technological expertise with the localized needs of different countries. Spatially-sticky TNIS industries can create niche markets in certain regions based on localized demand and enhance the match between existing innovations and potential demand in other regions. The G-N innovation model entails considerable scope for cooperation within numerous niche markets. BRI countries can mutually benefit from each other's stores of knowledge and transfer domestic mature technologies to other countries, enhancing the exchange of innovation. Furthermore, a precise match with demand

¹² https://www.fmprc.gov.cn/mfa_eng/wjbxw/202112/P020211218394332617729.pdf.

¹³ Dahlan, M. R. (2020). Envisioning foundations for the law of the belt and road initiative: rule of law and dispute resolution challenges. *Harvard International Law Journal*, 62, 1–21.

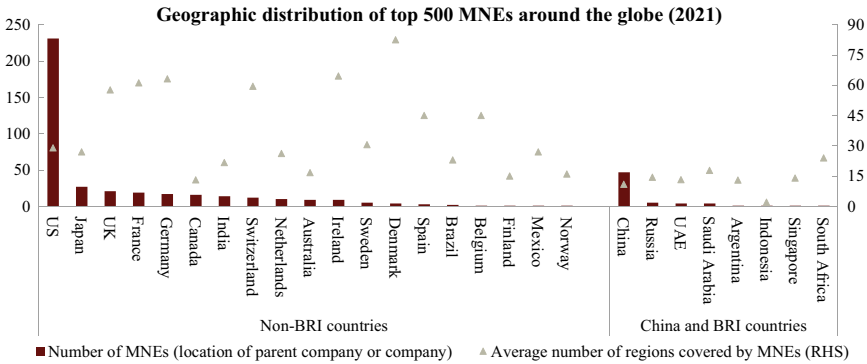


Fig. 2.7 Number of MNEs from BRI countries and overseas market coverage. *Note* Company location based on place of registration; for companies registered on Cayman Islands we use the location of parent companies. *Source* UNSD-OECD, CICC Global Institute

would improve cooperation and strengthen user stickiness, laying a solid foundation for future cooperation.

The lack of BRI-led intermediaries and supply–demand mismatch has resulted in insufficient structural coupling among multinational innovation entities in BRI countries. For example, cooperation networks for multinational innovation entities and their subsidiaries in BRI countries still need improvement. According to the United Nations Statistics Division-Organization for Economic Co-operation and Development (UNSD-OECD), among the global top 500 multinational enterprises (MNEs) and their about 122,000 subsidiaries in 2021, 82% of MNEs and 75% of subsidiaries were set up in non-BRI developed countries and regions, and they were the main builders of the global innovation network. Overseas branches of these MNEs on average covered around 38 countries and regions, nearly three times that of MNEs from China and BRI countries (around 14, Fig. 2.7).

Moreover, the current BRI innovation system lacks intermediaries like consulting firms, which are essential for spatially-sticky TNIS and mostly originate from non-BRI countries. This makes it difficult to match supply and demand in the innovation markets of BRI countries. Among the Forbes 2022 list of top global consulting firms, nearly 90% were from the US, Germany, the UK, and France. Moreover, non-BRI countries accounted for around three-fourths of the global consulting services market.¹⁴

Innovation intermediaries in BRI countries can be improved to reduce information asymmetry and transaction cost, boosting the coupling of other innovation entities. In the spatially-sticky TNIS system, knowledge creators and end-consumers are normally not in the same geographical region. This calls for interconnective channels to match supply with demand. Theoretically, companies and scientific research institutes can independently seek trading partners through MNE subsidiaries or branches;

¹⁴ <https://www.statista.com/statistics/1065188/management-consulting-market-size-country/>.

yet with the absence of a mature cooperation mechanism, establishing subsidiaries or branches in BRI countries may lead to major risks. Since a reliable cooperation network is unlikely to be established over the near term, we think it may be more practical to prioritize improving MNE intermediaries that focus on innovation and enhancing the cooperation between them.

We believe the issue of information asymmetry can be addressed through steps such as building an information sharing platform between BRI countries which consolidates data on national conditions provided by research institutes. Consulting firms for cross-border businesses and legal affairs can be established to link MNEs to local distribution channels and offer innovation entities information on local legislation and business prospects. In addition, innovation-oriented financial companies such as those focused on private equity and venture capital, and investment and commercial banks, can be developed to provide innovation entities with financial services such as financing, guarantees, and risk prevention, control, and management. This would help lower the trading cost of innovation. Furthermore, the transnational coupling in the early stage may incur a high fixed cost. We believe that the government can provide initial support for public goods such as information and start-up capital to facilitate the construction of transnational innovation intermediaries.

2.4.3 Market-Anchored and Production-Anchored TNIS Can Enhance the Openness and Sustainability of the Innovation System

After innovation entities and their transnational coupling improve, the market-anchored and production-anchored TNIS may continue to strengthen the BRI innovation system. Construction of market-anchored TNIS requires continued penetration into localized markets. There are three major ways to achieve this, in our opinion. Firstly, government-level conversation and cooperation can be strengthened, and a memorandum of understanding on cooperation can be signed to safeguard the lawful rights and interests of innovation investment and innovation products. Secondly, international intermediaries can be established to reduce or remove barriers to cooperation such as languages, tariffs, and standards, while financing, valuation, evaluation, and transaction services can be provided via international financial institutions. Thirdly, communication between countries exporting technology and those receiving it can be strengthened so as to provide technological guidance and help cultivate localized talent in receiving countries.

The establishment of production-anchored TNIS requires the continued promotion of a globalized market. In a production-anchored TNIS innovation system, knowledge is usually generated from localized industrial clusters. Innovations are verified in local niche markets, and then sold worldwide. The commercialization of innovations needs marketing in the global market. We believe it is therefore necessary to enhance MNEs' capabilities for overseas operations. For example, MNEs can

be encouraged to invest overseas, and participate in the M&A of local distribution channels. Marketing and aftersales services for innovation products can be strengthened to enhance brand image. Moreover, intermediaries for international marketing and consulting services can be established to prevent unnecessary losses.

Market-anchored and production-anchored TNIS innovations can serve as a bridge to prevent the BRI innovation system from becoming a technological “isolated island”. China and BRI countries boast intrinsic advantages in market-anchored and production-anchored TNIS cooperation. Developed countries currently have limited restrictions on these two types of industries, and this may serve as an entry point to enhancing the openness of the BRI innovation system. For example, the US, the UK, and Germany have expressed interest in cooperating with China in the construction of high-speed railways. Although such cooperation did not materialize due to various reasons, we do not rule out the possibility of such cooperation in the future given China’s visible advantages in such industries.

For market-anchored and production-anchored TNIS industries, we think China and BRI countries can enter Europe and the US market via MNEs, and start with basic transactions and market cooperation. As trading scales up, cooperation with Western scientific research institutions and governments can be gradually expanded from general technologies to cutting-edge technologies. Hence, China and BRI countries can strengthen their own innovation capabilities, and their leading position in some cutting-edge fields will attract developed countries to join the cooperation, in our view. Moreover, countries or entities willing to participate in the building of the BRI innovation system should be welcomed, setting a good example for global cooperation in the future.

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Chapter 3

Working Together Towards a Green Transition



Abstract China's outward investments have faced a global tightening of environmental constraints. Many BRI countries remain in the early stages of development, but they already face tighter ecological limitations. That is, BRI countries have to develop amid environmental restrictions, and this has brought many new changes to the BRI.

How will green constraints influence the development of BRI countries? Environmental economics uses an inverted U-shaped Environmental Kuznets Curve (EKC) to reflect the traditional development path of “polluting first and cleaning up later”. However, as the international community intensifies measures to address global environmental issues and as public awareness of environmental protection increases, we note that the EKC is flattening. This means that many developing BRI countries produce less pollution and emissions than developed countries did at the same level of development. Nowadays, developing countries need to follow a new path of green development that encompasses “cleaning up while developing”.

What are the challenges and opportunities facing BRI countries in taking the new development path? The key challenge is that tackling environmental issues at an early stage of development would raise costs of technology, energy, capital, and land. This in turn would constrain the development of energy, capital, and land-intensive industries, resulting in slow economic development and industrialization. However, the green transition also highlights the comparative advantages that many BRI countries have in resources such as new energy metals and clean energy. Developing countries also have labor cost advantages for developing mature green industries. While environmental constraints lead to higher green costs for BRI countries, the green transition process also empowers BRI countries to more actively engage their resources and labor forces in global industries. Green industries have the potential to become new economic growth drivers in BRI countries.

What can China do to help BRI countries develop under green constraints? The key is to help BRI countries seize green opportunities and reduce green costs. China has technological and financial advantages in the green transition. It can strengthen collaboration with BRI countries in green infrastructure and manufacturing, incorporating their resources in new energy metals, wind and solar resources, and low-cost

Author: CHEN Ji, WANG Shuai, JIANG Shurui, ZHAO Yang.

labor into the global green economy. This would enable BRI countries to benefit from the development of green industries. At the same time, China can help BRI countries cut green costs, encourage firms to apply higher emission standards, strengthen construction of social development projects, and promote establishing a cross-border environmental compensation mechanism. China can also share its own experience with BRI countries to help them break through green constraints in development.

3.1 A New Development Path for BRI Countries

Global environmental policies are becoming increasingly stringent as environmental awareness increases. We note that not only developed countries, but also many developing BRI countries, are tightening their environmental policies. According to the OECD, the Environmental Policy Stringency (EPS) of BRI countries such as Türkiye, Indonesia, and South Africa rose rapidly after the 1990s.¹ Many BRI countries already face tightening environmental constraints in the early stages of development. How will this affect the development of BRI countries? How can China better build a green BRI together with other countries?

To analyze the path of economic development for BRI countries under tightening green constraints, we begin with the relationship between the environment and development.² Environmental economics describes an inverted U-shaped relationship between a country's economic development and green environmental indicators—i.e., the Environmental Kuznets Curve (EKC). According to the EKC, as a country's GDP per capita grows, the level of environmental pollution first rises and then falls,³ a phenomenon described as “polluting first and cleaning up later”. Reducing carbon emissions, treating pollutants, and protecting the environment cannot be easily or quickly accomplished. The R&D of green technologies and purchase and operation of pollution control equipment will increase costs of companies, pushing up the green costs of economic development. In the early stages of economic development, the traditional path of polluting first and cleaning up later prioritizes economic growth at the expense of the environment.

However, as environmental constraints tighten, economists have observed a flattening of the EKC in developing countries.⁴ This suggests that developing countries produce less pollution and emissions than developed countries did at the same

¹ <https://stats.oecd.org/Index.aspx?DataSetCode=EPS>.

² This chapter focuses on developing countries rather than developed countries among BRI countries. At present, most BRI countries are developing countries, and most developing countries are also BRI countries. The core goal of the BRI is to help solve global development problems, and an important issue is how to balance the environment and development in BRI countries.

³ IBRD, World development report 1992: Development and the Environment, 1992.

⁴ Dasgupta, S., Laplante, B., Wang, H., & Wheeler, D. (2002). Confronting the environmental Kuznets curve. *Journal of Economic Perspectives*, 16(1), 147–168; Rasli, A. M., Qureshi, M. I., Isah-Chikaji, A., Zaman, K., & Ahmad, M. (2018). New toxics, race to the bottom and revised environmental Kuznets curve: The case of local and global pollutants. *Renewable and Sustainable*

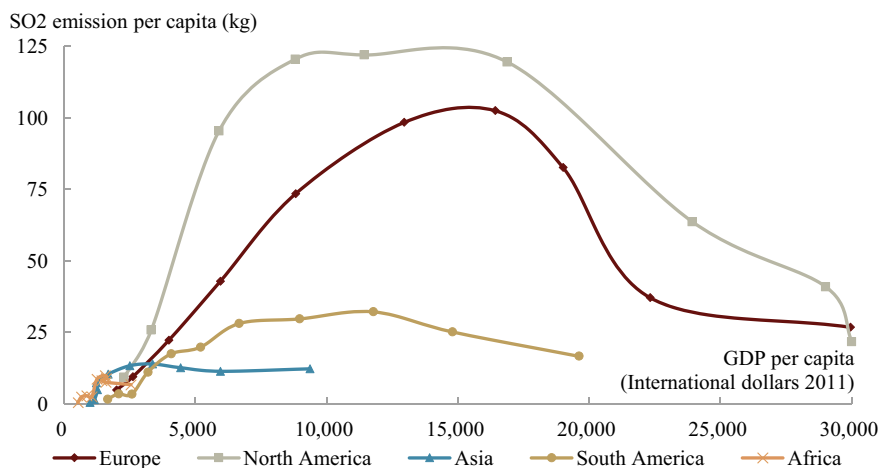


Fig. 3.1 EKC of SO₂ emissions per capita in select regions. *Source* Our World in Data, Maddison Project Database, CICC Global Institute

level of development. For industrial SO₂ emissions, South America and Asia, where developing countries are concentrated, have flatter EKC than Europe and North America (Fig. 3.1). At GDP per capita of Intl\$5000, SO₂ emissions per capita in North America (1890s) and Europe (1930s) were 90 kg and 40 kg, while emissions in South America (1950s) and Asia (1990s) were only 20 kg and 10 kg. For carbon emissions per capita, developing countries like China, Malaysia, and Thailand also have much lower EKC than developed countries such as the US, Germany, and the UK (Fig. 3.2). At GDP per capita of Intl\$10,000, carbon emissions per capita in the three developing countries (1990s–2010s) were around 5 t, while emissions in the three developed countries (1930s–1960s) exceeded 10 t.

The flattening of the EKC implies a change in the relationship between the environment and development. Given the green constraints, it seems that BRI countries can no longer follow the path of polluting first and cleaning up later as developed countries did. Instead, developing countries must follow a new path of green development that encompasses “cleaning up while developing”.

We believe that many BRI countries already face tightened green constraints while in the early stages of development and have to follow a new development path due to two main forces behind the tightening of green constraints. The first is the escalating international initiatives to address global environmental issues such as climate change and loss of biodiversity. The second is increasing public awareness of environmental protection in BRI countries. Such factors have resulted in tightening constraints on environmental damage such as pollutant emissions and loss of biodiversity.

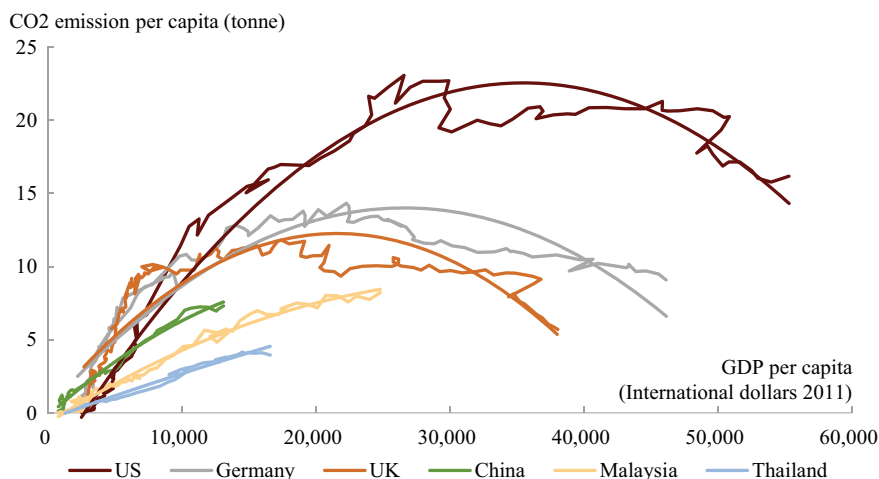


Fig. 3.2 EKC of CO₂ emissions per capita in select countries. *Note* The data range of some countries is from the eighteenth century to the present, and the data of each country is fitted with a quadratic function. *Source* Our World in Data, Maddison Project Database, CICC Global Institute

3.1.1 Navigating Global Constraints: Intensifying Efforts to Tackle Environmental Challenges

With the release of a series of international conventions on environmental protection, BRI countries are facing tightening environmental constraints. The United Nations Conference on Environment and Development held in Rio de Janeiro in 1992 adopted the United Nations Framework Convention on Climate Change and the Convention on Biological Diversity, which aimed at promoting global initiatives that addressed two major global environmental issues—climate change and the loss of biodiversity. Subsequently, several agreements on environmental protection were adopted at international conventions (e.g., the Paris Agreement and the Kunming-Montreal Global Biodiversity Framework). The Net-Zero Banking Alliance and the Joint Declaration of the Banking Sector to Support Biodiversity Conservation restrict international financial institutions from financing projects that have high environmental risks. Such limitations have imposed environmental constraints on BRI countries.

A study led by Tsinghua University and Vivid Economics team found that if BRI countries continued on the path of polluting first and cleaning up later, the world would be unlikely to achieve its goal of limiting the rise in global temperature to less than 2 °C above preindustrial levels. To meet this target, BRI countries would need to reduce their emissions by almost 70%, imposing a significant carbon constraint on their economic development.⁵ Furthermore, developed countries have either introduced or are contemplating unilateral trade policies to enforce more

⁵ Tsinghua University and Vivid Economics team, Ma, J., & Xie, M. (2020). Green Finance Roadmap to Support Low-carbon Development of the Belt and Road Initiative. *Finance Forum*.

substantial carbon constraints on all countries. This approach is driven by concerns about carbon leakage given the negative externalities associated with carbon emissions. A typical example is carbon tariffs. The EU has enacted the Carbon Border Adjustment Mechanism (CBAM), and the US has instituted the Clean Competition Act. The G7 is working toward establishing a “climate club” and forming a carbon tariff alliance. We believe that unilateral trade policies such as carbon tariffs will exert more significant international carbon constraints on BRI countries’ exports, thus forcing them to expedite measures to cut carbon emissions.

3.1.2 Domestic Constraints: Increasing Public Awareness of Environmental Protection

Domestically, BRI countries also face public demand for environmental protection. The global environmental movements that began in the 1960s, coupled with numerous environmental incidents, have been heightening public awareness of environmental protection. Particularly, the rapid dissemination of information on the internet has quickly unified and raised public awareness of environmental protection. In many BRI countries, individuals, non-governmental organizations, and media already exhibit a robust awareness of environmental protection. Of particular concern are two issues—pollution and biodiversity loss. The direct impact of air and water pollution on human health drives much of this concern. Moreover, many local residents rely on ecologically related industries such as agriculture and tourism, which are highly susceptible to changes in biodiversity. In some countries, local culture is deeply entwined with biodiversity.⁶

For example, projects such as the Lamu Coal Power Station in Kenya and the Kaliwa Dam in the Philippines faced environmental risks.⁷ Despite the significant disparities in economic development in different countries, there is rapid convergence in global public awareness of environmental protection. This is the reason that some BRI countries have suspended power projects that may cause environmental problems even in the face of severe power shortages. Behind what may appear to be an irrational decision is the commitment to green governance supported and driven by heightened public awareness of environmental protection.⁸ Environmental

⁶ Mao, S., Shen, Y., & Deng, H. (2017). Advances in Biocultural Diversity Research, *Acta Ecologica Sinica*, 37, 8179–8186.

⁷ <https://chinadialogue.net/en/energy/lamu-kenyan-coal-project-chinese-investors-take-environmental-risks-seriously/>; <https://chinadialogue.net/en/cities/11617-china-backed-kaliwa-dam-would-displace-indigenous-people-to-quench-manila-s-thirst-2/>.

⁸ Chen, D., & Fu, Y. (2013). Theoretical Interpretation and Evolution of Elite Governance: From the Perspective of Environmental Politics. *Special Zone Economy*, No. 288(01), 95–97.

	Address climate change	Reduce pollution	Protect biodiversity
Technology costs	↑ ↑ ↑	↑	-
Energy costs	↑ ↑ ↑	-	-
Capital costs	↑ ↑ ↑	↑	↑
Land costs	↑	-	↑ ↑ ↑

Fig. 3.3 Rising technology and factor costs under green constraints. *Note* ↑ indicates an increase, and ↑↑↑ indicates a significant increase. *Source* CICC Global Institute

constraints shaped by public awareness (often termed informal environmental regulations⁹) have become a significant force behind the tightening of formal environmental regulations in BRI countries.¹⁰

3.2 New Challenges from Rising Costs

While the new path of green development encompassing cleaning up while developing is desirable, trade-offs between environment conservation and development do exist. Most BRI countries are developing economies, and industrialization is likely to be a necessary step for them to attain economic development, while it also inherently leads to pollutant emissions and environmental damage. BRI countries will face challenges in adopting the new path of green development of cleaning up while developing, compared with the traditional path of polluting first and cleaning up later, in our view.

To explore these challenges, we need to revisit economic growth theory. According to the production function, an economy has the capability to convert factors of production such as capital, labor, land, and energy into output given specific technological conditions. This implies that economic growth is linked to technology and factor costs.¹¹ Other things being equal, the lower the factor costs and the higher the productivity, the lower the production costs for companies. This in turn improves investment return, encourages corporate investment, and promotes economic growth. We think that the main challenge for the new path of green development compared to the traditional development path lies in rising green costs, which could slow down economic development (Fig. 3.3).

⁹ Zhao, X., & Ni, J. (2022). Study on Informal Environmental Regulations and Their Environmental Governance Effects in Foreign Countries. *Social Sciences Abroad*.
¹⁰ Heyes, A., & Kapur, S. (2012). Community pressure for green behavior. *Journal of Environmental Economics and Management*, 64(3), 427–441.
¹¹ Xie, D., & Zhou, Z. (2019). Evolution and Future of Economic Growth Theory: From the Perspective of Evolution of Production Function. *Economic Review*.

3.2.1 *Technology: Costs of Some Green Technologies Remain High*

The cost of some green technologies remains high, especially for carbon emissions reduction technologies. Currently, countries primarily reduce carbon emissions by adopting low-carbon or zero-carbon production solutions emphasizing clean power and electrification.¹² However, the costs associated with clean power and electrification remain high in most BRI countries. While the levelized cost of energy (LCOE) of renewable power generation has declined significantly globally, making it competitive with coal-fired power,¹³ the weak manufacturing capabilities and high interest rates in most BRI countries contribute to the continued high cost of renewable power generation.¹⁴ For example, in Indonesia, the LCOE of solar power and onshore wind power are around 20% and more than 80% higher than LCOE coal-fired power by 2022, respectively.¹⁵

Similarly, in terms of electrification, the application of various low-carbon and clean production technologies translates to higher costs. Taking Türkiye's steel industry for example, transitioning from blast furnaces to electric furnaces cuts carbon emissions per tonne of steel, but it simultaneously increases steel production costs by around 10%.¹⁶ Given that the cost of low-carbon and clean production technologies in high-carbon industries is generally high, a rapid reduction in carbon emission would lead to a sharp increase in green costs.

Moreover, many carbon emission reduction technologies—even in developed economies—have not reached full-scale commercialization. Especially for BRI countries with weak innovation capabilities, it is difficult to leverage late-mover advantages in adopting such technologies. For example, many industrial processes can only reduce carbon emissions through carbon capture, utilization, and storage (CCUS) technologies. However, these technologies are still in the early stages of commercialization,¹⁷ and their costs are still high. Currently, the cost of carbon capture technology exceeds US \$100 per tonne of CO₂, and energy consultancy firm Wood Mackenzie forecasts that the cost of CCUS projects will remain above US \$70 per tonne of CO₂ even by 2050.¹⁸ For instance, Vietnam is set to continue to rely on coal-fired power for many years to come.¹⁹ A study indicates that applying carbon

¹² Zou, C., He, D., & Jia, C., et al. (2021). Connotation and Path of World Energy Transition and Implications for Carbon Neutrality. *Acta Petrolei Sinica*, 42(2), 233–247.

¹³ IRENA. (2022). Renewable Power Generation Costs in 2021.

¹⁴ IRENA. (2022). Renewable Power Generation Costs in 2021.

¹⁵ Source BNEF 2H 2022 LCOE: Data Viewer.

¹⁶ Medarac, H., Moya, J., & Somers, J. (2020). Production costs from iron and steel industry in the EU and third countries. *Luxembourg: Publications Office of the European Union*.

¹⁷ Xing, L., Wu, Z., & Zhang, R. (2021). Analysis of CCUS Industry Development Status and Prospects. *International Petroleum Economics*.

¹⁸ Wood Mackenzie. (2021). Carbon capture and storage: how far can costs fall?

¹⁹ <https://www.dfdl.com/insights/legal-and-tax-updates/vietnams-national-power-development-plan-2021-2030/>.

capture to reduce emissions in Vietnam's coal-fired power plants would result in a substantial increase in electricity generation costs.²⁰

3.2.2 Energy: Carbon Emissions Reduction Policies Increase Cost of Energy Use

Green policies, especially those related to carbon emission reduction, will increase the cost of fossil energy use in BRI countries. We divide carbon emissions reduction policies into command-and-control or non-pricing policies (e.g., energy efficiency standards, carbon emission intensity or total control, and renewable energy standards) and pricing policies (e.g., carbon taxes and carbon markets). Both types of policies increase the cost of fossil energy use for energy-using companies. Non-pricing policies bring implicit carbon emission reduction costs, and pricing policies bring explicit residual carbon emission costs.²¹

BRI countries have widely adopted non-pricing carbon emissions reduction policies. BRI countries adopting non-pricing policies far outnumber those adopting pricing policies.²² While most BRI countries have introduced emissions reduction policies such as industrial energy efficiency and vehicle emission standards, measures in Africa are comparatively less robust.²³ Recently, many BRI countries have started to explore carbon pricing policies. For example, Vietnam outlined its development path for the carbon market in 2022, with plans to initiate pilot carbon trading in 2025. In February 2023, Indonesia inaugurated the first phase of mandatory carbon trading for coal-fired power plants and plans to introduce subsequent phases in 2025 and 2028. As a result, industrial enterprises must purchase energy-efficient and eco-friendly production equipment and invest more in the R&D of environmental protection technologies to comply with government-mandated carbon emissions reduction requirements. This will lead to higher costs associated with emissions reduction and fossil energy use.

²⁰ Ha-Duong, M., & Nguyen-Trinh, H. A. (2017). Two scenarios for carbon capture and storage in Vietnam. *Energy Policy*, 110, 559–569.

²¹ Campbell, E., & Pizer, W. (2021). Border Carbon Adjustments without Full (or Any) Carbon Pricing (No. 21–21). *Resources for the Future*.

²² Currently carbon pricing policies such as carbon taxes and carbon markets are mainly used in developed countries. Most BRI countries do not have carbon pricing policies, possibly due to a less-developed market economy, insufficient green technologies, and the fact that explicit carbon costs may be susceptible to opposition. *Source* CRU. (2022). Carbon pricing schemes: only for the rich?; <https://carbonpricingdashboard.worldbank.org/>; Zhang, H., Meng, J., & Yau, K. N. (2022). Carbon pricing or non-pricing for developing countries? A dual-track strategy for decarbonization in China. *Applied Economics Letters*, 1–7.

²³ <https://www.unep.org/interactive/air-pollution-note/>.

3.2.3 *Capital: Demand for Green Funds Pushes up Cost of Capital*

BRI countries generally face challenges related to insufficient capital stock and higher capital costs (interest rates) compared to China and developed countries. These disparities stem from their limited capital formation capacity and lower levels of economic development.²⁴ However, the green transition is expensive. A recent study estimates that the climate finance demand of emerging markets and developing countries (excl. China) will reach US \$1 trn (4.1% of GDP) by 2025 and US \$2.4 trn (6.5% of GDP) by 2030. Notably, about half of these needs are expected to be met by domestic sources.²⁵ This suggests that BRI countries' investment in green transition would expand their domestic funding needs and push up their funding costs. Moreover, with a given capital stock, green investment and financing could crowd out other capex, leading to higher capital costs and slower development in capital-intensive industries.²⁶

A consequence of the high cost of capital for the green transition is that renewable power generation projects in BRI countries may not be economically viable. As renewable power generation projects are characterized by substantial initial capex and comparatively lower opex, their project economics (as measured by the LCOE) exhibit a heightened sensitivity to interest rates.²⁷ The United Nations Development Programme (UNDP) estimates that other things being equal, the LCOE of gas-fired power and wind power in developing countries with elevated capital costs are 6% and 40% higher than such costs in developed countries.²⁸

The limited appeal to private sector funds means that renewable power generation projects in BRI countries must depend on more affordable public funds, including domestic fiscal funds and international development assistance. In terms of fiscal funds, BRI countries have generally grappled with escalating expenditures on public health, energy, and foreign debt interest, coupled with declining fiscal revenue in recent years. Fiscal expenditures on environmental improvement have a lower multiplier effect on economic growth compared to expenditures on transportation infrastructure and R&D.²⁹ According to the International Monetary Fund (IMF), developed countries generally allocate more than 0.6% of GDP to fiscal spending on environmental protection, while BRI countries typically allocate 0.3–0.4%.³⁰ In contrast to fiscal funds, international public funds contribute more actively to environmental

²⁴ <https://advisor.visualcapitalist.com/mapped-interest-rates-by-country-in-2022/>.

²⁵ The Independent High-Level Expert Group on Climate Finance. (2022). Finance for climate action: scaling up investment for climate and development.

²⁶ Pearce, D., & Palmer, C. (2001). Public and private spending for environmental protection: a cross-country policy analysis. *Fiscal studies*, 22(4), 403–456..

²⁷ <https://findevlab.org/financing-costs-of-green-transition-in-developing-countries/>.

²⁸ UNDP. (2013). Derisking Renewable Energy Investment.

²⁹ CICC Research & CICC Global Institute. (2023). *Building an Olive-Shaped Society: Economic Growth, Income Distribution and Public Policies in China*. Springer.

³⁰ <https://climatedata.imf.org/pages/go-indicators>.

improvement and can play a significant role in supporting green development of BRI countries. However, the current flow of international funds into BRI countries remains insufficient for meeting their substantial external financing needs.³¹

3.2.4 Land: Changes in Use Patterns Increase Cost of Land Use

Land use patterns are evolving under green constraints, highlighting the growing significance of land as a crucial factor of production. Beyond providing space for construction of renewable energy projects (such as wind power, solar power, and hydropower), land also absorbs carbon dioxide in the form of carbon sinks such as forests. Addressing climate change may necessitate changes in land use and land-forms. Land occupation during economic development is a key cause of biodiversity loss,³² especially through habitat loss or fragmentation resulting from economic activities such as arable land reclamation, industrialization, urbanization, and road infrastructure construction. Achieving biodiversity conservation requires significant adjustments to land use patterns.

Adopting the cleaning up while developing path aimed at addressing climate change and conserving biodiversity could reduce available land and raise land use costs. This dynamic could have adverse effects on economic development, particularly in BRI countries that boast rich biodiversity resources but have limited land area.

This conflict between land use and economic development is more evident in BRI countries in which infrastructure investment projects that cover expansive land areas—such as water conservancy, hydropower, and road transport—might not be built due to potential harm to biodiversity. Consequently, this hampers power and infrastructure development in BRI countries. Despite significant untapped hydropower development potential in Southeast Asian countries such as Indonesia, Myanmar, and Malaysia, as well as Russia and Türkiye, concerns related to biodiversity may impede the construction of necessary hydropower projects. Similarly, while some countries in Southeast Asia and South Asia still have substantial demand and room for improvement in road network connectivity and infrastructure quality, the rich biodiversity in these regions may pose obstacles to the construction of hydropower and road infrastructure. This scenario may lead to underutilization of hydropower resources and gaps in road infrastructure.

³¹ Zhang, J., & Zhang, X. (2022). Assessment and Research of Funding Needs of Belt and Road Partner Countries to Address Climate Change. *Journal of Hohai University (Philosophy and Social Sciences)*.

³² In addition to land occupation, other causes of biodiversity loss include endangerment or extinction of species due to overfishing and deforestation. Source <https://luclab.berkeley.edu/landuseandconservation/>.

3.3 New Opportunities from Green Industries

Historical evidence suggests that developing countries can achieve economic development by capitalizing on opportunities arising from global development trends. This involves allocating a country's factors of production on a broader scale and participating in global production and the global division of labor. The green transition is one of the most prominent development trends globally, and we attribute this acceleration in recent years to the growth of new energy industries and the implementation of national policies. Although BRI countries face rising green costs under environmental constraints, the green transition also presents new comparative advantages. Many BRI countries endowed with resources such as new energy metals, wind energy, and solar energy can find opportunities in global green industries. Moreover, the sizeable labor forces in these countries can participate in global production within the context of the green transition. In addition, an economy's development hinges on its factor endowments to cultivate industries where it has comparative advantages and can participate in global production.³³ In this context, we believe that the green transition will allow BRI countries to use their resources and labor forces to further participate in global industries. Green industries have the potential to become new economic growth drivers for BRI countries.

3.3.1 New Resources Offer Comparative Advantages

The global green and low-carbon transition essentially replaces traditional energy sources with new energy sources. Amid the green transition, the increasing importance of new energy metals such as lithium, cobalt, nickel, platinum, copper, and manganese gives new comparative advantages to BRI countries that have such new energy metal resources. The US Geological Survey (USGS) notes that the BRI countries that hold new energy metal resources include Chile and Argentina (rich in lithium resources); the Democratic Republic of the Congo, Russia, the Philippines, and Cuba (rich in cobalt); Indonesia, the Philippines, and Russia (nickel resources); and South Africa and Russia (platinum resources). As demand for new energy metals increased against the backdrop of the global green transition and the energy supply shock in 2022, the export revenue from new energy metals increased.³⁴

More importantly, many BRI countries rely on their new energy metal resources to diversify into downstream industries that have higher added value such as new energy metal smelting and electric vehicles. This allows them to achieve development catch-up. For example, Chile is developing its smelting industry and increasing its smelting capacity to reach carbon neutrality and promote sustainable industrialization.³⁵ In

³³ Lin, J. Y. (2011). *Demystifying the Chinese economy*. Cambridge University Press.

³⁴ <https://www.bnamericas.com/en/news/chilean-lithium-producer-sqm-reports-milestone-performance-in-1q22>.

³⁵ <https://www.163.com/dy/article/H851LUVa05198CJN.html>.

2020, Indonesia banned nickel ore exports. Consequently, its domestic investment in metal processing industries such as nickel smelting rapidly grew, leading to an increase in both output and export value of nickel products with higher added value.³⁶ Moreover, as nickel is an essential raw material for electric vehicle batteries, Indonesia is also supporting the development of its electric vehicle and parts industries. The country aims at establishing a complete new energy vehicle value chain encompassing mining, smelting, battery production, and vehicle manufacturing. To achieve this, Indonesia is seeking foreign investment by offering preferential tax policies. This serves as a prime example of seizing the opportunity presented by the green transition to seek development. As Indonesia's then-president Joko Widodo emphasized, the path to the country's development lies in developing downstream industries.³⁷

BRI countries in North Africa, West Asia, and South America are rich in wind and solar resources, giving them comparative advantages in green transition. If wind and solar resources are combined with little-utilized, low-cost land such as deserts, this could allow countries to better leverage their comparative advantages in resource endowments. For example, the EU and North Africa plan to cooperate on renewable power generation and green hydrogen in the Sahara Desert. This initiative aims at making full use of North Africa's solar and wind resources coupled with low-cost land. The cooperation can help the EU reach its carbon emissions reduction target and promote power supply and economic development in the BRI countries in North Africa.³⁸ Kazakhstan also has rich solar and wind resources, and proposes building 10 GW of new energy projects by 2035.³⁹

3.3.2 *Labor Force Participation to Rise*

Many BRI countries have large labor forces. Traditional energy-intensive and high-polluting manufacturing industries are primarily characterized by their reliance on technology and capital, and feature relatively short value chains. It is difficult for BRI countries to participate in these industries and leverage their comparative advantages in labor resources. In contrast, new energy industries such as solar and wind power have lower technological barriers to entry and long value chains. Significant labor is required in these industries, from the manufacturing of solar cells and modules to the construction, operation, and maintenance of power plants. A study found that the

³⁶ <https://asiatimes.com/2022/02/indonesia-bans-mineral-exports-to-move-up-value-chain/>.

³⁷ <http://www.52hrtt.com/admd/n/w/info/A1669889152659>.

³⁸ Van Wijk, A., & Wouters, F. (2021). Hydrogen—the bridge between Africa and Europe. In *Shaping an inclusive energy transition* (pp. 91–119). Cham: Springer International Publishing.

³⁹ http://www.sinopecnews.com.cn/xnews/content/2023-01/20/content_7057259.html.

number of jobs created by renewable power generation per kWh exceeds three times that of fossil power generation.⁴⁰

This suggests that BRI countries are more likely to participate in new energy industries,⁴¹ making it easier for them to leverage their comparative advantages particularly in low-cost labor. This in turn potentially boosts their labor force participation rates and fosters the growth of green employment. According to the IEA's World Energy Employment 2022 report, clean energy industries now surpass fossil energy industries in terms of employment in most BRI countries or regions except the Middle East and Russia. The IEA anticipates that the global energy transition will create at least 13 mn new jobs by 2030.⁴² In Morocco, where the unemployment rate is high, the Noor I solar project created about 1800 construction jobs and 250 operation jobs. Moreover, Siemens' wind turbine rotor blade plant created another 700 jobs. The energy transition is expected to create more than 480,000 jobs in Morocco over the next 20 years.⁴³ New energy industries are inclusive, and present opportunities to increase BRI countries' participation in global green industries and raise their domestic labor income.

BRI countries such as Türkiye and Vietnam have already established robust international competitiveness in certain new energy projects thanks to their advantages in low-cost labor and low technological barriers to entry within new energy industries. This is particularly evident in engineering, procurement and construction (EPC) projects in which labor costs play a more significant role. Many companies from BRI countries are experiencing substantial growth in solar EPC projects. Companies such as Eko Renewable Energy in Türkiye and RumtechS in Vietnam have demonstrated considerable strength to compete with their counterparts in China and developed countries.⁴⁴ Some BRI countries are also competitive in solar cell and module production thanks to their advantageous factor prices. CICC Research estimates that the production costs of solar cells and modules in Southeast Asian countries are only about 5% higher than in China in early 2020s. Moreover, these countries benefit from low tariffs on their exports.

⁴⁰ Blyth, W., Gross, R., Speirs, J., Sorrell, S., Nicholls, J., Dorgan, A., & Hughes, N. (2014). Low carbon jobs: The evidence for net job creation from policy support for energy efficiency and renewable energy. *London: UK Energy Research Centre*, 31.

⁴¹ Bowen, A., Kuralbayeva, K., & Tipoe, E. L. (2018). Characterising green employment: The impacts of 'greening' on workforce composition. *Energy Economics*, 72, 263–275.

⁴² IEA. (2022). World Energy Employment.

⁴³ Auktor, G. V. (2017). Renewable energy as a trigger for industrial development in Morocco. *Green Industrial Policy*. <https://moroccoonthemove.com/2016/03/10/siemens-build-wind-turbine-rotor-blade-factory-morocco-renewable-energy-magazine/>.

⁴⁴ <https://wiki-solar.org/company/contractor/>, <https://www.pv-magazine.com/2021/09/06/ihs-clean-energy-insights-the-30-largest-epc-pv-system-providers-took-28-of-the-global-market-in-2020/>.

3.4 Reflections and Insights

China's proposal that the BRI should be green aligns with the above analysis of opportunities and challenges facing BRI countries in green development. We believe that the key to establishing a green BRI lies in helping these countries maximize green benefits while minimizing associated costs. On the one hand, we believe that China can leverage its expertise in green industries to help BRI countries capitalize on opportunities within the green value chain, enabling them to share the economic benefits of green development. At the same time, we believe that China can actively address the environmental costs of BRI countries by drawing upon its technological, financial, and management strengths. China can also call for the international community to contribute more to compensating developing countries for the global environmental costs they bear.

3.4.1 *Harnessing Green Opportunities by Leveraging Complementary Strengths*

We believe that China can integrate its competitive advantages in green industries with the resources and labor forces of BRI countries so as to assist them in capitalizing on green development opportunities.

For BRI countries abundant in new energy metal resources, we believe that China could make distinctive contributions to help them break the so-called “resource curse”.⁴⁵ In contrast to many developed countries that primary focus on adopting “soft infrastructure” measures such as reinforcing resource revenue management and enhancing the transparency of information disclosure, China can provide “hard infrastructure” solutions for resource-rich countries to help them diversify their economies and break the “resource curse”.⁴⁶ Many resource-rich countries face the challenges of inadequate infrastructure and high transportation costs, impeding the sustainable development of their economies. Addressing this, we see a pressing need to develop and enhance infrastructure in these countries. In cooperating with these countries on resource projects, China can play a pivotal role in improving their infrastructure by leveraging its strengths in “hard infrastructure” construction (i.e., low construction costs, short construction periods, high construction quality, and low financing cost).

Moreover, China possesses substantial potential to aid countries abundant in new energy metal resources in expanding into midstream and downstream manufacturing industries. Several Chinese new energy vehicle manufacturers such as BYD and SAIC have established electric vehicle manufacturing plants in Indonesia. Moreover,

⁴⁵ See Chap. 9 for more information on “resource curse”.

⁴⁶ Kelley, J. (2011). China in Africa: Curing the resource curse with infrastructure and modernization. *Sustainable Dev. L. & Pol'y*, 12, 35.

Chinese firms such as Huayou Cobalt and Lygend Resources & Technology have ventured abroad to build cobalt and nickel smelting capacity.

For BRI countries with abundant wind and solar resources, we believe that China has the potential to assist in the development of local industries and unlock labor dividends by enhancing cooperation in green power infrastructure construction. China's cost advantages and economies of scale contribute to the global competitiveness of its solar products and electrical equipment. In light of BRI countries' demand for construction of wind and solar power plants, as well as their imports of related equipment and parts, China can engage in mutually beneficial cooperation with these countries in green power construction and new energy equipment trade.

South Africa aims at 20.4GW of new installed capacity of wind and solar power by 2030.⁴⁷ In pursuit of this goal, several Chinese firms such as Goldwind Science & Technology and Longyuan Power have collaborated with South Africa on wind and solar power plants.⁴⁸ Such cooperation also boosted China's equipment exports to South Africa. At the same time, some BRI countries are grappling with the challenge of inadequate power grid infrastructure as they strive to develop clean power industries. Leveraging its leading power grid technology, China can help BRI countries enhance their green infrastructure necessary for development of green industries. For example, Power Construction Corporation of China's EETC 500 kV power transmission project in Egypt has played a significant role in the upgrading of the country's national power grid.⁴⁹

3.4.2 *Supporting the Cost Reduction for Green Development*

A crucial question for BRI countries involves finding a better balance between environmental preservation and development and paving the way for a new era of sustainable development at lower environmental costs. Addressing this question requires examining the externalities associated with environmental issues. In economic terms, externality theory holds that in the absence of effective environmental policy mechanisms, externalities can result in the divergence between private cost–benefit and social cost–benefit related to environmental public goods.⁵⁰ This discrepancy hinders the market from achieving optimal resource allocation. Theoretically, two approaches can be employed to solve this cost–benefit inconsistency: (1) Imposing costs on environmental polluters for negative externalities; and (2) compensating environmental protectors for positive externalities.

(1) *Assuming the cost of environmental damage*

⁴⁷ Source The Integrated Resource Plan (IRP) introduced by the South African government in 2019.

⁴⁸ International Institute of Green Finance (IIGF) at the Central University of Economics. (2019). Renewable Energy Cooperation, Investment and Financing between China and South Africa.

⁴⁹ <http://www.sasac.gov.cn/n2588025/n2588124/c10205027/content.html>.

⁵⁰ Sang, Y. (2015). Carbon Emissions Trading: Social Cost Internalization and System Design. *Journal of Zhongnan University of Economics and Law*, No. 5.

First, we believe that China can raise companies' consciousness of environmental responsibility and guide them in bolstering environmental assessments and public participation. This can be achieved by establishing environmental industry norms for overseas investment, fostering industry self-discipline, and guiding firms to embrace environmental responsibly. Meanwhile, China needs to enhance companies' proficiency in conducting environmental due diligence for overseas projects and improve the recognition of environmental impact assessment information in BRI countries.⁵¹

Additionally, China can also promote transparency in project information and encourage companies to publish environmental reports regularly. Stakeholder participation in environmental decision-making processes can be promoted to mitigate the impact of informal regulations on project implementation. In particular, China's decision to halt new overseas coal-fired power projects,⁵² announced in September 2021, reflects its commitment to avoiding environmental damage and assuming associated costs. Following the announcement, at least 15 coal-fired power projects totaling 13 GW in which China participated were cancelled within six months, and a potential total of 32 coal-fired power projects (37 GW) may eventually be cancelled.⁵³ Such initiatives, in our view, will contribute to supporting green and low-carbon energy development in developing countries.

Second, we believe that China can motivate companies to bear environmental costs and reduce emissions by raising emission standards to mitigate environmental damage. In line with the Environmental Protection Guidelines for Outward Investment and Cooperation Construction Projects jointly issued by China's Ministry of Ecology and Environment and Ministry of Commerce in 2022, companies are encouraged to adopt international standards or China's more stringent standards when host countries lack relevant environmental policies or have low standards. We see this approach as better equipping companies to address the risks and challenges in the BRI's green development.

A typical example of adopting high environmental standards to assume costs is PetroChina's oil and gas project in Chad. The project adhered to international environmental standards regarding atmosphere, soil, groundwater, and waste treatment. The firm also fulfilled its social responsibility by organizing employees to participate in afforestation activities. Recognizing these efforts, the project received a certificate of outstanding contribution to environmental protection from the government of Chad.⁵⁴ From a cost-benefit analysis perspective, environmental risks associated with projects are increasing due to stricter green constraints, while the cost of pollution control is falling thanks to technological advancements. Adopting high environmental standards may increasingly emerge as a rational choice for Chinese firms.

⁵¹ Zhu Y., & Zhao Si., et al. (2017). Research on Environmental Investigation Procedures for Belt and Road Projects. *Environmental Impact Assessment*, No. 4.

⁵² https://www.ndrc.gov.cn/xxgk/zcfb/tz/202203/t20220328_1320629.html.

⁵³ <https://energyandcleanair.org/publication/2022-chinese-overseas-coal/>.

⁵⁴ <http://app.zgsyb.com.cn/paper/c/202208/30/c189280.html>.

Third, we believe that China can direct companies to assume environmental costs even after projects are completed. This can be achieved by establishing a follow-up project tracking and assessment mechanism, as well as stipulating requirements for environmental information disclosure and the handling of potential environmental risk events during project operation. Such measures would encourage and guide companies to fortify environmental impact management throughout the life cycle of projects. In the future, accountability measures may be enforced for violations of environmental regulations and standards in BRI investment to ensure that firms fulfill their environmental responsibilities. For projects that prioritize environment considerations and demonstrate successful outcomes, China can compile them as exemplary environmental practices to provide references and incentives for companies.

(2) *Compensating for the benefits of environmental protection*

On the one hand, we believe that China can call for global collaboration in compensating for environmental protection measures. This would involve participating in and leading international environmental protection and sustainable development initiatives. Moreover, it would be valuable to explore establishing a BRI cross-border environmental compensation mechanism and encourage developed countries to participate. It is reasonable to assert that developed countries should shoulder a greater responsibility for compensating BRI countries for their environmental protection. This stems from the fact that developed countries are actually beneficiaries of the environmental protection efforts made by BRI countries. Historically, developed countries have contributed significantly more to cumulative emissions and environmental damage compared to developing countries. The environmental protection measures taken by developing countries, such as the protection of the Amazon rainforest, play a crucial role in the global climate and ecological environment. However, developed countries have not adequately compensated for these environmental benefits. Aligning environmental responsibility with the level of economic development and requiring developed countries to compensate for global environmental benefits aligns with the principle of “common but differentiated responsibilities”.⁵⁵

On the other hand, we believe that China can extend various forms of compensation to BRI countries, including financial assistance. Given that risks are manageable, China can provide aid funds and technological support to BRI countries as compensation for their environmental protection efforts. A viable approach is to offer Payment in Kind to BRI countries.⁵⁶

⁵⁵ “Common but differentiated responsibilities” (CBDR) is a principle that was formalized at the ‘Earth Summit’ held in Rio de Janeiro, Brazil in 1992 as part of the United Nations Framework Convention on Climate Change (UNFCCC). It acknowledges that all states have a shared obligation to address environmental problems yet not equally responsible. <https://leap.unep.org/en/knowledge/glossary/common-differentiated-responsibilities>.

⁵⁶ Cai, J., & Luo, W. (2020). International Experience and Evaluation of Payment for Ecosystem Services from a Global Perspective. *China Forestry Economics*, No. 1.

3.4.3 *Sharing China's Experience: Overcoming Green Development Constraints*

China has navigated a stage marked by growing conflict between economic development and environmental protection, and the lessons learned from this experience are valuable as China advocates for a green BRI.

Lesson No. 1: Addressing environmental issues in development. During its initial stages of economic development, China mainly adopted a reactive approach to environmental protection. The emphasis was on addressing environmental issues in specific locations or factories to resolve immediate concerns.⁵⁷ As China's economic development gained momentum, the rapid expansion of energy-intensive and highly polluting industries exacerbated environmental problems, creating a systematic conflict between the environment and development. Recognizing this, China emphasized the importance of coordinating environmental protection and development, and made "sustainable development" a national strategy.

After 2012, China's economic development entered a new normal, and the country stepped up efforts to address environmental issues such as air pollution. Concurrently, green industries such as the lithium-ion battery, photovoltaic, and new energy vehicle industries emerged as new drivers of economic growth.⁵⁸ China took the initiative to promote green development. We note that with economic growth and industrial restructuring, green constraints on the economy are diminishing, while the contribution of green industries to economic growth is gaining strength. The higher the level of economic development, the stronger the ability to tackle environmental issues. We think that an essential lesson from China's experience for BRI countries is that overcoming green constraints in development is key to solving environmental issues.

Lesson No. 2: Nurturing green and environmental protection industries. Traditional environmental management typically occupies the tail end of economic activity and industrial production, and thus they may not become a pillar industry. However, the current global green transition—which encompasses shifts in energy supply, production methods, and lifestyles—presents opportunities for developing countries to form pillar industries. China's development of green industries initially stemmed from the international market and was subsequently bolstered by domestic industrial policy. Its success underscores the importance for BRI countries to leverage their resources and labor forces to participate in global green industries.

As a new product standardizes, its mature production process and production capacity often relocate to regions with lower production and transaction costs. As new energy industries mature and enter the commercialization stage, conditions become conducive for their expansion into developing countries. In pursuit of low labor and tariff costs, substantial production capacity in new energy industries have already

⁵⁷ Guo W. (2009). Evolution and Development of China's Environmental Policy Thoughts: An Interview with Qu Geping, Former Chairman of the Environmental Protection and Resources Conservation Committee of the National People's Congress. *Environmental Protection*, No. 23.

⁵⁸ Wu S., Huang D., & Liu, Z., et al. (2018). Evolution of the Relationship between Environmental Protection and Economic Development in China over 40 Years. *Environmental Protection*, No. 20.

shifted to BRI countries in Southeast Asia. This trend is likely to persist, contributing to local employment and economic development. We believe that BRI countries are well positioned to embark on a new path of green development by attracting and nurturing new energy industries by favorable industrial policies.

Lesson No. 3: Maximizing the impact of international aid and support. China emphasizes the efficient use of international aid funds, prioritizing the resolution of urgent and large-scale environmental challenges to mitigate the economic costs of environmental pollution. For example, China used World Bank loans to support air pollution control in the Beijing–Tianjin–Hebei region.⁵⁹ Simultaneously, China directs aid funds toward the acquisition of advanced environmental protection technologies, and enhances its capabilities through international exchanges and training initiatives. More importantly, recognizing the escalating severity of climate change and biodiversity loss, China has been intensifying its collaborative efforts on global environmental issues. Initiatives like the EU-China Energy Cooperation Platform, focusing on energy conservation and efficiency, can contribute to reducing pollution and carbon emissions. Additionally, projects such as the integrated solid waste management cooperation project between China and United Nations Environment Programme (UNEP) demonstrate China's commitment to promoting waste management and recycling, thereby reducing solid waste pollution and preserving biodiversity.

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⁵⁹ https://www.gov.cn/xinwen/2016-09/25/content_5111719.htm.

Chapter 4

Promoting Financial Cooperation Among BRI Countries



Abstract Financial support plays an essential role in promoting economic cooperation among BRI countries. Financial services for economies in BRI countries (BRI finance) are both development-oriented, as they attach importance to advancing the development of these countries, and commercial in nature, as such services also pay attention to the economic benefits and long-term sustainability of relevant projects as well as those of the financial support for these projects. BRI finance is mainly funded by policy financial institutions and state-owned banks, and mainly takes the form of bank loans. Currently, BRI finance mainly serves natural resource, energy, and infrastructure construction projects in developing countries in Southeast Asia, Central Asia, Africa, and Latin America. It has played an important role in alleviating poverty and boosting economic growth in BRI countries.

Like early overseas investments conducted by some developed countries, BRI finance is led by governments. BRI finance focuses on infrastructure construction, and is based on the valuable experience amassed since China's reform and opening up. In the past decade, BRI finance has greatly supported the connectivity and development of real economies in BRI countries. In the coming decade, we believe BRI finance has the potential for sizable growth. For example, diversifying participating entities and forms of finance, which helps improve performance, reduce risks, and enhance efficiency of investment and financing, has become a trend in economic development. This is evidenced by the following: (1) The universe of investors and lenders is expanding beyond unilateral policy financial institutions to include multi-lateral institutions and private sectors that work together or separately; (2) BRI finance is switching from a government-led model to a government-guided and sustainable market-based model that attaches importance to returns; and, (3) it is shifting from a bank loan-dominated model to a new, capital market-based model that is characterized by multiple financing options.

BRI finance is still in its infancy. Looking ahead, we think infrastructure construction in BRI countries will continue to generate substantial demand for funding. Banks will continue to play an essential role in BRI finance, and capital markets will be crucial to expanding the range of financing options and improving investment efficiency, in our view. Domestic financial institutions can improve their capabilities in

Author: WU Xiaohui, WANG Naixi, PENG Wensheng; Contributor: ZHU Feng.

going global, advance financial connectivity in BRI countries, and build a flexible, stable, and resilient BRI financial system based on local conditions in order to boost long-term common development in China and BRI countries.

4.1 BRI Finance Pays Attention to Both Development and Profitability

BRI advocates win-win cooperation and common development among emerging economies. Since embarking on reform and opening up in 1979, China has gradually become integrated with the global market, its economy has grown rapidly, and the country has made tremendous achievements and amassed rich experience in development. Finance has played an essential and positive role in this process. Currently, pursuing high-quality development and high-level opening up has become the consensus and focus of policies in China and many economies. We have seen increased uncertainties in the world since outbreaks of the COVID-19 pandemic and the Russia-Ukraine conflict. BRI countries are making joint efforts to resolve bottlenecks in development, overcome difficulties, and embrace new development opportunities. Financial support is essential for them to achieve these goals.

We have stated in the Chap. 1 of this book that development is the master key to advancing the BRI. High-quality, efficient financial resources are indispensable in supporting the development of real economies in BRI countries. BRI finance is different from either traditional development finance or commercial finance. The core of BRI finance is that it integrates development finance's focus on public goods that serve the whole society and the market-based, efficiency-driven, and profitability-oriented approach to commercial finance. In addition to serving China's strategic goals, increasing economic, trade, and investment links among BRI countries, and advancing common interests among BRI countries, BRI finance also seeks to balance strategic benefits and financial returns, as well as foster close collaboration and a win-win situation among BRI countries, societies, and private sectors.

4.1.1 Current Status: Bank Loans and Direct Investment Are the Main Sources of BRI Funding

Finance provides important support to BRI projects. Since the launch of the BRI, development finance provided by state-owned financial institutions in China has played a dominant role in the development of BRI finance, supplemented by commercial finance. As of end-2021, China's cumulative investment and financing in BRI countries amounted to nearly US\$1.3trn (Fig. 4.1). Of these funding sources, bank loans and grants were more development-oriented, while direct investment and portfolio investment were more commercial in nature. Bank loans, foreign direct investments (FDI), portfolio investments, and grants accounted for around 73%, 21%, 4%,

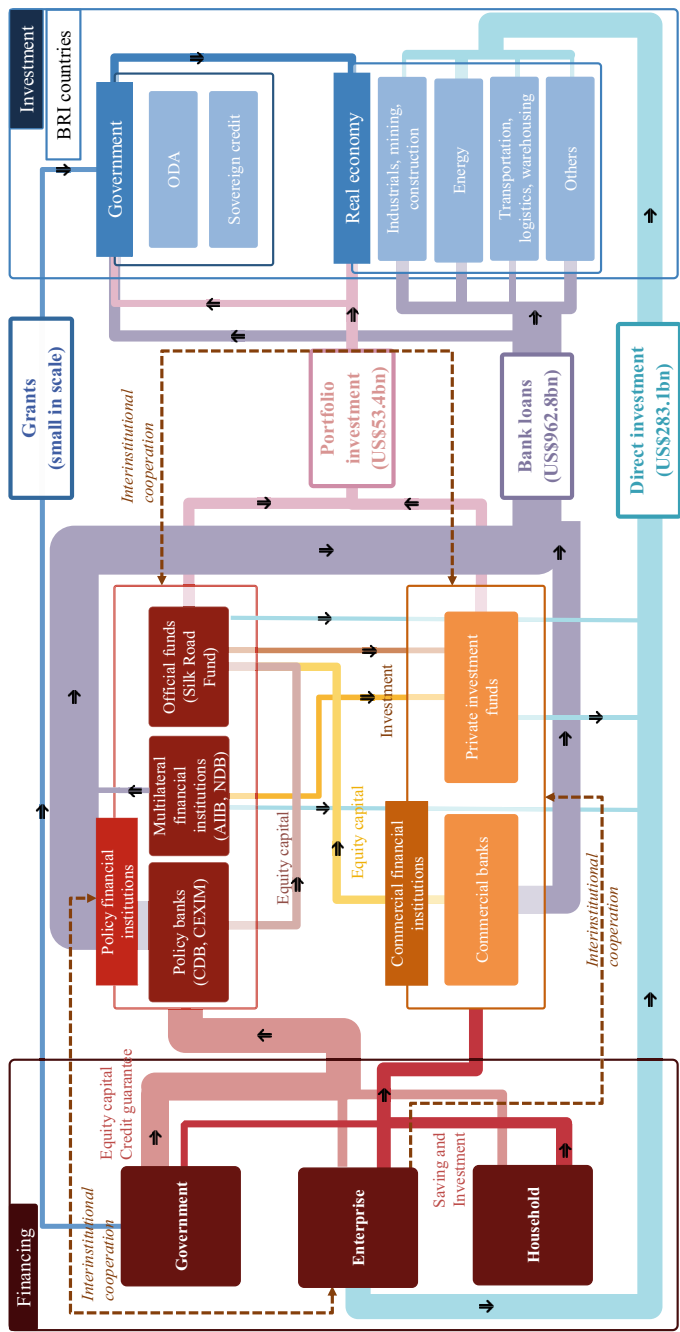


Fig. 4.1 Basic types of access to investment and financing for BRI countries—policy financial institutions play a crucial role. *Note* Currency unit: US dollar; ODA stands for official development assistance; we use data on existing investment in 2021; direct loans in this figure refer to “loans” defined in the report *Time-series data of international investment position of China* released by the State Administration of Foreign Exchange; direct investment in this figure refers to China’s existing direct investment in countries that have signed BRI cooperation agreements with China (based on Ministry of Commerce data); capital market investment refers to China’s existing portfolio investment in countries that have signed BRI cooperation agreements with China (based on IMF data). Changes in thickness of lines in the figure do not represent proportional changes. *Source* State Administration of Foreign Exchange, IMF, Wind, AEI, CICC Global Institute

and 2% of the total proceeds. Overall, two state-owned policy banks (China Development Bank and Export–Import Bank of China) and four state-owned commercial banks¹ in China were the main lenders, accounting for more than 80% of total BRI loans. The Asian Infrastructure Investment Bank (AIIB), New Development Bank (NDB), and other multilateral financial institutions accounted for merely 2% of total BRI loans.² Some loans were lent to governments in BRI countries in the form of sovereign credit before being injected into real economies in these countries. Some BRI loans were directly offered to industries in real economies via banks.

Direct investment is mostly made in real economies in BRI countries via companies, and a small proportion of direct investment is made by financial institutions³ (such as Silk Road Fund, China Investment Corporation, and other government funds, as well as private equity funds). As of 2021, China's existing direct investment in BRI countries reached US \$283.1 bn, of which US \$206.1 bn or 70% was equity investment. Portfolio investment in BRI countries is mostly made by government funds and private-sector investment funds via capital markets. As of 2021, existing portfolio investment in BRI countries was merely US \$53.4 bn, of which 54% was in the form of bonds and 46% in the form of equities. The size of grants is smaller than that of portfolio investment, and grants are mostly offered by the Chinese government to governments in BRI countries.⁴

Capital links between financial institutions also play an important role in BRI finance. Banks are the main sponsors of investment funds that are focused on BRI countries.⁵ Such investment funds can be categorized into two groups—government funds and private-sector investment funds. Government funds include the Silk Road Fund and bilateral funds established by Chinese government in partnership with governments in other countries. Private-sector investment funds mainly comprise private equity (PE) and venture capital (VC) funds that invest in stocks and bonds. Government institutions are the main sponsors of the Silk Road Fund. Specifically, the State Administration of Foreign Exchange, China Investment Corporation, Export–Import Bank of China, and China Development Bank account for 65%, 15%, 15%,

¹ Namely Industrial and Commercial Bank of China (ICBC), Agricultural Bank of China (ABC), Bank of China (BoC), and China Construction Bank (CCB).

² Dreher, A., Fuchs, A., Parks, B., Strange, A., & Tierney, M. J. (2022). *Banking on Beijing: The aims and impacts of China's overseas development program*. Cambridge University Press. He, A. (2019). *The Belt and Road Initiative: motivations, financing, expansion and challenges of Xi's ever-expanding strategy*. Waterloo, ON, Canada: Centre for International Governance Innovation.

³ American Enterprise Institute. (2022). China Global Investment Tracker.

⁴ Dreher, A., Fuchs, A., Parks, B., Strange, A., & Tierney, M. J. (2022). *Banking on Beijing: The aims and impacts of China's overseas development program*. Cambridge University Press. Liu, W., Zhang, Y., & Xiong, W. (2020). Financing the belt and road initiative. *Eurasian Geography and Economics*, 61(2), 137–145.

⁵ He, A. (2019). *The Belt and Road Initiative: motivations, financing, expansion and challenges of Xi's ever-expanding strategy*. Waterloo, ON, Canada: Centre for International Governance Innovation.

and 5% of total capital of the Silk Road Fund.⁶ Commercial banks are the key sponsors of bilateral funds.⁷ Funds from government sources and multilateral institutions also flow into BRI countries in the form of fund-of-funds, either through direct investment or portfolio investment by other investment funds.

In a nutshell, traditional development finance continues to hold a dominant position in BRI finance. Loans from state-owned policy banks and commercial banks currently account for a dominant proportion in BRI finance, supplemented by direct investment from companies. China lags developed countries in terms of promoting commercial finance in BRI countries. The scale of China's direct investment and portfolio investment in these countries remains small. However, the scale of China's existing direct investment in BRI countries is catching up. Its existing direct investment in BRI countries was equivalent to 20%, 44%, and 79% of US, German, and Japanese direct investment in these countries in 2021 (vs. 6%, 9%, and 33% in 2009). On the other hand, the size of China's portfolio investment in BRI countries remains notably lower than those of developed countries. Its existing portfolio investment in BRI countries was equivalent to merely 3%, 4%, and 15% of US, German, and Japanese portfolio investment in these countries in 2021.⁸

Currently, China cooperates with more than 150 economies under the BRI framework. It invests in many countries via development finance. However, the amounts of its investment vary in different regions and different industries. China's direct BRI investment in East Asia and the Middle East has been increasing more rapidly than that in sub-Saharan African countries, while the number of its BRI investment and financing projects in Europe and America is less than that in other regions. As of 2021, the top 10 BRI countries measured by the value of direct investment from China accounted for 61% of China's direct investment in BRI countries. Among them, Singapore ranked No. 1, accounting for 24% of China's direct investment in BRI countries.⁹

As BRI finance focuses on serving the real economy, the universe of industries across which BRI finance has spread is influenced by the economic structures of recipient countries. BRI finance is currently concentrated in natural resource (metal & mining), energy, and infrastructure construction projects. In particular, China's bank loans in BRI countries are concentrated in the infrastructure construction and energy industries. Infrastructure related industrials, mining, and construction industries, combined with transport and warehousing industries, accounted for approximately 48% of China's bank loans in BRI countries over 2013–2017, and the proportion was around 28% for the energy industry (Fig. 4.2). Direct investment is also concentrated in energy, transport and logistics, and mining projects. The energy industry accounted for 36% of China's direct investment in BRI countries over 2013–2022,

⁶ <http://www.silkroadfund.com.cn/cnweb/gywm/gsgk/gsjj/index.html>.

⁷ He, A. (2019). *The Belt and Road Initiative: motivations, financing, expansion and challenges of Xi's ever-expanding strategy*. Waterloo, ON, Canada: Centre for International Governance Innovation.

⁸ Source Wind, IMF.

⁹ American Enterprise Institute. (2022). China Global Investment Tracker.

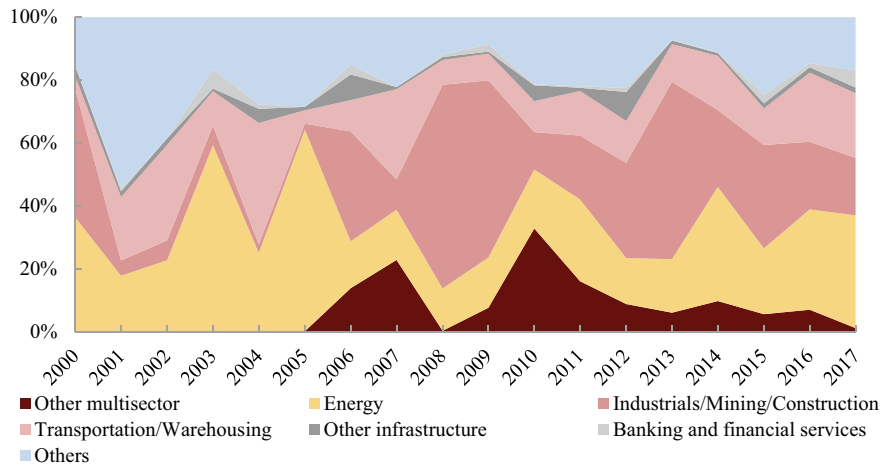


Fig. 4.2 Bank loans for BRI countries are concentrated in the natural resource, energy, and infrastructure construction industries. *Source* AidData, CICC Global Institute

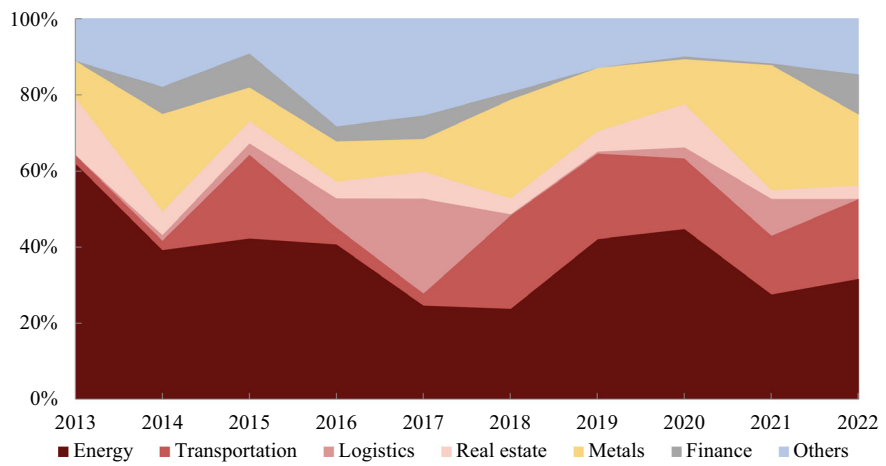


Fig. 4.3 Direct investment in BRI countries is concentrated in the natural resource, energy, and infrastructure construction industries. *Source* AEI, CICC Global Institute

and the proportions were around 20% for the transport industry and about 17% for the metal industry (Fig. 4.3).¹⁰ This, to some degree, shows that China and some BRI countries can meet each other’s economic development needs in a complementary way.

¹⁰ American Enterprise Institute. (2022). China Global Investment Tracker.

4.1.2 Uniqueness: BRI Pays Attention to Both Economic Development and Financial Returns

In order to offer effective financial support to BRI projects, we believe efforts can be made to promote both policy-based development finance and market-oriented financial services from commercial financial institutions. Modern development finance or development assistance can be traced back to the Marshall Plan, which was sponsored by the US after the end of the Second World War. The Marshall Plan facilitated post-war reconstruction in Europe, boosted the economic recovery of European countries, and built a foundational cooperation and financial support framework for international development finance. Major participants in the Marshall Plan tended to be developed countries.

BRI finance is more akin to the development finance that focused on promoting industrialization and infrastructure construction in developing countries in the 1950s and 1960s than to the Marshall Plan. Long plagued by poverty, these developing countries lacked basic public services, and their industrial foundations were fragile in the 1950s and 1960s. During this period, development finance was mainly extended by bilateral or multilateral institutions; and a global development finance system comprising the World Bank, the International Monetary Fund (IMF), affiliated organizations of the United Nations, and regional development banks was established. In the following several decades, the scope of development finance has expanded to cover all aspects of the economy, as well as social development and governance in major regions around the world.

The organizational form of BRI finance is similar to those of early development assistance plans, which were led by countries that had made notable achievements in development and governance. China is advancing the construction of a system that is based on new international financial organizations (such as the AIIB and New Development Bank) so as to boost the growth of BRI countries, mitigate risks, and create a win-win situation among all parties involved.

The emergence of development finance after the end of Second World War was, to a large degree, attributable to market failure, which resulted in inefficient distribution of resources and hence sluggish and unbalanced economic development. The Great Depression in the 1930s showcased the destructive effect of market failure, giving rise to Keynesian economics, which advocates the use of fiscal and monetary policies to stabilize the economy and boost growth. Development finance, to some degree, emerged in response to market failure, as an extension of Keynesian policies abroad. The main purpose of development finance is to utilize government intervention to resolve the severe economic and financial imbalances in developing countries and regions, creating jobs, boosting economic growth, and promoting social progress, including poverty alleviation and sustainable development. In many developing countries, technologically backward infrastructure facilities, poor public services, and companies' limited access to credit and other forms of finance have hindered corporate development, economic growth, and job creation. Development finance, coupled with policy guidance and technical assistance, is a key means of

inter-country, regional, and global collaboration for mitigating the impacts of market failure on economic growth and social progress in less developed countries.

Some essential elements of economic growth, including infrastructure in the traditional economy (such as highways and railways) and 5G base stations and data in the digital economy, are, to some degree, public goods. They also have unique externalities. The self-correcting mechanism of the market typically cannot eliminate all the distortions in these elements, thereby leading to second-best optimality. Therefore, government intervention is often required to correct market failure. Infrastructure and other public goods are, to some degree, non-excludable. When a good is non-excludable, it implies that once it has been produced and provided, there is no efficient way to prevent someone from consuming or benefiting from it, regardless of whether they have paid for it. Public goods are also non-rivalrous. This means they are accessible by all while one's usage of the product does not affect the availability for subsequent use. For instance, highways and railways are essential to development, yet the construction and maintenance of such facilities are typically costly. In less developed market economies, such facilities tend to generate much lower private returns than social benefits. As a result, the private sector would be unwilling to offer these public goods.

Externalities may pose fundamental economic policy problems when the private sector is unable or unwilling to internalize the indirect costs of or the benefits from their economic transactions. The resulting wedges between social and private costs or returns would lead to inefficient market outcomes. In some circumstances, they may prevent markets from emerging. Government intervention is one of the most common ways of helping investors and enterprises overcome the limitations of market forces and internalize returns and costs. As such, public fiscal policies and development finance are the key approaches to offering and regulating public goods and services in less developed countries.

Looking at China as an example, at the initial stage of the country's economic development, the government realized the attributes of infrastructure facilities as public goods that are essential to development. Since the beginning of its reform and opening up, China has utilized development finance to expand its funding sources to support infrastructure construction. The country has amassed rich experience and set a role model for the rest of the emerging world in leveraging policy finance and development finance to support rapid growth of the real economy.

BRI finance and traditional development finance have many things in common. Both are aimed at boosting economic growth and social progress in developing countries, addressing the problem of inadequate infrastructure facilities and other problems arising from market failure that may weigh on economic growth, and creating a win-win situation for all stakeholders involved. As with traditional development finance, lenders need to consider the efficiency, sustainability, and impact of BRI finance on local communities and environments when making their lending decisions. Unlike the more policy goal-oriented development finance or the more efficiency and returns-focused commercial finance, BRI finance lies somewhere between the two. The uniqueness of BRI finance can be summarized in four aspects:

First, one of the main purposes of BRI finance is to support economic and financial connections between the countries involved. Large BRI infrastructure construction projects aim to build networks of railways, highways, and ports, among others, to connect China with the producers, consumers, and capital markets in Asia, Africa, Europe, and South America so as to boost bilateral and multilateral trade and investment. They also promote market, economic and financial integration, and create or increase the economies of scale. As such, the size and scope of BRI finance is different from those of traditional development finance. As is the case with traditional finance, China-led BRI finance typically takes the form of loans. However, BRI finance attaches greater importance to industrial links between China and recipient countries so as to promote multilateral trade and investment, while some traditional forms of development finance tend to support special development projects through unilateral and multilateral organizations' conditional aid, grants, and concessional loans.

Second, BRI finance combines development finance and commercial finance to offer a combination of development-oriented and market-based funding. One important aspect of BRI finance is that it seeks to promote friendly bilateral and multilateral relationships among BRI countries to achieve a win-win situation that would foster common prosperity. Therefore, the purpose of BRI finance goes beyond financial returns. International aid provided by Europe and the US is often intended to serve important strategic interests in addition to pursuing economic growth and humanitarian goals.¹¹

For example, the US government has been promoting development finance projects via the US Agency for International Development (USAID) and the US International Development Finance Corporation (DFC), and these projects are closely associated with the US government's international strategic goals and diplomatic policies. Promoting development in recipient countries is just one of the goals of these projects. The US Congressional Research Service has made it clear that one of the reasons behind the establishment of the DFC is to respond to the BRI.¹² Judging from actual fund flows, we find that the DFC also invests in high-income countries that are not in urgent need of financial support; and the External Investment Plan (EIP) of the EU invests in African regions that are adjacent to the EU in its effort to resolve the problem of illegal immigration to the EU by boosting economic growth and employment in Africa.

In addition, market-based mechanisms and profitability are crucial to the sustainability of financing projects in developing countries. Since the establishment of the Marshall Plan, grants, concessional loans, and other aid-based funding have been the most common types of financial support received by developing countries from the international community. While the organizational form of the BRI is similar to that of the Marshall Plan, the financial structures of the two are entirely different. The

¹¹ Apodaca, C. (2017). Foreign aid as foreign policy tool. In *Oxford research encyclopedia of politics*.

¹² Akhtar, S. I., & Brown, N. M. (2022). U.S. International Development Finance Corporation (DFC).

US offered a total of US \$13.3 bn in aid to 16 European countries over 1948–1951, of which nearly 90% was in the form of grants and the remainder was in the form of loans.¹³ Given the need for substantial fiscal subsidies to facilitate such cross-border finance, most countries, apart from the US and several other countries, were unable to offer long-term foreign aid after the end of the Second World War.

However, large amounts of aid can make recipient countries reliant on free or low-cost external assistance rather than developing their own competitive industries and financial systems, thereby de-incentivizing self-propelled growth. Such aid may also cause the cross-border “crowding-out effect” by reducing private sector investment in recipient countries, and distorting effective market-based resource distribution mechanisms rather than addressing market failure. BRI finance, which is mainly in the form of bank loans offered by policy banks and state-owned banks and focuses on promoting market-based financing and capital operations, is more likely to increase the profitability and long-term sustainability of BRI projects than aid-based funding support (Figs. 4.4 and 4.5).

Third, BRI projects can effectively support and complement China’s real economy, which may in turn improve the viability and sustainability of BRI finance. BRI projects are typically large-scale projects that involve many economies, projects, and companies. Infrastructure construction projects can be very costly and time-consuming. The sustainability of BRI projects largely hinges on the social benefits and private sector returns that can be generated from such projects. As a result, BRI

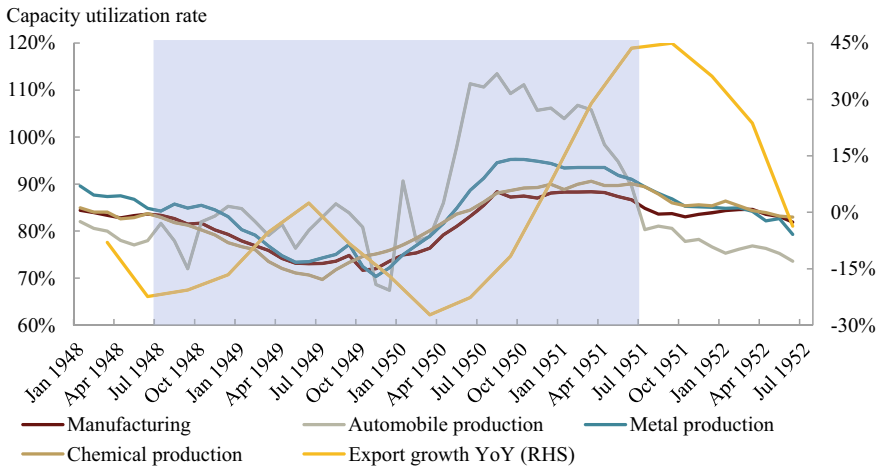


Fig. 4.4 The Marshall Plan boosted recovery of US exports and helped increase capacity utilization rates of many industries. *Note* Areas shaded in grey represent the period of implementing the Marshall Plan. *Source* CEIC, CICC Global Institute

¹³ Tarnoff, C. (2018). The Marshall plan: Design, accomplishments, and significance (Vol. 18). Congressional Research Service.

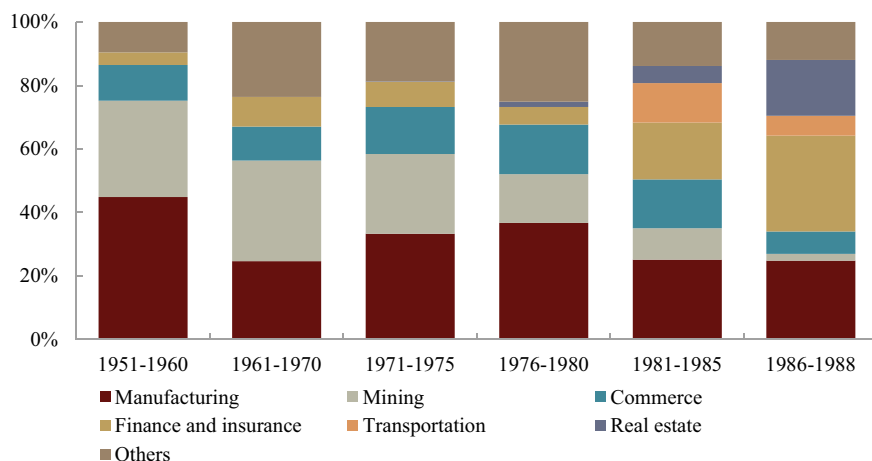


Fig. 4.5 The percentage of Japan's FDI in the financial and insurance industries increased, while that in the mining industry declined. *Source* Komiya & Wakasugi (1991),¹⁴ CICC Global Institute

finance should be market-based and serve China's strategic goals while paying attention to profitability and financial viability so as to create a win-win situation between China and BRI countries and between state-owned companies and private sectors.

For example, China and Laos account for 70% and 30% of total investment in the China-Laos Railway, which started operation in December 2021. This project was funded by loans from the Export-Import Bank of China¹⁵ and has notably boosted the number of tourists as well as trade between the two countries. The passenger traffic and cargo volume of the China-Laos Railway in the year following its launch reached 8.5 mn and 11.2 mnt, of which more than 1.9 mnt were cross-border cargos. China's imports and exports via the China-Laos Railway came in at Rmb2.99 bn and Rmb8.6 bn over January–October 2022.¹⁶ Such BRI projects have presented important opportunities for the internationalization of Chinese companies. The internationalization of Chinese financial institutions is essential to helping Chinese companies go global and companies in BRI countries build their presence in China. With sound infrastructure facilities, the moves to increase financial support for profitable non-infrastructure projects and businesses will improve financial returns and the sustainability of BRI finance, in our view.

Finally, BRI finance focuses on the growth potential of emerging economies. It takes the lead in exploring new trends in international development finance, and advocates paying closer attention to infrastructure and other important economic growth

¹⁴ Komiya, R., & Wakasugi, R. (1991). Japan's foreign direct investment. *The Annals of the American Academy of Political and Social Science*, 513(1), 48–61.

¹⁵ World Bank Group. (2020). Transforming Lao PDR from a Land-locked to a Land-linked Economy. <https://www.worldbank.org/en/country/lao/publication/transforming-lao-pdr-from-a-land-locked-to-a-land-linked-economy>.

¹⁶ <http://www.people.com.cn/n1/2022/1207/c32306-32582460.html>.

drivers in the long term. According to traditional macroeconomic theories, excessive borrowing and investment by public sectors may cause surplus in demand, and lead to a decrease in private sector investment via higher actual interest rates, thereby generating a typical “crowding-out effect” on private sector investment. However, in 1989, Aschauer noted that government investment in infrastructure could help private sectors improve efficiency and profitability, thereby drawing further private sector investment. This is known as the “crowding-in effect”,¹⁷ which occurs when higher government spending leads to an increase in private sector investment.

This is why China has been promoting government infrastructure investment—to encourage companies to enter the market and benefit from economic growth. Infrastructure construction has been one of the most important growth engines for China’s economy since the reform and opening up of the country. Substantial government spending and investment of financial resources in infrastructure construction have supported development of China’s real economy. Currently, there are notable investment deficits in less developed economies. Infrastructure construction projects are now a key focus of BRI economic plans, and hence of BRI finance. This is an important difference between BRI finance and the general form of commercial finance, in our view.

4.2 The Road to Diversification

BRI finance is intended to serve real economies in China and BRI countries, increase trade and investment among them, boost economic growth, and mitigate risks. In order to achieve these goals and meet the different needs of BRI projects, BRI finance could expand its universe of investors and lenders to include more countries, regions, industries and entities; increase BRI countries and private sectors’ involvement in BRI finance; and improve the role that capital markets play in BRI finance. Increased diversification in investor base, investment and financing options, and capital market access is crucial to supporting the BRI and mitigating investment and financing risks associated with BRI projects, in our view.

4.2.1 *Diversification in Investor and Lender Base*

The purpose of financial diversification in the context of BRI finance is to offer various forms of financial services and access to funding to support different kinds of BRI projects based on actual demand and economic rationale, as well as to match different risk appetites of investors. Among BRI countries, 89.4% are developing countries

¹⁷ Aschauer, D. A. (1989). Does public capital crowd out private capital? *Journal of monetary economics*, 24(2), 171–188.

and 17.9% are low-income countries.¹⁸ These countries still have sizable demand for infrastructure construction projects, which tend to require substantial investment with long payback periods and relatively low returns. Policy financial institutions play a dominant role in funding these projects, mostly by offering development loans (or grants) at concessional interest rates. We suggest focusing on the following aspects to improve diversification in BRI finance.

The first aspect is improving diversification in investor and lender base. Multilateral development banks (MDBs) such as the World Bank, the Asian Development Bank (ADB), and the Inter-American Development Bank have played a key role in development finance, especially in providing financial and technical assistance to boost economic growth and sustained development in developing countries. MDBs have multiple advantages over unilateral development financial institutions. First, multilateral development institutions can effectively help reduce related financing costs. With direct and/or indirect government guarantees, unilateral development financial institutions can leverage sovereign credit to issue low-interest rate capital market bonds. For emerging BRI countries, bonds issued by multilateral institutions typically have higher credit ratings, lower interest rates, and more favorable credit terms than those of unilateral sovereign development bonds. For example, the New Development Bank established by the BRICS countries (Brazil, Russia, India, China, and South Africa) is rated AA+, while China, which has the highest sovereign rating among these BRICS members, is rated A+.

In addition, multilateral development institutions' funding is more stable, and can play important countercyclical roles in stimulating economic development. MDBs and the IMF expanded their annual financial support by 30–50% amid the global economic crisis.¹⁹ Bond financing by the ADB has increased steadily in recent years. Its bond financing continued to increase and remained high despite the impacts of the COVID-19 pandemic and Fed interest rate hikes in 2022, showing greater resilience than that by commercial institutions.²⁰

The second aspect is supporting a diverse range of BRI infrastructure construction projects, increasing involvement of the private sector, and allowing capital markets to play a more important role in BRI finance. The types of infrastructure construction projects are becoming increasingly diverse in China, and the involvement of capital markets in funding such projects continues to increase. This may also be the trend in BRI countries going forward, in our view. We note that over time, China has shifted focus from transport and electricity and thermal power projects to water conservancy, public facilities, and other infrastructure construction projects. Data from the National Statistics Bureau (NBS) of China shows that the percentage of

¹⁸ Based on the classification standards and per capita income data released by the World Bank (end-2021 data), out of the 151 BRI countries (as of January 2023), 135 were developing countries and 27 were low-income countries.

¹⁹ World Bank Group. (2016). Multilateral Development Banks. https://www.un.org/esa/ffd/wp-content/uploads/2016/01/Multilateral-Development-Banks_WBG_IATF-Issue-Brief.pdf.

²⁰ Xu, J., Ren, X., & Wu, X. (2019). A panoramic overview of global development financial institutions: Connotation, Rationale and Diversity. *New Structural Economics Development Financing Research Report No. 1*.

fixed asset investment funded by companies increased to nearly 70% in 2022 from 40% in 1990,²¹ showing increasing involvement of private sectors in such investment. Data on total social financing (TSF) in China shows that bank loans as a percentage of existing TSF dropped to 62% in 2022 from 80% in 2002, and that non-financial companies' equity financing, corporate bonds, and government bonds accounted for 9%, 4%, and 17% of existing TSF in 2022. Capital markets, especially bond markets, have grown notably and have played a more important role in financing the Chinese economy.

The third aspect is promoting public-private partnerships (PPP), which are conducive to developing diversified and market-based solutions to BRI finance, especially in the field of infrastructure construction. The PPP-based investment and financing model, under which there is a concession agreement between a government and private sector institutions to deliver public products and/or services, is widely adopted in developed countries. Currently, PPP account for a small proportion of BRI projects, and we see large growth potential in PPP-based BRI projects. In addition, the G20 announced at its Development Ministers' Meeting in 2022 principles to scale up blended finance, suggesting that governments advance local sustainable priorities for development and engage in more cooperation with multilateral institutions, foundations, philanthropists, and other private-sector institutions which pursue goals beyond making a profit, such as creating positive social impact.²² We think PPP, blended finance, and other innovative financing models will help increase the private sector's involvement in BRI investment, make BRI finance more sustainable, and diversify forms of BRI investment and financing.

4.2.2 *Diversification in Investment and Financing Options*

Countries and regions participating in the BRI differ notably. We believe efforts can be made to diversify investment and financing options to meet different needs in different BRI countries and regions. There are notable differences between regions across the world in the following respects: Infrastructure investment opportunities; reliance on the export of energy, minerals, agricultural products, and other resources; level of financial market development; and quality of digital infrastructure (Fig. 4.6).

Southeast Asia has ranked No. 1 in the infrastructure development index (which indicates infrastructure investment opportunities) for four consecutive years, and its score was notably higher than that of the runner-up in 2022. The infrastructure development indexes of Vietnam, the Philippines, and Malaysia exceeded the average level

²¹ Fixed asset investment includes infrastructure construction investment, manufacturing investment, and real estate investment. We use funding sources for fixed asset investment, rather than those for infrastructure investment, as data on the latter is not available.

²² https://perpustakaan.bappenas.go.id/e-library/file_upload/koleksi/migrasi-data-publikasi/file/Unit_Kerja/Deputi%20Bidang%20Pendanaan%20Multilateral/G20-Principles-to-Scale-Up-Blended-Finance-in-Developing-Countries-including-LDCs-and-SIDS.pdf.

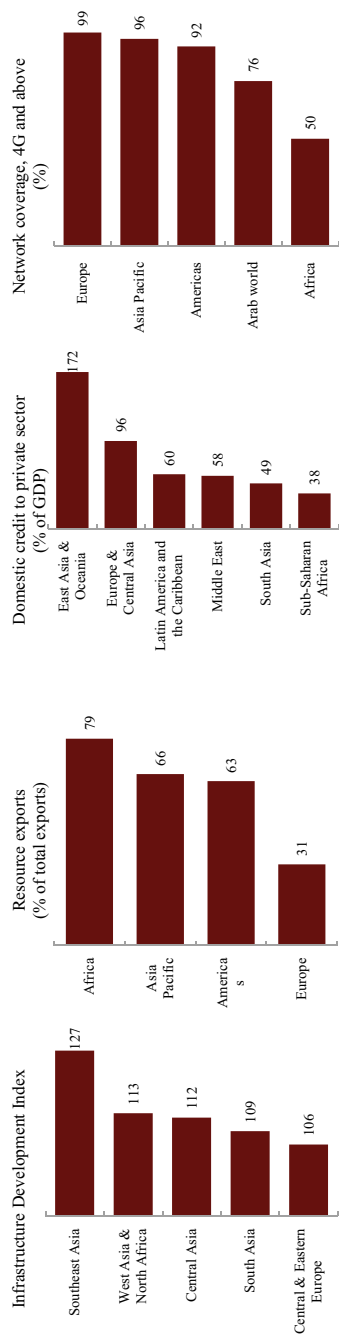


Fig. 4.6 Regional economic differences call for tailored financing. *Note* Infrastructure Development Index (2022), resources export proportion (2021), credit ratio (2020), and network coverage ratio (2022); the Arab world includes 21 countries and regions (ITU data). *Source* World Bank, China International Contractors Association, UNCTAD, International Telecommunication Union (ITU), CICC Global Institute

in the region.²³ Demand for infrastructure construction in Southeast Asia presents opportunities for China. We think bank loans, bonds, and other long-term financing tools for projects will continue to play an important role in BRI finance, while the bond financing to bank loan ratio and the proportion of PPP-based financing may be increased in an appropriate manner so as to expand funding sources and improve the economic efficiency of BRI finance.

Europe, the Asia–Pacific region, and the Americas have gained notable advantages in the field of digital infrastructure construction. This is evidenced by the wide coverage of 4G and more advanced networks in these regions, which has laid a solid foundation for the development of the digital economy. PE, VC, and other equity-based financing options can be explored to support related tech startups, in our view.

Energy and mineral exports are of great significance to some African countries. In energy and mineral industries, we believe mature companies can gain access to stable funding via banks and bond markets, while new startups can tap capital markets and other equity-based funding sources.

From the angle of financial development, we think East Asia and Europe already have a solid financial foundation, and efforts can be made to improve capital market connectivity as well as cooperation on payment clearance and settlement in these regions. We think policy banks can play a role in guiding financial cooperation in Africa and other less financially developed regions. We also see room for fintech and other innovative financial activities to develop in Africa and other less financially developed regions. We expect an increasingly diverse range of industries and financing methods to be involved in the BRI cooperation projects in which China participates as BRI countries differ notably in the levels of economic and financial development.

The experience of other countries shows that investment in developing countries and related financing methods are becoming increasingly diversified. The ADB and International Finance Corporation (IFC) believe equity investment allows more flexibility, and are expanding the coverage of their investments. IFC, an equity investor that often takes influential minority stakes in client companies, can provide hands-on strategic guidance to critical players in local and regional economies.²⁴ ADB conducts both PE and VC investment. ADB Ventures is a financing partnership facility supporting early-stage companies. It also plays a role in helping the ADB increase the use of technology-enabled solutions to address climate change and gender inequality in developing countries. The ADB also invests in PE funds to support companies in sectors and countries where direct equity and lending programs may have limited penetration. Such investments during 2021 were particularly timely

²³ China International Contractors Association. (2022). BRI Country Infrastructure Development Index Report 2022.

²⁴ IFC. (2023). IFC Annual Report 2022—Stepping Up in a Time of Uncertainty. <https://www.ifc.org/content/dam/ifc/doc/2023/IFC-AR22.pdf>.

due to the impact of the COVID-19 pandemic, and they were concentrated in highly impacted sectors such as agriculture, education, financial services, and healthcare.²⁵

BRI finance not only funds investment projects, but also offers diversified financial services that can help promote international trade and boost growth of medium, small, and micro enterprises (MSMEs) in BRI countries. Trade finance is a very important financial service, in our view. Common forms of trade finance include credit lines offered by banks to import and export trade companies, letters of credit offered by banks, factoring, and transport and delivery insurance programs. The amount of trade finance provided by policy banks and commercial banks in China has increased, and still has significant potential to grow, in our view. BRI countries that rely on commodity exports can utilize futures and other derivatives in the financial derivatives markets to mitigate the impacts of risks arising from volatile commodity prices and other changing trade conditions, improve the pricing of related commodities in BRI countries, and facilitate industrial and macroeconomic risk management.

BRI countries are mostly less developed economies. They typically do not have adequate banks and other financial institutions that can meet the demand for financing services from MSMEs. China has in recent years accumulated rich experience in advancing inclusive finance via fintech. Fintech can help meet different financial needs in BRI countries. Loans offered by fintech companies that focus on big data analysis can supplement loans from commercial banks²⁶ as they can support MSMEs that have poor access to bank loans due to high risks and inadequate collateral. Data from MYbank, a virtual bank in China, shows that 99.8% of its loan products were offered to small and micro companies with annual sales value of less than Rmb1 mn in 2017, of which nearly 50% were based in tier-3 and tier-4 cities.²⁷ In addition to loans, large fintech companies also offer payment, insurance, deposit, investment and other financial services to MSMEs.²⁸

4.2.3 *Developing BRI Capital Markets*

Experience in China and other countries shows that investment and financing markets tend to eventually become diversified, characterized by a variety of financing options. Therefore, BRI projects with different investment and financing needs and of different natures can receive funding support that matches their characteristics and risks. Such capital support includes bank loans and capital market-based direct financing.

²⁵ ADB. (2022). Annual Report 2021: Toward a Green and Inclusive Recovery. <https://www.adb.org/sites/default/files/institutional-document/788046/adb-annual-report-2021.pdf>.

²⁶ Tang, H. (2019). Peer-to-peer lenders versus banks: substitutes or complements? *The Review of Financial Studies*, 32(5), 1900–1938.

²⁷ Huang, Y., Zhang, L., Li, Z., Qiu, H., Sun, T., & Wang, X. (2020). Fintech credit risk assessment for SMEs: Evidence from China.

²⁸ Frost, J., Gambacorta, L., Huang, Y., Shin, H. S., & Zbinden, P. (2019). BigTech and the changing structure of financial intermediation. *Economic Policy*, 34(100), 761–799.

Different players can participate in BRI projects via capital markets, sharing returns and risks.²⁹ Unlike indirect financing via banks, financing in capital markets involves multiple actors. In some BRI emerging economies, it is costly and time-consuming to amass credit information, in which case bank loans tend to be a preferred option, while capital market financing faces difficult information obstacles and “free rider” problems. In a capital market in which investors, lenders, and information sources are more diversified, combining different views on the profitability of investment projects can better reflect real situations. Compared with banks, capital markets may be more effective in monitoring financing projects, and are more likely to force the termination of inefficient projects. Investors in capital markets have different levels of risk appetite and requirements on return. This diversity should be taken into account in BRI investment and financing.

Landscapes of financial sectors, especially the importance of capital markets, vary among different economies (Fig. 4.7). The level of capital market development tends to correlate with that of economic growth,³⁰ but protection of property rights and investors, as well as legal systems, also play important roles in driving the development of capital markets. Different types of financial arrangements can help companies, financial institutions, and markets better assess potential investment opportunities, improve corporate governance, strengthen risk mitigation, increase liquidity, and mobilize social savings. Investment and financing-related systems and environments have a direct bearing on the feasibility and efficiency of financial arrangements. Capital markets tend to play a bigger role in countries in which shareholders receive stronger protection than creditors, accounting systems are more reliable, and deposit insurance protection is weaker.³¹ Data shows that stock markets are less developed in Germany, Japan, Argentina, and other countries that score lower in minority shareholder protection. South Africa scores second only to the UK in minority shareholder protection, and the level of capital market development is higher in South Africa than in many other emerging countries. The levels of per capita GDPs are similar between Argentina and China, but the former lags in measures such as minority shareholder protection, and the financial market is also less developed in Argentina than in China.³²

The growth and expansion of capital markets in BRI countries are conducive to the development of finance industry in China and BRI countries. In addition to limitations caused by the earlier stages of economic development and systems, capital markets in BRI countries are also faced with other problems such as inadequate policy support, high costs associated with regulatory coordination, the need for financial

²⁹ Thiel, M. (2001). Finance and economic growth—a review of theory and the available evidence. *European Economy-Economic Papers 2008–2015*, (158).

³⁰ Cull, R., Demirgüç-Kunt, A., & Lin, J. Y. (2013). Financial structure and economic development: a reassessment. *The World Bank Economic Review*, 27(3), 470–475.

³¹ Demirgüç-Kunt, A., & Levine, R. (2001). Bank-based and market-based financial systems: Cross-country comparisons. *Financial structure and economic growth: A cross-country comparison of banks, markets, and development*, 81–140.

³² Data source: World Bank; Djankov, S., McLiesh, C., & Shleifer, A. (2007). Private credit in 129 countries. *Journal of Financial Economics*, 84(2), 299–329.

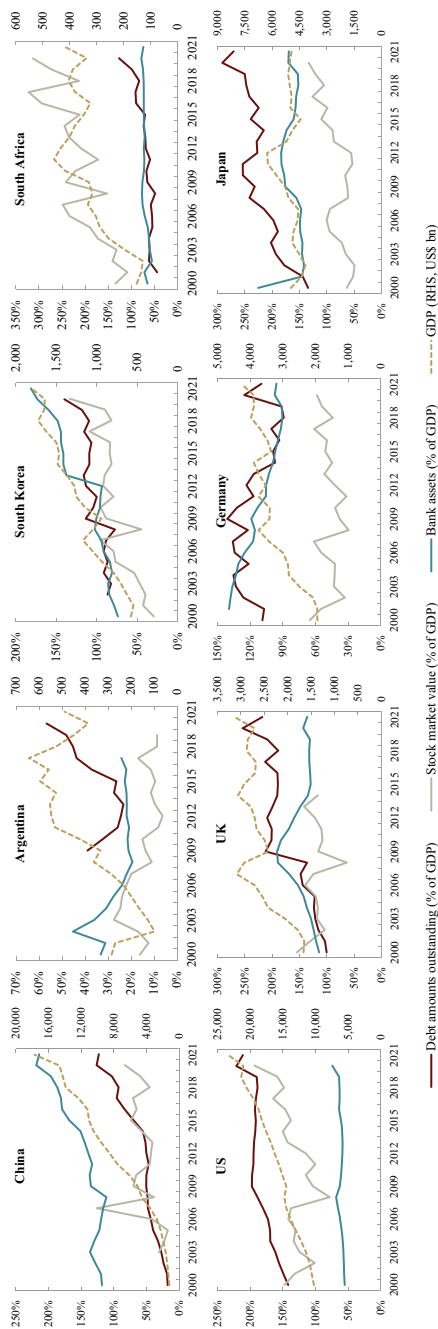


Fig. 4.7 Structures of financial markets in select countries. *Note* Debt amounts outstanding refers to the total amount of domestic and international bonds. *Source* World Bank, BIS, CICC Global Institute

institutions in China and BRI countries to improve their competency, and restrictions on cross-border capital flows. Chinese institutions have a relatively weak foundation for equity investment. Their businesses in BRI countries are still in their infancy, and are subject to high investment risks. Sizes of BRI bonds and panda bonds remain small, and short-term dim sum bonds can only offer limited support to BRI projects.³³ We think the internationalization of BRI finance will be a key future trend, which can be built upon China's expertise and experience in funding economic development as an emerging economy.

In addition, multilateral collaboration can be encouraged both on the level of regulatory authorities and on the level of financial institutions, and to build a BRI international capital market, establishing a cross-border financial paradigm. Efforts can also be made to support stock and bond connect programs and Chinese depository receipts (CDRs), help Chinese companies go global via qualified domestic institutional investor (QDII) programs, increase cooperation with stock exchanges in BRI countries, and improve connectivity mechanisms. Participants in BRI finance could seize opportunities to solve problems and boost the development of capital markets in BRI countries.

4.3 Reflections and Insights

BRI finance plays an important role in helping BRI projects serve the real economy and in promoting financial development in BRI countries. It represents a new trend emerging alongside the changing goals and forms of post-Second World War development finance. It also reflects the experience in some major developed countries and developing countries. Priorities and needs continue to change in global governance and developing countries, from postwar reconstruction to the construction of dams, highways, and other large infrastructure in the 1960s and 1970s; poverty alleviation, industrialization, and social development in the 1990s; education, healthcare, other basic services and sustainable development; and then to the important roles of infrastructure and energy industries in BRI finance.

BRI finance can effectively support long-term economic growth, connectivity, and common prosperity in BRI emerging countries. The following efforts are essential to BRI finance: Increasing cross-border multilateral collaboration in finance and real economies in BRI regions, strengthening connectivity of markets and resources in BRI countries, and using innovative investment and financing methods to support sustainable development and mitigate risks. Such efforts require multilateral involvement and collaboration, including cooperation with multilateral organizations, United Nations agencies, non-governmental organizations, and private

³³ A panda bond is an RMB-denominated bond from a non-Chinese issuer which is sold in the Chinese mainland. Dim sum bond is an unofficial name for bonds denominated in RMB and issued in Hong Kong SAR.

sectors that participate in traditional development financing activities, so as to enable participants to play their due roles.

The capacity building of Chinese financial institutions is crucial to delivering quality financial services for Chinese companies and BRI countries. Financial institutions can go global by conducting direct investment and M&A deals, entering into partnerships, providing technological and consulting support, and issuing financial products internationally. We believe this will enable them to better support economic development in BRI countries.

While diversification is important, we think BRI finance can still focus on infrastructure construction, especially the construction of telecommunication, internet, artificial intelligence, and other digital infrastructure that could create new business models and opportunities and improve productivity. In addition, BRI finance can support the use and development of digital technologies in agriculture, healthcare, education, and other sectors.

Building infrastructure in BRI countries requires the support of financial services. Promoting the internationalization of China's financial sector and increasing financial cooperation among BRI countries (such as developing a centralized clearing system, jointly promoting regional financial centers in BRI countries, and fostering cooperation between BRI related financial regulatory institutions) are instrumental to the provision of such services, in our view. Efforts can be made to foster the principles of "mutual recognition" and "domestic control". Cross-border risk management measures can help increase real-time supervision and communication. Monitoring changes in financial sectors and ensuring the long-term stability of financial systems in BRI countries may also help enable BRI finance effectively support real economies, benefit local communities and people, and reflect local needs and priorities.

It is essential to provide support and guidance for the private sector to play a bigger role in the BRI, increase returns and reduce costs, and improve the sustainability of BRI finance in the long term, in our view. Private financial institutions and corporate investment and finance are of great importance to economic growth and employment. BRI finance can provide funding and other forms of support to companies. It can also create a favorable environment for cross-border investment and earnings growth of private sectors by improving policies and regulations. Government institutions, financial institutions, and companies can join hands to explore innovative financing solutions and products. For example, social bonds and sustainability-linked bonds can be offered to fund social projects and environmental protection projects so as to allow participants from China and other BRI countries to mutually benefit from BRI projects.

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Chapter 5

BRI Finance: Important Roles of the Capital Market



Abstract Introducing BRI finance into the capital market can meet BRI countries' demand for sustainable funding over the long term, and the economic transformation in BRI countries may be expedited via the sharing of managerial experience, introduction of industrial resources, and optimization of resource usage. For Chinese funds, BRI countries boast various investment options which may enhance potential returns. For Chinese-funded financial intermediaries, the BRI projects can drive their globalization. For China's capital market, the deepening of cooperation with exchanges in BRI countries may expand the capital markets. Moreover, experience in the development of BRI capital markets can be used as a reference for loan growth and resolution of debt defaults in BRI finance.

BRI capital markets remain small in scale at the current stage. However, we expect them to prosper given the multitude of opportunities. China's capital investment can cater to the needs of BRI countries that are developing their capital markets in ways such as increase in non-US dollar denominated financing, long-term funding support, and sharing of industrial experience and resources. Over the short to medium term, strengthening of policy support could reduce the current regulatory cost and enhance business capabilities. Over the medium to long term, we think BRI capital markets may grow swiftly over the next 5–10 years as the economic and trade cooperation between China and BRI countries deepens.

At present, China's BRI finance is mainly dominated by state-owned banks, and bank loans constitute the largest portion of funds that flow to BRI countries. Given the significance of BRI finance, we think it is reasonable and necessary for policy banks and the big four state-owned banks to take the lead in the initial stage. However, there have been concerns as to whether the status quo (i.e., investment projects concentrated on a few industries and geographical regions) can meet the needs of BRI countries over the long term, and whether the introduction of more financial instruments is practical and necessary.

Author: CHEN Jianheng, LIU Gang, YAO Zeyu, WANG Haibo, WEI Lulu, YU Jie, WAN Xiaoyue, ZHANG Weihai, ZHOU Dongping.

In recent years, the capital market has made initial contributions to the economic linkage and development of BRI countries, such as China's issuance of BRI bonds, BRI countries' issuance of panda bonds (RMB-denominated bonds issued by non-Chinese issuers in the Chinese mainland) and dim sum bonds (RMB-denominated bonds issued in Hong Kong SAR), Chinese-funded private equity (PE) companies' establishment of special BRI funds or investment in firms from BRI countries, and Chinese-funded securities brokers' assistance with the listing of firms from BRI countries on HK- and US-share markets.

This chapter is organized as follows. Section 1 focuses on the feasibility and necessity of introducing capital markets into BRI finance from the perspectives of economic development in BRI countries and benefits for Chinese funds and financial institutions. Section 2 elaborates on the current capital markets in BRI countries, and the status quo, structure, and characteristics of capital market tools in BRI finance. Section 3 analyzes the opportunities in BRI capital markets. Section 4 offers a glimpse of the development of BRI capital markets in the future.

5.1 Importance and Role of Capital Markets in BRI Finance

Policy-based financial institutions and state-owned banks are major sources of funding for BRI finance. The funds, raised mostly via bank loans, are mainly invested in resources, energy, and infrastructure projects in developing countries in Asia, Africa, and Latin America. BRI finance includes development finance (which is led by policy-based financial institutions and state-owned banks, and takes the form of bank loans) and diversified finance (which provides various financing channels such as equities, stocks, and bonds via China's capital market). In the past, BRI finance focused on infrastructure projects to meet basic needs for infrastructure construction and economic growth in BRI countries. As infrastructure facilities are not very appealing to the profit-oriented private sector, government-led development finance became an important way to provide and regulate public goods in less developed countries.

5.1.1 Importance of Diversified BRI Finance for BRI Countries

(1) Introduction of capital markets can meet funding demand in BRI countries

As previously stated, the current BRI investment and financing system is mainly based on developmental financial tools, mostly bank loans. However, some BRI countries have less developed economies that are faced with major financial pressures. This leads to high uncertainty over long investment periods. The risk level does

not match bank loans for which companies' short-term solvency and the quality of tangible assets matter the most. Hence, fiscal incentives such as loan discounts or policy-based guarantees may be required to distribute the funding costs and risk of losses.

Capital markets can enhance the risk tolerance via risk pricing, and provide sustainable short- to long-term financial services based on companies' life cycles. Data from the World Bank shows that BRI countries' demand for infrastructure investment alone may reach US \$649.9 bn in 2030,¹ and demand for funding may be even greater considering that actual construction is not limited to infrastructure. To guarantee sufficient and sustainable funding, a market-oriented investment system led by the private sector and guided by governments may need to be built.² Capital markets in most BRI countries, restrained by economic scale, are small and subject to issues like limited liquidity. It is therefore important to leverage China's financing and investment capabilities, and to introduce diversified financial instruments into BRI finance.

Specifically, PE and venture capital (VC) with high risk tolerance and long investment periods may become a major source of funds for medium-sized, small, and start-up companies in BRI countries. China has a large-scale, internationalized, and multi-layer capital market. Its stock market financing, such as A- and HK-share listing and refinancing, can provide additional financing channels for growth-stage companies in BRI countries. Bonds can be introduced to attract funds with different levels of risk preferences such as non-bank institutions, and provide fund support for projects with relatively controllable risks, like infrastructure construction.

Judging by the historical development of global markets, we think funds that initially flowed to emerging markets were mostly in the form of loans and trade-related borrowings, and gradually expanded to other financial instruments, including equity investment, secondary stock investment, secondary bond investment, and loans and others. According to the World Bank, over three-fourths of net fund inflows into developing countries over 1980–1982 were loans and trade-related borrowings for sovereign governments. The share of bond investments was low, and secondary stock investments barely existed. The investment risks and trade costs decreased after developing countries loosened regulations on financial markets, technologies and financial instruments improved, economic conditions stabilized, and liabilities declined.

Moreover, some developing countries delivered strong economic growth, which offered high expected returns and solid investment opportunities. As a result, fund flows to developing countries via secondary stock and bond markets and FDI rose significantly, and their share in total fund inflows exceeded 75% in 1995–1996. In addition, the major receivers of funds shifted from governments to the private sector. Over 1986–1995, the number of emerging market country funds and regional or global emerging market funds rose from 19 and nine to around 500 and 800,

¹ JU, C. (2021). Challenges and Suggestions for BRI Financial Integration. *China Investment*, No. 536(ZA):20–21.

² <https://finance.sina.com.cn/roll/2019-04-25/doc-ihvhiqax4950924.shtml>.

and combined assets of all emerging market funds increased from US \$1.9 bn to US \$130 bn.³ Based on data from the Institute of International Finance (IIF),⁴ we estimate the shares of equity investment, other creditors' rights investment, bank loans, and stock investment in global net private capital flows to emerging markets by 2014 were 45%, 30%, 15%, and 10%, respectively.

(2) *China's capital market can provide financial development experience and support for industrial development in BRI countries*

Overall, most BRI countries still lag developed countries in the development of capital markets and real industries. In addition to economic support like loans, advanced development experience and industrial resource support are also needed during the transformation of capital markets and real industries. China's multi-layer capital market and its institutional structure have steadily improved. We think BRI countries can learn from China in the development of capital markets and system construction, including the building and improvement of financial regulation systems, the construction of multi-layer capital markets, the approach to boosting the real economy via capital markets, and the development of green finance and environmental, social, and governance (ESG) practices. Moreover, China's capital market can facilitate industrial growth in BRI countries through approaches like introducing industrial resources. Equity investment companies can provide BRI firms with business models and link them to strategic shareholders and corporate partners in China. The M&A and restructuring market allows high-quality companies to expand externally and achieve economies of scale, and companies with weaker operating capabilities to be acquired or restructured.

During China's development, the capital market played an important role in boosting the growth of the economy and companies, and in expediting the transformation of the economic structure. After more than 30 years of development, China's capital market has been the world's second largest as of 2020s. Total market cap of the A-share market by end-2022 totaled Rmb79 trn, with the balance of bonds reaching Rmb141 trn. The multi-layered capital market (i.e., integration of regional equity markets, NEEQ, Beijing Stock Exchange, ChiNext, Sci-Tech Innovation Board, and Main Board) contributed to the development of the real economy, economic transformation and financial sector reform, and optimization of corporate governance.

First, the capital market boosted growth in direct financing and the real economy. Cumulative equity financing in China exceeded Rmb21 trn as of end-2020.⁵ According to the People's Bank of China, the balance of direct financing by end-2022 totaled Rmb101.8 trn, accounting for around 29.6% of the balance of social financing.

Second, the capital market expedited economic transformation. Since 2018, companies in emerging industries of strategic importance such as the semiconductor,

³ World Bank. (1997). Private Capital Flows to Developing Countries.

⁴ IFF. (2013). Capital Flows to Emerging Market Economies.

⁵ China Securities Regulatory Commission. (2021). Thirty Years of China's Capital Markets.

information technology, and medical care industries have raised funds via the A-share market. The registration-based IPO reform allowed the listing of unprofitable innovation companies, red chips, and those with special equity structures.

Third, the capital market boosted reforms and opening-up in the financial sector. As interconnection mechanisms improved and expanded, and with restrictions on investment quotas and on the ratio of foreign shareholdings being lifted, fund flows in China's financial market accelerated. The share of foreign funds in the market cap of A-share outstanding stocks rose from 3.7% in 2014 to 9.8% at end-2022.⁶

Fourth, requirements for information disclosure and tightening of regulations helped improve corporate governance at listed firms and bond issuing companies.

5.1.2 Diversification of BRI Finance and Capital Market Development

For Chinese funds and investors, as China switched from rapid growth to high-quality growth and some new-economy sectors matured, investment opportunities and returns began to decline. Meanwhile, BRI countries have various economic entities, and some countries remain in the early stages of economic transformation. This provides more investment options and potential additional returns for domestic capital market investors. First, the variance of bond investment returns among BRI countries could be high due to the large spread of their international ratings, which helps Chinese-funded institutions optimize their risk investment portfolio and enhance investment returns. Second, the interconnection of Chinese stock exchanges with those in BRI countries, if built, would provide additional channels for fund outflows. Moreover, as the reform of the Stock Connect system continues, high-quality companies from BRI countries may be listed in the A-share and H-share markets, providing more investment choices for domestic investors. Third, as for equity investment, new economy industries in some BRI countries remain in the early stages of development, presenting opportunities for investment, M&A, and restructuring. For example, digital payment volume in BRI countries like Indonesia, the Philippines, and Vietnam reported higher growth than the global average after infrastructure facilities improved. Moreover, fields such as digital finance have become a focus of investment in Southeast Asia. China's PE firms may continue to benefit from the boom in BRI internet markets.

For financial intermediaries like securities brokers, a sustainable and improved system for opening-up may expedite their globalization. China's securities companies are generally in the early stages of global expansion, and mainly provide cross-border services for local clients. Given the solid cooperation between China and BRI countries and the similarity of culture in China and some BRI countries (mostly Asian

⁶ Based on estimates by CICC strategy team. See details in *2023 A-share outlook: A new chapter* (published November 2022).

countries), we think BRI projects may help Chinese-funded securities firms expand their overseas business and establish a global presence, creating a new revenue driver.

In addition, the interconnection of exchanges and infrastructure facilities for payment, clearing, and settlement between China and BRI countries could reduce the friction cost of foreign exchange related issues. The communication between exchanges, technologies, and other fields can boost the opening-up of China's capital market and create mutual benefits for both China and BRI countries.

Lastly, the development of BRI capital markets may set an example for the development of loans and resolution of debt defaults in BRI finance. BRI capital markets are a comprehensive way to export capital, industrial resources, and managerial experience rather than pure fund outflows. This helps enhance the possibility of successful investment and investment returns, and helps prevent failures and debt defaults caused by low efficiency. The overall scale of BRI capital markets remains small, and they cannot replace BRI loans. However, we think the market experience can be used as a reference for company assessment and project risk control for loan granting, thus reducing the default risk.

5.2 Structure and Characteristics of Existing BRI Capital Markets

After analyzing the importance of capital markets to BRI countries, Chinese capital, and Chinese financial institutions, we summarize the structure of capital markets in, the sources of overseas capital inflows into, and China's capital investment in BRI countries.

5.2.1 BRI Capital Markets Are Generally not Large, but Each Have Their Own Characteristics

The development of capital markets is correlated with the stage of economic growth. Capital markets are mature in developed countries like South Korea, Italy, Luxembourg, and Singapore, but have developed slowly or have yet to be established in developing or less developed countries.

However, developed BRI countries are restricted by the size of their economies, and they still have smaller capital markets than China. As of end-2022, the total market cap of listed companies in South Korea was merely US \$1.6 trn, which was low compared with total market cap of listed companies of Rmb79 trn or US \$11.3 trn in the A-share market. For the bond market, outstanding bonds in Italy totaled around US \$3.5 trn by end-2022, while the amount in China was Rmb141 trn or US \$20.3 trn.

Developing and emerging-market BRI countries have smaller stock and bond markets, and their financing capabilities are relatively weak. By end-2022, the

market cap of listed companies in the United Arab Emirates, Indonesia, Russia, and Argentina totaled US \$873.6 bn, US \$610.3 bn, US \$150.1 bn, and US \$53 bn, and the balance of bonds reached US \$239 bn, US \$552.6 bn, US \$646.1 bn, and US \$339.7 bn.

It is worth noting that amid their economic growth, the stock markets of some BRI countries have grown rapidly. The Indonesian stock market, for example, is a multi-layered and multi-type investment market comprising a main board, development board, acceleration board, and new-economy board. It has become one of the most active IPO markets in Southeast Asia. According to the World Federation of Exchanges (WFE), 429 companies were listed in Indonesia over 2010–2022, with total IPO proceeds reaching US \$39.04 bn, both ranking No. 1 in Southeast Asia. By market cap of outstanding shares, Indonesia-listed companies are mainly financial firms such as banks and companies in industries with local advantages. By end-2022, foreign investors accounted for one-third of stock transactions in Indonesia.

Emerging-market countries, which were late entrants into the bond market, mostly started with sovereign bonds (especially fixed-interest rate sovereign bonds), and expanded to credit bonds. Their bond markets show different characteristics due to the differences in economic development, politics, and culture. For example, bond markets in South Africa are more developed and boast high liquidity, and credit bonds are mainly issued by banks. According to AsiaBondsOnline, Malaysia is one of the most developed bond markets among ASEAN countries, as well as the world's largest Islamic bonds market. The proportion of overseas investors as of end-2021 reached as high as one-third.

5.2.2 Share of Capital Market Investments like Equity and Bonds in Sources of Overseas Capital Varies Significantly Among BRI Countries

Sources of overseas capital vary significantly among BRI countries due to factors such as the economy, culture, and the size and structure of their capital markets. In countries with relatively developed capital markets, overseas investment mainly goes to equities and debt securities (e.g., according to IMF, around 60% for South Korea and over 40% for New Zealand in 2022 vs. about 15% for Argentina in 2022, which has a less developed capital market). Specifically, South Korea relies more on foreign investment in equity securities. Moreover, a country's reliance on financing via equity or debt securities also fluctuated in different years as the financial environment changed.

5.2.3 Development of Equity and Bond Markets in BRI Capital Markets

The relatively modest size of the financial markets in BRI countries restricts the amount of China's investment in BRI capital markets. By end-2022, BRI countries accounted for around 2.1% of China's PE investment, and companies from BRI countries comprised merely 3% of Hong Kong SAR listings and 2% of US listings. As for bonds, domestic BRI bonds by end-2022 accounted for only 0.06% of China's total domestic bonds, and BRI countries made up 0.35% of RMB-denominated bonds issued by non-Chinese issuers in the Chinese mainland, and 6.7% of RMB-denominated bonds issued in Hong Kong SAR. Meanwhile, BRI countries as of end-2021 accounted for around 22% of global GDP, 40% of China's exports, and 44.9% of China's imports, according to data from the World Bank World Development Indicators (WDI) and United Nations Conference on Trade and Development (UNCTAD).

First, PE investment is small in scale, and BRI funds are mainly invested in companies with BRI-related businesses. According to Zero2IPO, domestic PE companies' annual average direct investment in BRI countries since 2014 was merely Rmb46.8 bn, accounting for around 2% of total PE investment and 14% of overseas direct investment. China's PE investment in BRI countries has been falling in recent years, dropping from a high of Rmb91.5 bn in 2017 to Rmb34.6 bn in 2022. Data from Pedata shows that China had eight registered BRI PE funds by end-March 2023. Only one fund directly invested in a local company in the United Arab Emirates (China Investment Capital Funds Management's BRI satellite media fund), while the others indirectly invested in BRI markets through domestic companies with BRI businesses.

Second, the size of IPOs of companies from BRI countries is relatively small. As of end-2022, the H-share market had 90 companies from BRI countries (3% of total listings), and the US-share market had 87 companies from BRI countries (2% of total listings). Moreover, these companies were mainly from countries with mature economic development, such as Singapore, Malaysia, Argentina, and South Korea.

In addition, Chinese-funded securities brokers still need to strengthen their competitiveness compared with foreign investment banks, and they did not participate as much in the IPO of companies from BRI countries in Hong Kong SAR and the US. By end-2022, Chinese-funded securities firms accounted for 23% of the H-share IPO underwriting of BRI companies (US \$2.25 bn) and 2% of the US-share IPO underwriting of BRI companies (US \$51 mn).

Third, issuance of RMB-denominated bonds in BRI countries is limited. The BRI capital markets currently mainly focus on two types of bonds: (1) Domestic BRI bonds or bonds with funds raised for BRI projects; and (2) cross-border bonds, including RMB-denominated bonds issued by non-Chinese issuers in the Chinese mainland and RMB-denominated bonds issued in Hong Kong SAR. According to Wind, the issuance of domestic BRI bonds fluctuated sharply over 2016–2019, reaching its peak of Rmb46.1 bn in 2018 and staying below Rmb10 bn in other years. The issuance volume has stayed above Rmb20 bn from 2020 onwards. The

net increase in the issuance of domestic BRI bonds dropped to below zero in 2021 due to the maturity of a significant amount of bonds, and rebounded in 2022.

Although the issuance volume of panda bonds and dim sum bonds has been high, few such bonds were issued by companies from BRI countries. International development companies gained regulatory approval to issue RMB-denominated bonds in the Chinese mainland in 2005, but the initial issuance amount was low. The issuance volume only began to rise significantly after pilot firms' overseas parent companies were allowed to issue RMB-denominated bonds in the Chinese mainland, and the policy clarified that funds for subsidiaries in the Chinese mainland are not included in the risk-weighted balance of cross-border financing in April 2016. Issuance of panda bonds hit a historical high of Rmb130 bn in 2016, delivering a net increase of Rmb124.7 bn. The annual issuance volume has since ranged between Rmb50 bn and Rmb110 bn. Companies from BRI countries—including Singapore, Malaysia, Russia, Italy, and South Korea—have issued panda bonds, but their share in total panda bond issuance remains low.

The first dim sum bond was issued in 2007. The issuance amount reached Rmb570.2 bn in 2014 before subsequently falling due to RMB FX reform, but rebounded in 2018, exceeding Rmb1 trn in 2022. As of end-2022, the balance of dim sum bonds in BRI countries was Rmb81.2 bn, around 6.7% of the total balance. Issuing dim sum bonds does not require regulatory approval, but the FX cost of using funds may be a major reason for the limited issuance of these bonds overseas.

5.3 Growth Opportunities for BRI Capital Markets

BRI capital markets remain relatively small in scale, and still face challenges from existing policies and their stages of financial development. However, there are also opportunities for growth. China's capital investment may boost the development of BRI capital markets in various ways.

5.3.1 BRI Countries' Demand for Capital Markets and Financing

Most BRI countries have relatively small capital markets, and development of capital markets is a prerequisite for economic growth. The injection of funds from other countries is therefore necessary to fill the short-term gap in funds.

BRI countries need financing denominated in currencies other than the US dollar. The dominance of the US dollar has created both opportunities and challenges for countries across the globe over the past few years. Major changes to US monetary policy have challenged the stability of the global financial market, especially BRI countries with less developed capital markets. Financing denominated in currencies

other than the US dollar can help BRI countries reduce their reliance on the US dollar, and prevent market fluctuations caused by large volumes of inflows and outflows of US dollar funds.

BRI countries need long-term funding support. Emerging BRI countries need a long-term vision and stable funds that focus on long-term returns. Expanding sources of funds from countries other than the US and European countries is also good for BRI countries that want to diversify their financing over the medium to long term and boost long-term economic growth.

It is important for BRI countries to learn from other countries' experience in developing capital markets. China's capital market developed rapidly over the past few decades, and BRI countries can learn from its experience. In addition, BRI countries need industrial experience and resources. Moreover, resource consolidation and potential business opportunities would bolster economic growth in BRI countries.

5.3.2 What China's Capital Market Can Bring for BRI Countries

First, China can provide stable non-US dollar-denominated financing for BRI countries to ease the impact of volatile US-dollar inflows and outflows on their financial stability. The sharp fluctuations in inflows and outflows of US dollar funds caused by the US Federal Reserve's adjustments to monetary policy may exert negative impacts on the financial stability in BRI countries. The US Federal Reserve cut the interest rate by 225 bp at the end of 2018, and hiked the rate 10 times by a total of 500 bp between early 2022 and May 2023. Its control over the supply and overseas FX rate of the US dollar via adjustments to the target range for the Federal funds rate to some extent disrupts the financial stability in other countries.

Under the current international currency system, the spillover effect of US dollar funds has become a major trigger of the global financial crisis. In 2022, after the Federal Reserve announced a new round of rate hikes, over 90 economies across the globe⁷ followed suit, leading to an increase in financing costs. For BRI countries, excessive reliance on the US dollar may weaken the effectiveness of their monetary policies and cause financial risks. Hence, it is necessary for them to increase non-US dollar-denominated financing to maintain financial stability.

The RMB is less volatile in terms of FX rate and interest rate, and can provide stable non-US dollar-denominated financing for BRI countries. Following its inclusion in the Special Drawing Rights Basket in 2016, the RMB has increasingly become an "anchor currency" for BRI countries. Data on the FX rate of currencies in BRI countries shows that over half of the currencies maintained a more stable FX rate against the RMB than against the US dollar, and currencies with a more stable FX rate against the US dollar are mainly commodity currencies affected by the oil dollar,

⁷ <http://world.people.com.cn/n1/2022/1001/c1002-32538384.html>.

such as the Emirati dirham, Saudi riyal, and Kuwaiti dinar. The RMB rate fluctuates less than the US dollar rate. RMB-denominated financing can help reduce the volatility in financing costs for BRI countries.

Second, China can provide stable long-term funding support for BRI countries. The domestic capital return rate in China is currently relatively low due to economic slowdown, driving up demand for capital outflows. Currently, the real economy sector in China exhibits low willingness and ability for additional leverage, and demand for social financing may remain weak. Coupled with a possible economic downturn and low inflation, this may keep China's interest rates from rebounding to a high level over the near term. Domestic interest rates therefore may remain lower than overseas interest rates over the long term, boosting demand for overseas investment.

We learned from overseas Chinese-funded institutional investors that they have shifted their offshore investment focus away from Chinese-issued US dollar bonds to BRI-issued US dollar bonds. As the RMB interest rate dropped to below the US dollar interest rate, and the supply of Chinese-issued US dollar bonds declined on the low cost of domestic loans, Chinese-funded financial institutions began to explore investment opportunities in US dollar bonds issued by other BRI countries. Financing of lower-cost and long-term funds also caters to the demand of BRI countries amid US dollar rate hikes and rising fund costs. Hence, we think China may sustain high demand for overseas investment over a long period of time, while BRI countries can acquire low-cost and long-term sources of financing.

Third, China can share its experience in developing capital markets with BRI countries. Chinese financial companies can share with BRI countries their experience in developing businesses such as equity investment, PE financial consulting, and IPOs for new-economy industries like information and communication technology (ICT) and e-commerce. Moreover, they can leverage their expertise in M&A funds, M&A financial consulting, and IPOs to help local companies in BRI countries with relatively high levels of economic development and strong capital. Market-oriented capital market services can offer funding support for BRI countries and facilitate the transformation of their economic structures.

Moreover, China can help BRI countries create more long-term opportunities to grow their industries. Globalization has strengthened economies of scale, and even small countries can benefit via free trade. However, the rising trend of deglobalization has impeded countries' participation in the global market. Developing countries would be more heavily affected by factors like the COVID-19 pandemic, geopolitical conditions, and global economic downturn. As BRI countries generally have small economic scale, we think BRI finance and industrial cooperation can help related countries benefit from China's economies of scale amid deglobalization, and introduce companies from BRI countries into China's mature industrial value chain. This should facilitate industrial upgrades in both China and BRI countries and create long-term growth opportunities. The flow of Chinese funds to BRI countries is in sync with BRI countries' goals of developing capital markets and attracting investment, and we expect opportunities for growth for BRI capital markets.

5.4 Reflections and Insights

We expect the BRI capital markets to rapidly scale up over the next 5–10 years, boosted by the aforementioned opportunities for growth, policy support, and incremental investment. As capital projects are not yet fully deregulated, China's outward direct investment in BRI countries is currently more active than cross-border fund flows in the secondary market (Fig. 5.1). Through outward direct investment, we think Chinese companies can better understand the national institutions and business environments in BRI countries, and reduce the barriers to secondary market investment. This can also help BRI countries understand the Chinese market and boost fund inflows.

Looking forward, we believe financial cooperation, especially in capital markets, will enter a new stage of development. Wind data indicates that China's outward financial investment surged from US \$55.3 bn in 2010 to US \$300.4 bn in 2021, a CAGR of 16.6% (Fig. 5.2). Nevertheless, the proportion of overseas financial investment in total financial assets and liabilities remains low compared with developed countries (1.8% in 2021 in China vs. around 11% since 2005 in the US, according to Haver). Hence, we think China's outward financial investment still has considerable market potential as the financial opening-up and economic structure transformation continue.

Over the medium to long term, we expect the share of outward financial investment in China's total financial assets and liabilities to rise to 5%. Based on the growth of China's overseas financial assets and liabilities over the past decade, we estimate

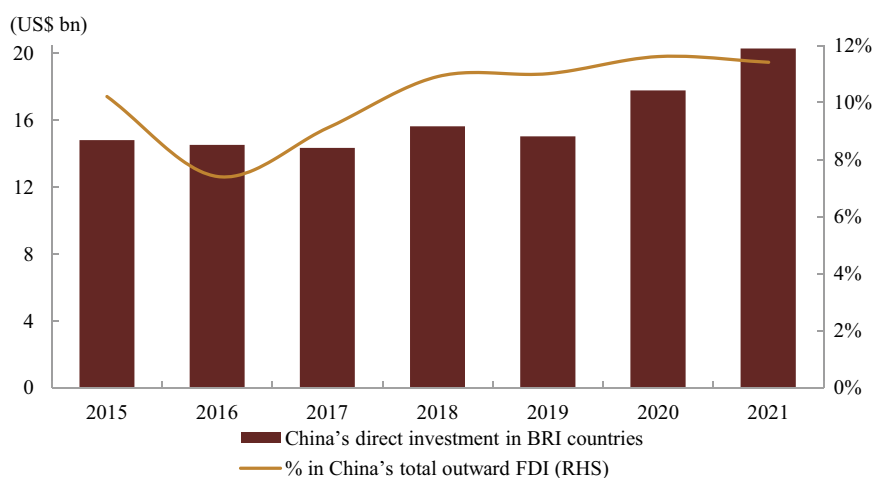


Fig. 5.1 China's direct investment in BRI countries steadily edged up. *Source* Wind, CICC Research



Fig. 5.2 China's outbound financial investment surged. *Source* Wind, CICC Research

China's outward financial investment may reach US \$1 trn in the next ten years.⁸ China's direct investment in BRI countries grew steadily over 2015–2021. Its share in China's total direct investment was 11.4% in 2021, and we expect the ratio to reach or even exceed 15% over the long term as more supportive policies are introduced and as economic and trade cooperation between China and BRI countries deepens further. We estimate the BRI finance market may reach close to US \$200 bn.

⁸ Based on CAGR of 6.4% over 2012–2022 and expected proportion of outward financial investment (5%), we estimate China's financial assets and liabilities in 10 years may reach US \$23 trn, and outward financial investment may reach around US \$1 trn.

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Chapter 6

BRI and RMB Internationalization



Abstract Since 2003, RMB internationalization has been advancing amid twists and turns, but the proportion of the RMB in global foreign exchange reserves is still lower than China's share in the global economy and trade. We believe the root cause is that the RMB has not yet completed a closed loop of cross-border investment and financing. Specifically, the internationalization of a currency entails the expansion of its monetary functions through three basic measures: A medium of exchange, a store of value, and a unit of account. Compared with its function as a medium of exchange, the RMB's development as a store of value and a unit of account has lagged, and the relatively unbalanced development of these three functions of the RMB has imposed constraints on the process of its internationalization. However, the international monetary system is now moving towards a higher degree of diversification. This requires the RMB to play a greater role in global financial and trade scenarios, in our view.

The BRI provides a good opportunity for RMB internationalization, and the formation of a closed loop for the smooth and convenient circulation of the RMB in turn facilitates the healthy interaction between the BRI economy and RMB internationalization. We believe the BRI provides an opportunity to expand the influence of the RMB. First, China has advantages in trade over BRI countries as a whole, with their trade being highly complementary and conducive to further promoting the functions of the RMB as a unit of account and a medium of exchange. Second, the financial markets of most BRI countries are less developed than that of China, which has opened its capital account to a certain extent, helping to improve the functions of the RMB as a store of value. Therefore, the BRI can contribute to developing the three major functions of the RMB and creating a closed loop of RMB investment and financing, in our opinion. In addition, the formation of a closed loop of smooth circulation of the RMB can also facilitate investment, financing, and trade cooperation among BRI countries, and facilitate the high-quality development of the BRI.

Against the background of changes in the global landscape driven by de-dollarization and de-globalization, and drawing on the German and Japanese experience in currency internationalization, we believe China can give full play to its advantages in economic size and trade volume. First, it can seek breakthroughs in

Author: LI Liuyang, LI Jin, YANG Xiaoqing.

promoting the use of the RMB as a settlement currency and an invoicing currency for cross-border trade with BRI countries. On this basis, it can promote the use of the RMB as a store of value by driving the development and opening up of China's financial markets, launching more RMB-denominated products and building a closed loop of RMB investment and financing.

We believe the signing of bilateral currency swap agreements could help promote the use of the RMB as a settlement currency, the development of RMB-denominated commodity products could expand the use of the RMB as an invoicing currency, and the development of foreign exchange markets is likely to strengthen the use of the RMB as a store of value. We believe these three measures will play important roles in promoting the internationalization of the RMB in BRI countries.

6.1 The Degree of RMB Internationalization Has Significant Room for Growth

Currency internationalization refers to the use of a currency outside its country of issue, and an international currency is used and held by residents or non-residents beyond the borders of the issuing country. An international currency needs to assume the functions of being a medium of exchange, a store of value, and a unit of account. A currency can be regarded as an international currency in a real sense only if it has all three functions.

Since 2003, RMB internationalization has moved forward amid twists and turns. Among the three basic functions, the RMB's function as a medium of exchange has developed relatively fast, followed by the function as a store of value, and finally the function as a unit of account. During 2003–2009, the RMB was in the initial stage of internationalization. During this period, cross-border trade started to be denominated and settled in RMB, the RMB business kicked off in Hong Kong SAR and Macao SAR, and China Development Bank issued RMB bonds for the first time in Hong Kong SAR in 2007.

In 2009–2015, the internationalization of the RMB accelerated. China facilitated the settlement of cross-border trade and direct investment in the RMB by launching and expanding pilot programs. Regarding cross-border investment, schemes such as RMB Qualified Foreign Institutional Investors (RQFII), RMB Qualified Domestic Institutional Investors (RQDII), and Shanghai-Hong Kong Stock Connect were introduced. In addition, measures were taken to relax restrictions on cross-border RMB loans and trade financing. The offshore RMB market, as represented by Hong Kong SAR, grew rapidly. The People's Bank of China (PBoC) started to provide RMB overseas via bilateral local currency swaps. In 2015, the International Monetary Fund (IMF) decided to include the RMB in the Special Drawing Rights (SDR) basket, and the Cross-border Interbank Payment System (CIPS) started operation.

After the exchange rate reform in 2015, the RMB exchange rate fluctuated sharply and the pace of RMB internationalization slowed. As China's economic condition

Functions	Official use	Private use
	International reserves	Currency substitution and investment
Store of value	► The RMB was officially included in the SDR currency basket on October 1, 2016, and the weight of the RMB in the basket was raised to 12.28% in August 2022	► As of 2022, total domestic RMB financial assets held by overseas investors totaled Rmb9.6trn, of which the share of stocks, bonds, loans, and deposits was 33%, 36%, 13%, and 18%, respectively
	► As of 2022, the share of RMB in official foreign exchange reserves was 3%	► Offshore RMB financial assets increased rapidly
Medium of exchange	Vehicle currency	Settlement currency
	► Non-mainstream FX intervention third-party currencies	► Cross-border trade and investment settlement: In 1Q23, cross-border RMB receipts and payments accounted for 45.3% of total domestic and foreign currency receipts and payments over the same period
Unit of account	► As of 2022, the PBoC had signed bilateral local currency swap agreements with central banks or monetary authorities of 40 countries and regions, totaling Rmb4.02trn	► One of the most active currencies in cross-border transactions; RMB is the fifth most active currency for global payments by value by the end 2022
	Anchor currency	Invoicing currency for trade and financial transactions
Unit of account	► Non-mainstream anchor currencies	► Use as a unit of count for cross-border trade and investment makes steady progress
		► Starting to be used as a unit of count for commodities

Fig. 6.1 Overview of RMB internationalization. *Note* SDR stands for Special Drawing Rights. *Source* PBOC, IMF, SWIFT, Chinn & Frankel (2007),¹ CICC Research

improved in 2017 and capital outflow pressure eased, the process of RMB internationalization continued to accelerate steadily. After 2017, Bond Connect and RMB-denominated crude oil futures were launched; MSCI, FTSE Russell, and S&P Dow Jones announced the inclusion of A-shares in their index systems; and the opening-up of China's domestic financial sector accelerated further. Since 2020, the pace of RMB internationalization has accelerated again, with bilateral local currency settlement being a bright spot (Fig. 6.1).

However, the level of RMB internationalization is still disproportionate to the large size of China's economy (with potential for widening), which remains a key issue. Despite the US's share of global GDP falling from 30% in 2000 to 24% in 2021 while China's share rose sharply from 4 to 18% over the same period, the current international monetary system is dominated by the USD. According to IMF statistics, as of 2022, the USD's dominant position in global foreign exchange reserves has remained solid. The USD accounts for 58% of global foreign exchange reserves, followed by the EUR (20%), the JPY (6%), and the GBP (5%). The RMB ranks fifth with a share of about 3%.

In addition, the development of the RMB as a medium of exchange and a unit of account clearly lags behind China's position in global trade. China has become the world's largest trading country, accounting for 12.5% of total global trade in 2022, whereas the RMB's share of international payments as a settlement currency was only 2.15%. In contrast, about 65% of international debts, 55% of international loans, and 80–90% of global commodity trade were denominated in USD in the same year.

¹ Chinn, M., & Frankel, J. A. (2007). Will the euro eventually surpass the dollar as leading international reserve currency? In *G7 Current account imbalances: sustainability and adjustment* (pp. 283–338). University of Chicago Press.

6.2 A Win–Win for Internationalization and the BRI

To realize internationalization, a currency needs to have a complete closed loop of cross-border investment and financing. We believe the RMB's primary hurdle to fully assuming the role of international currency is that such a closed loop has not yet been formed for the RMB. In a complete closed-loop of cross-border investment and financing, business entities would be willing to raise funds and have relatively easy access to RMB financing through channels such as bond issuance and bank loans, and RMB holders would have the channels to use the currency to buy goods or invest in financial products. The RMB has long faced constraints on both the investment and financing sides. As the RMB was a high-interest currency for much of its history, it naturally lacks competitive advantages on the financing side. However, this situation changed in 2022–2023, and the financing cost of the RMB has fallen notably relative to the USD as the US has been in the most aggressive rate-hike cycle in four decades. On the investment side, the types and proportion of commodities denominated and settled in RMB are still relatively limited.

The mismatch between the international status of the RMB and China's share of the global economy and trade has been undergoing changes. The BRI brings an opportunity to facilitate RMB internationalization, which can facilitate investment, financing, and trade cooperation among BRI countries; increase two-way interaction; and create a virtuous cycle. We expect RMB internationalization and BRI development to create a win–win situation, driving an effective breakthrough in promoting the use of the RMB as an invoicing currency and a settlement currency. After the outbreak of the Russia-Ukraine conflict, the three functions of international reserve currencies—e.g., a medium of exchange, a store of value, and a unit of account—have been separated. As a result, we believe it has become more possible for a currency to develop the function as a unit of account and a medium of exchange first, and then as a reserve of value. We expect the RMB to be presented with greater opportunities in developing the functions as a medium of exchange and a unit of account.

6.2.1 Large Trade Volume and the Trade Network Are Favorable to Expanding the Use of the RMB in Trade Settlement

One of China's greatest advantages in promoting RMB internationalization is its large trade volume. China has a trade surplus with BRI countries as a whole, and their trade is highly complementary. Since the introduction of the BRI in 2013, China and BRI countries have strengthened trade cooperation and lowered trade barriers through the establishment of free trade zones and economic cooperation zones, and the value of trade between China and BRI countries has continued to grow. The proportion of BRI countries in China's trade value increased from 39.1% in 2013 to 42.2% in 2021. BRI countries rely heavily on energy for economic development, exporting

raw materials and intermediate goods to China. Furthermore, China has a well-developed manufacturing industry chain and exports capital goods, transportation equipment, and consumer goods to its BRI partners. Research shows that² China and BRI countries are building an increasingly extensive trade network.

Trade cooperation creates demand for currency cooperation. China's trade surplus with BRI countries means that the latter have RMB financing demand, and the mutually complementary trade structures of the two parties can promote the formation of a closed loop of RMB investment and financing. The signing of free trade agreements can effectively reduce the level of tariffs between China and BRI countries. As trade flows increase, the RMB can expand its role as a settlement currency, boding well for the wider use of the RMB.

To date, the PBoC has signed bilateral trade swap agreements with central banks of a number of BRI countries, allowing the latter to inject RMB funds into their financial systems and facilitate their domestic companies or institutions' access to RMB financing to pay for imports from China. The use of RMB can help lessen the risk of using third-party currencies for settlement and facilitating trade activities. For example, if BRI countries can directly use RMB as the settlement currency for trade, financial, and investment activities, it could help streamline the procedures of transactions, reduce transaction costs, avoid the negative impact of third-party exchange rate fluctuations on trade, and promote the development of intra-regional trade and finance. Against such a background, countries have naturally turned to diversifying their foreign exchange reserves and increasing the use of local currencies for settlement, which could help them reduce the dependence of their financial systems on other countries and lessen attendant risks.

6.2.2 *China's Industry Chain Advantages Facilitate Development of the RMB as an Invoicing Currency*

China has advantages in industry chain over BRI countries, which is favorable to the development of the RMB as an invoicing currency. If a country exports goods with high technological content and value added, it usually has stronger bargaining power and is more capable of driving trade activities denominated in its own currency.³ Studies show that from the industry chain perspective, China plays an important role in BRI countries, and has dominated the industry chains of textile and high-tech

² Li, E., Lu, M., & Chen, Y. (2020). Analysis of China's importance in "belt and road initiative" trade based on a gravity model. *Sustainability*, 12(17), 6808.

³ Ozeki, Y., & Tavlas, G. S. (1992). The internationalization of currencies: an appraisal of the Japanese yen. In *The Internationalization of Currencies*. International Monetary Fund.; Minikin, R., & Lau, K. (2013). *The Offshore Renminbi: The Rise of the Chinese Currency and Its Global Future*. Singapore: John Wiley & Sons.

manufacturing sectors.⁴ China is ahead of most BRI countries in terms of manufacturing and strategic emerging industries, especially high-end manufacturing fields such as artificial intelligence (AI), high-speed rail, nuclear power, and aerospace. The levels of economic and industrial development vary among BRI countries, covering almost every stage of industrialization. Different BRI countries have various advantageous industries. China and BRI countries are mutually complementary in advantageous industries, and China can address their needs for equipment, technologies, and capital.

6.2.3 China Can Leverage Its Financial Markets to Make RMB Reserves More Attractive

Compared with BRI countries, China has a large and relatively open financial market. China has gradually opened its capital account since the 1990s under the principle of prioritizing inflows over outflows, long-term funds over short-term funds, direct investment over indirect investment, and institutions over individuals. Specifically, China opened direct investment first, followed by securities investment and then other investments.

China launched the Qualified Foreign Institutional Investors (QFII) program in 2002, after which foreign capital entered the country's capital market. Since 2005, both China's current account and capital account have continued to record large surpluses. China reformed its exchange rate formation mechanism to encourage orderly capital outflows and facilitate balance-of-payments equilibrium, and shifted its foreign exchange management from "liberal influx and stringent outflow" to "two-way balanced management". The Qualified Domestic Institutional Investors (QDII) system was introduced in 2006, allowing domestic investors to invest in overseas securities markets. In 2009, the pilot program of RMB settlement for cross-border trade was launched, marking an acceleration in RMB internationalization. Subsequently, China rapidly improved the facilitation of cross-border RMB flows under the current account and capital account through the RQFII and RQDII schemes. China announced the start of the Shanghai-Hong Kong Stock Connect pilot program in 2014, the Shenzhen-Hong Kong Stock Connect program in 2016, and the Bond Connect program in 2017. Restrictions on QFII and RQFII investment quotas were lifted in 2019, and the Swap Connect program was officially launched in 2023.

We believe China has large room for economic development and its economy has been growing at a fast pace, supported by sound fiscal and monetary policies and continued opening-up of financial markets. As RMB assets are liquid and can deliver relatively stable comprehensive returns, they are attractive to investors in BRI countries. Overall, stocks and bonds in the domestic financial market are the main types of RMB financial assets held by overseas market entities. As of end-2022, total

⁴ Chen, A., & Chen, F. (2022). Industry Chain and Supply Chain Competition between China and BRI Countries: Foundation, Development and Countermeasures. *Journal of Xiamen University (Arts & Social Sciences)*, 72(06):40–53.

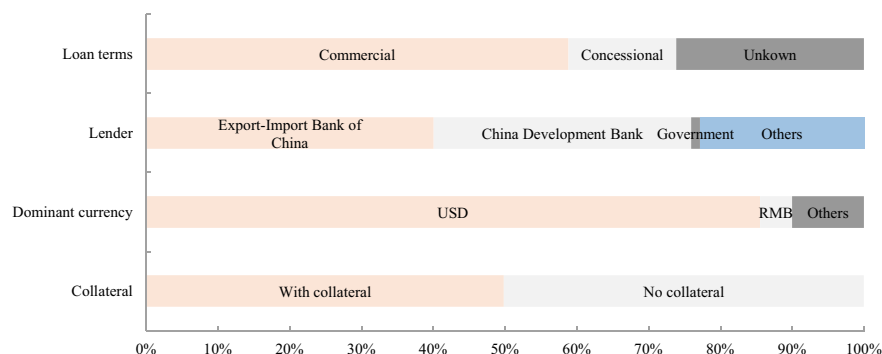


Fig. 6.2 Characteristics of China’s overseas loans. *Note* The data sample in the chart is China’s overseas loans from 2000 to 2017. *Source* Sebastian Horn, Carmen M. Reinhart & Christoph Trebesch, “China’s Overseas Lending”, NBER, CICC Research Department

RMB financial assets held by overseas investors was Rmb9.6 trn, of which stocks, bonds, loans, and deposits accounted for 33%, 36%, 13%, and 18%, according to the PBoC.

6.2.4 *China Can Promote RMB Financing Through Infrastructure Construction*

Among the five main goals of the BRI (namely policy coordination, infrastructure connectivity, unimpeded trade, financial integration, and closer people-to-people ties), infrastructure connectivity is at the core, with infrastructure construction laying a foundation for strengthening cooperation under the BRI.⁵ According to data from the Ministry of Commerce, from 2013 to 2021, China signed US \$1.1 trn of new contracts with BRI countries for projects under the BRI framework, accounting for about 51% of its total new contracts for foreign projects. Infrastructure construction enhances economic growth potential and improves people’s living standards, but it is a public good accompanied with high investment amounts, long construction periods, and limited direct economic benefits, to some extent. To meet the large-scale and long-term investment demand in infrastructure, it is necessary for BRI countries to build stable and sustainable financial support systems. We believe that China can promote RMB financing through infrastructure construction in BRI countries, by leveraging its advantage in engineering, and making use of financial institutions such as the Asian Infrastructure Investment Bank (AIIB) (Fig. 6.2).

⁵ In his keynote speech at the Belt and Road Forum for International Cooperation held in 2017, XI Jinping, general secretary of the Communist Party of China (CPC) Central Committee, stressed that Infrastructure connectivity is the foundation of development through cooperation. We should promote land, maritime, air, and cyberspace connectivity, concentrate our efforts on key passageways, cities and projects, and connect networks of highways, railways, and sea ports.

6.3 Choice of Paths: How to Promote Currency Internationalization?

From historical experience, there are two typical models of currency internationalization. The first is the German model, which features the dominance of real economy trade and support from finance; the second is the Japanese model, in which finance plays a major role. If we use the share of global official foreign exchange reserves as a proxy measure of the level of currency internationalization, the internationalization of the Deutsche mark (DEM) was more successful than that of the Japanese yen (JPY). Comparing the typical models of internationalization of the two currencies, and given the current macroeconomic landscape of deglobalization and definancialization, we believe the path to DEM internationalization on the back of its trade advantages and regional cooperation is more valuable as a reference for RMB internationalization.

6.3.1 *The German Model: Denomination of Trade Plus Capital Control*

In the 1950s, Ludwig Wilhelm Erhard, then West German Economics Minister, advocated free competition and market forces. He introduced a number of policies, including monetary reform and trade liberalization. Over this decade, West Germany's GDP grew at an annualized rate of 7.5%. The rapid growth in exports resulted in a large current account surplus. In 1952, West Germany began to gradually relax foreign exchange controls and in 1958, it officially realized current account convertibility. At the same time, the Bundesbank adopted a monetary policy with the primary objective of ensuring price stability, and it used monetary policy tools such as interest rate control and deposit reserves to maintain the stability of the DEM's value. However, at that stage, West Germany had not yet opened its financial market to the outside world, and capital inflows and non-trade payments remained limited.

From the 1960s to the 1980s, the proportion of the DEM in trade settlements and international reserves increased rapidly. Due to West Germany's deregulation of its exchange rate, large international capital inflows also exerted inflationary pressure on the country, with the inflation rate rapidly climbing from around 2 to 7% over 1969–1974. In response, the West German government adopted a proactive and flexible policy. It underwent a repeated process of “tightening, lifting, and reinstating restrictions” on capital inflows. The DEM exchange rate system also underwent an evolution to a fixed exchange rate, floating exchange rate, and the establishment of the European Monetary System (EMS), which effectively reduced the impact of exchange rate appreciation on the domestic economy and trade.

Since the 1980s, the internationalization of global financial markets has gradually stepped up, and capital markets in Tokyo, London, New York, and Hong Kong SAR have continued to expand. West Germany shifted from its previous attitude of financial repression and began to accelerate the development of its financial market

and relax financial regulations. In 1984, West Germany achieved capital account convertibility. The European monetary system gradually became pegged to the DEM, while West Germany assumed responsibility for stabilizing the DEM against the USD.

In general, Germany's model of currency internationalization is backed by strong manufacturing industries, with trade under its current account as the core driving force. Underpinned by the achievements of European economic integration, the DEM gradually became the currency for regional trade settlement and foreign exchange interventions through stable currency value and capital control.

6.3.2 The Japanese Model: Insulated Financial Liberalization Plus Offshore Market

In April 1964, Japan lifted exchange restrictions related to receipts and payments in the current account. In February 1973, it adopted a floating exchange rate system, and the volatility of the JPY began to increase. To cope with exchange rate risk exposure, the Japanese government promoted the settlement of exports in JPY, marking the start of JPY internationalization.

In the 1980s, the Japanese government began to implement the strategy of JPY internationalization, and the JPY achieved current account convertibility and then capital account liberalization. In December 1980, Japan promulgated a thoroughly revised Foreign Exchange and Foreign Trade Control Law,⁶ which lifted the previous restrictions on foreign exchange, marking Japan's move towards capital account convertibility and driving a substantial increase in financial transactions denominated and settled in JPY. Subsequently, Japan's financial liberalization reform began to accelerate. In May 1984, as the trade imbalance between Japan and the US increased, the US asked Japan to accelerate financial liberalization and the internationalization of the JPY. The Japanese government released a report, *Current Status and Prospects for Financial Liberalization and the Internationalization of the Yen*, which involved improvement in a number of measures to step up the internationalization of the JPY, including the establishment of Japan's offshore market, relaxation of financial regulations, and permission of foreign bank branches in Japan to operate the Euroyen (offshore yen) deposit business in Japan.⁷ The Japan Offshore Market (JOM) was officially established on December 1, 1986. With the rapid progress of the internationalization of the JPY, the currency appreciated sharply driven by inflows of international capital. As a result, the Japanese government started to worry about the decline in the competitiveness of its exports.

To drive economic growth, the Japanese government implemented a policy of low interest rates and loose liquidity to detach asset prices from their real value. In the

⁶ https://www.mof.go.jp/english/about_mof/councils/customs_foreign_exchange/e1b064c1.htm.

⁷ Zhang, C., & Zhang, J. (2015). Paths and Lessons Learned from the Internationalization of the JPY.

late 1990s, due to the collapse of the bubble economy and the impact of long-term economic stagnation, the internationalization of the JPY came to a standstill. After 1990, the JPY's share of international reserves declined from a high of 10% to only 3% in 2006, and has remained at a relatively low level since then.

In general, the Japanese model relies on the currency internationalization strategy and the implementation of financial liberalization policies with the opening of offshore markets at the core. However, the internationalization of the JPY was dragged by the slow pace of onshore market reform and the lack of regional monetary and financial cooperation.

6.3.3 Implications of the Paths to RMB Internationalization

First, competitiveness in trade is at the core of currency internationalization, and changes in the macroeconomic environment such as deglobalization and definancialization highlight the necessity of advancing RMB internationalization via the current account. The paths to internationalization of the DEM and JPY were both based on the real trade settlement demand brought about by the growth in the two countries' economies and trade. The export channel of the DEM was based on the global goods production and trade network with products made in West Germany at the core. The DEM was the dominant means of payment and clearing, laying a foundation for its sizable international demand. As for Japan, the country's position and bargaining power in the global industry chain were relatively weak. Therefore, Japan encouraged domestic and overseas financial institutions to participate in the trading of JPY assets mainly by liberalizing capital controls and "exporting" JPY through financial channels. The internationalization of the RMB in BRI countries can rely on China's trade and industry chain advantages, with a focus on the use of RMB as a settlement and invoicing currency for cross-border trade.

Second, in the early stages of currency internationalization, efforts should be made to coordinate interest rate liberalization, exchange rate liberalization, and capital account convertibility. However, the opening of financial markets or lifting of capital controls are not prerequisites for currency internationalization, and the competitiveness of real trade may be more important in the early stages of internationalization, in our opinion. In the 1980s, although Japan's financial market was more open than West Germany's, it lacked support from the real economy's commodity trading in the international market. By contrast, West Germany was more cautious about the opening of its capital account and experienced a flexible, gradual process of tightening, lifting, and reinstating regulations. West Germany chose the path of opening up capital outflows first and then capital inflows later.

We believe the opening-up of financial markets or the lifting of capital controls are not a necessary condition for the internationalization of the RMB. In the early stages of RMB internationalization, a faster pace of capital account opening than interest rate and exchange rate reforms may incur risks. However, from a longer-term perspective, capital controls and incomplete currency convertibility may hinder cross-border flows

of local currencies, thus affecting the speed and extent of internationalization. In the medium and long term, China may consider gradually relaxing financial regulations and giving full play to the role of financial markets under the BRI framework.

Third, regional cooperation is an effective means to achieving currency internationalization. The successful internationalization of the DEM also benefited from the political and institutional arrangements among European countries. With the goal of promoting trade and investment facilitation and European economic and monetary integration, West Germany leveraged the development of intra-European trade, especially the establishment of the EMS in March 1979, to support the development of the DEM into a key regional currency, laying the foundation for the birth of the EUR in 1999. For China, the BRI aims to strengthen close cooperation and connectivity in various fields among BRI countries, increase the scale of intra-regional trade and investment activities, and improve the openness of countries in the region, thus providing an opportunity for the wide use of the RMB in the regional economy.

In conclusion, we believe the path to DEM internationalization on the back of its trade advantages and regional cooperation is a more valuable reference for RMB internationalization. According to the German and Japanese experience, free convertibility under the capital account is not a precondition in the early stages of RMB internationalization, and faster capital account opening than interest rate and exchange rate reforms may incur risks instead. Changes in the macroeconomic environment (i.e., deglobalization and definancialization) have further highlighted the necessity and importance of promoting RMB internationalization through the current account. To promote RMB internationalization, more attention can be paid to the competitiveness of the real economy and technological innovation, and efforts can be made to facilitate cooperation between China and BRI countries in payment and finance, with a focus on partnerships in trade and real economic investment, in our view.

6.4 Three Focuses in Promoting RMB Internationalization

Taking into account the characteristics of BRI countries and drawing on the German and Japanese experience in promoting currency internationalization, we believe China can give full play to its competitive advantages in economic size and trade volume. First, it can seek breakthroughs in promoting the use of the RMB as a settlement currency and an invoicing currency for cross-border trade in BRI countries. On this basis, it can promote the use of the RMB as a store of value by driving the development and opening up of China's financial markets, launching more RMB-denominated products, and building a closed loop of RMB investment and financing. To be specific, we believe there are three practical measures that China can adopt to promote RMB internationalization.

6.4.1 *Bilateral Currency Swap Agreements and BRI Finance*

Bilateral local currency swap agreements signed between the PBoC and foreign central banks have two main functions. The first is establishing a liquidity replenishment mechanism for BRI countries: Compared with bilateral swap agreements of developed countries, China's bilateral swap agreements cover more developing countries, especially BRI countries. The second is facilitating trade and investment between China and BRI countries: Under such agreements, overseas central banks can provide RMB financing to domestic commercial banks and enterprises by using currency swap quotas to address demand for RMB imports and direct investment.

After the PBoC signed a Rmb180 bn bilateral local currency swap agreement with the Bank of Korea in 2008, it had signed bilateral currency swap agreements with central banks or monetary authorities in 40 countries and regions as of end-2021. The quota of the agreements has increased notably since 2018, with the total amount rising from Rmb3.02 trn in 2018 to Rmb4.02 trn in 2022, and the effective amount at Rmb3.54 trn (the difference between the total amount and the effective amount is the amount that had not been renewed and, thus, expired). In particular, China has signed bilateral currency swap agreements with 22 BRI countries, which has played a positive role in promoting bilateral trade and investment between China and BRI countries.

The signing of bilateral currency swap agreements can promote the use of the RMB. As of end-2022, overseas monetary authorities utilized a total of Rmb88.78 bn under bilateral currency swap agreements with the PBOC. Under these agreements, central banks of multiple countries—including South Korea, Russia, Mongolia, Türkiye, and Argentina—have used RMB to pay for imports from China, investment and financing, and to address liquidity needs to stabilize the foreign exchange market. The balance of RMB utilized by overseas monetary authorities increased to Rmb88.78 bn at end-2022 from Rmb15.80 bn at end-2014. In particular, the balance has increased rapidly since end-2020 amid growing international demand for the RMB. By signing bilateral currency swaps, the two parties can avoid potential losses caused by exchange rate fluctuations, which will help reduce their dependence on the USD and facilitate the internationalization of their own currencies.

Bilateral currency swap agreements signed between the PBoC and overseas central banks can help establish a liquidity replenishment mechanism. Research on central bank currency swap agreements⁸ shows that as a form of international lender of last resort, central bank swap lines have a significant impact on a country's foreign currency financing cost. When swap lines provide liquidity support to overseas countries, the deviation between the pricing of their foreign exchange forwards and the theoretical value of covered interest parity (CIP) will narrow significantly, and the premium to be paid for foreign currency financing on behalf of the country's financial system will decline.

⁸ Bahaj, S., & Reis, R. (2022). Central bank swap lines: Evidence on the effects of the lender of last resort. *The Review of Economic Studies*, 89(4), 1654–1693.

We believe China's bilateral swap agreement can provide a good liquidity replenishment mechanism for BRI countries that are in urgent need of foreign currency liquidity, although the long-term effect might not be highly visible at present. The existence of such mechanisms and related practices indicates that the bilateral currency swap agreements signed by China and other countries have become an important supplement to the existing international liquidity arrangements.

Nevertheless, there are still restrictions on the use of bilateral currency swap lines, one of which is that the mechanism for the use of bilateral local currency swap lines has not been clarified. At present, the actual amount of swap funds being used remains small compared with the total size of the agreements, and the use scenarios remain limited. According to recent practices, the main scenario for the use of local currency swap funds is cross-border trade settlement, yet the swap lines have played a limited role in helping BRI countries establish financial safety nets. As the main source of demand for local currency financing, BRI countries seldom use swap lines to meet cross-border investment demand. To address this issue, China could improve its regular mechanisms (i.e., explicit regulations on the quota, currency, quotation, and threshold) related to bilateral local currency swaps. These may help enhancing the understanding of swap agreements by commercial banks and enterprises, making it easier for them to use the swap lines.

6.4.2 *Improving Bilateral Foreign Exchange Markets in BRI Countries*

China has close economic and trade ties with BRI countries, but related activities are mostly settled in USD. This is mainly due to the well-developed supporting financial services, high level of convenience in financing, and relatively low cost of foreign exchange transactions in relation to the USD.

The USD shows advantages in risk reduction, transaction costs, and potential investment returns. Figure 6.3 shows the bid and ask prices for currency pairs at large banks in Thailand and Indonesia on April 12, 2023. For Bangkok Bank, the largest bank by assets in Thailand, the bid-ask spread for THB/USD was only 0.88%, and the transaction cost was less than half that for other major currencies. In contrast, the

Bangkok Bank (Thailand)				Bank Mandiri (Indonesia)			
Currency	Buying rate	Selling rate	Spread (%)	Currency	Buying rate	Selling rate	Spread (%)
USD	34.0500	34.3500	0.88	USD	14,750.00	15,100.00	2.37
GBP	42.1175	43.0075	2.11	GBP	18,260.00	18,854.00	3.21
EUR	36.9950	37.7350	2	EUR	16,041.00	16,578.00	3.35
100JPY	25.2300	25.9350	2.79	100JPY	109.48	113.87	4.01
RMB	4.8875	5.0425	3.17	RMB	2,110.00	2,226.00	5.5

Fig. 6.3 Foreign exchange quotes at Bangkok Bank in Thailand and Bank Mandiri in Indonesia (April 12, 2023). *Source* Bangkok Bank of Thailand, Bank Mandiri of Indonesia, CICC Research

bid-ask spread for THB/CNY reached 3.17%. Data from Bank Mandiri, Indonesia's largest bank by assets, also shows that USD has the lowest transaction costs.

An important reason for the relatively high cost of currency exchange between the RMB and local currencies of BRI countries is that their bilateral foreign exchange market remains underdeveloped, or no direct currency exchange markets have taken shape. Therefore, the USD continues to be used as the medium currency for the currency exchange between the RMB and local currencies. For example, the transaction cost of THB/CNY is more than twice that of THB/USD, and the bid-ask spread for THB/CNY is twice the spread for THB/USD. When the cost of transactions between the RMB and the local currency is high, trade contracts denominated in USD become a conventional option for the two parties to share the exchange rate risk.

To solve the problem of high transaction costs, we believe it is increasingly important to build and improve bilateral foreign exchange markets between China and BRI countries. A well-functioning foreign exchange market with better liquidity for direct bilateral local currency transactions can help China and BRI countries achieve direct conversion without using third-party currencies in foreign exchange transactions. Such a move can shorten the time and reduce the cost needed for indirect transactions with the USD as the intermediary, and avoid the exchange rate risk caused by fluctuations in the USD and the shortage of liquidity in the international foreign exchange market, thereby promoting the use of the RMB in international trade transactions.

Regarding the development of the onshore RMB foreign exchange rate market, the China Foreign Exchange Trade System launched direct RMB-MYR trading in the interbank foreign exchange market in 2010 under the market-making mechanism, the same as that for CNY/USD. Since then, the China Foreign Exchange Trade System has launched direct transactions between the RMB and 21 non-USD currencies. Such transactions reached around Rmb2.2 trn in 2022, with their share of the total value of direct transactions hovering between 3.6 and 4.2% in recent years. Among the above-mentioned non-USD currencies, 11 are from BRI countries (or regions), with annual transaction value at about Rmb100 bn before 2022, accounting for about 1–2% of China's bilateral trade with the corresponding countries.

To facilitate the development of the BRI, offer financial support for the development of the real economy, and facilitate the development of the inter-bank RMB foreign exchange direct transaction market, the China Foreign Exchange Trade System decided to waive fees associated with bid and ask prices in direct trading among the RMB and 10 foreign currencies—i.e., Singapore dollar, Russia ruble, Malaysian ringgit, New Zealand dollar, South African rand, Saudi riyal, UAE dirham, Polish zloty, Hungarian forint, and Turkish lira—for three years starting August 1, 2017.⁹ In 2020,¹⁰ besides the above-mentioned 10 currencies, the South Korean won as well as Thai baht were also included in the scheme.

Regarding the development of the offshore RMB foreign exchange market, the Chinese mainland and Hong Kong SAR signed the Memorandum of Understanding

⁹ <https://www.shibor.org/chinese/sfbf/20170704/1004682.html>.

¹⁰ <https://www.shibor.org/chinese/scggwhscggsggtz/20200803/1726501.html#cp=scgg-whscgg>.

in 2004, marking the official launch of the offshore RMB market. Since then, by leveraging the financial market platform in Hong Kong SAR and the development of infrastructure (i.e., cross-border RMB clearing and payment), the offshore RMB foreign exchange market has gradually developed into an emerging force in the global foreign exchange market. In many countries, offshore RMB sees strong demand and has good liquidity in the local foreign exchange markets thanks to the increase in China's share of global trade, the gradual opening-up of China's capital account, and the development of bilateral foreign exchange markets.

By 2022, RMB became the fifth most traded currency in the world in terms of foreign exchange turnover, second only to established currencies such as the USD, EUR, JPY, and GBP. Recently, with the gradual increase in the number of participants in the CIPS system and the implementation of emerging functions such as the Multi-Central Bank Digital Currency (CBDC) Bridge platform, the transactions and use of RMB in the local markets of BRI countries have become more convenient.

At the same time, the development of the RMB foreign exchange market faces challenges on multiple fronts, in our view:

- (1) The infrastructure of the foreign exchange market remains inadequate. Some BRI countries have immature financial markets and inadequate foreign exchange market infrastructure, trading systems, and clearing and settlement mechanisms.
- (2) The opening up of financial markets still has upside. The financial markets in some BRI countries are not fully opened, and restrictions imposed on foreign investment may affect the cooperation between China and these countries in building bilateral foreign exchange markets and hinder the expansion of direct transactions between the currencies of the two parties.
- (3) Supporting services still have room for improvement. The financial markets of some BRI countries are underdeveloped and are characterized by relatively weak risk management capabilities. The market for direct transactions between the RMB and local currencies might lag in terms of supporting services.
- (4) Difficulties in coordinating among policies of various countries. Coordination among relevant policies in different countries is challenging due to the notable differences in the levels of economic development, monetary policies, and financial regulatory policies of different countries.

6.4.3 Promoting the Use of RMB as an Invoicing and Settlement Currency for Commodity Trade in BRI Countries

RMB has opportunities to improve its payment and invoicing functions. Barry Eichengreen (2010)¹¹ believes that the internationalization of a country's currency

¹¹ Eichengreen, B., & Flandreau, M. (2012). The Federal Reserve, the Bank of England, and the rise of the dollar as an international currency, 1914–1939. *Open Economies Review*, 23(1), 57–87.

should undergo the following three stages: (1) Encouraging the use of the currency as an invoicing and settlement currency in trade activities; (2) promoting the use of the currency in private financial transactions; and (3) incentivizing central banks and governments to hold the currency as foreign exchange reserves. Based on this framework, we believe that promoting RMB settlement for bilateral trade between China and BRI countries by leveraging China's advantages in trade and industry chain could improve the RMB's functions as a medium of exchange and a unit of account. According to the traditional international trade theory, the choice of currency as a unit of account for trade activities is related to the transmission of exchange rates. That is to say, trade activities can be denominated in either the currency of the producing country or that of the consuming country.

Changes in the global landscape have provided opportunities for the RMB to play a bigger role in trade settlement and invoicing. Many emerging BRI countries are seeking to reduce their reliance on a single currency for settlement and invoicing. By leveraging China's extensive trade network and relatively sound infrastructures (i.e., for payment, clearing, and foreign exchange transactions), the RMB has become an important choice for many countries in trade settlement and invoicing.

As most BRI countries are resource-rich, we suggest focusing on commodities in the process of promoting the use of the RMB as an invoicing and settlement currency in the trade of goods. First, China has strong demand for the imports of commodities, and promoting RMB settlement of commodities can help the partner countries develop RMB reserves to a certain extent, thereby enhancing the function of the RMB as a store of value. Second, commodities-rich countries are in the upstream of the value chain, and their choices of invoicing and settlement currencies might be less affected by the currencies used for settlement and invoicing in the upstream and downstream of the value chain.

Promoting the use of the RMB as an invoicing and settlement currency requires striking a balance between efficiency and economic interests. We believe BRI countries need to meet certain conditions such as abundant natural resources, a local economy that is mutually complementary to China's economy, and close bilateral trade with China. Under the premise that the above-mentioned basic conditions are met, different RMB circulation systems can be developed according to the trade relationship between China and the counterparty. Specifically, when a country has a trade surplus with China, the RMB can be exported to the country through the current account, and it can return the RMB to the domestic market or flow into the offshore RMB market through the capital account. When a country is in a trade deficit with China, China can invest the RMB in the country in the form of direct investment, securities investment, and other capital account items.

In our view, priority could be given to promoting the use of the RMB as a settlement currency in countries with natural resources as their main exports (more than 50%), large bilateral trade volume with China (more than US\$10bn), and a high proportion of bilateral trade with China in total imports and exports (more than 9%). Under the trend of economic globalization over the years, some countries' exports are dominated by commodities as they are relatively rich in agricultural products, energy, or mineral resources. In addition, these countries are usually characterized as having

ample room for economic development and a relatively low level of industrialization. As the world's largest manufacturing country, China can meet its economic needs by exporting manufactured goods and other products. Coupled with the fact that China is the world's largest importer of commodities, it can develop a mutually complementary relationship with these resource-rich countries through bilateral trade (Fig. 6.4).

Settlement currency refers to the currency used to pay for goods and services, while invoicing currency is that used to mark or set prices in transactions. Although the settlement currency and the invoicing currency tend to be the same in most cases, the levels of difficulty in using the RMB as an invoicing currency can vary among different types of commodities (as commodity pricing is market-based to a large extent). For commodities that feature limited use of the USD as an invoicing currency and active trading on domestic exchanges, measures could be taken to promote the use of the RMB as a settlement currency and an invoicing currency simultaneously, in our view. Regarding commodities for which the USD enjoys strong first-mover advantages as an invoicing currency (i.e., oil and gas), efforts could be made to promote the use of the RMB as a settlement currency first, and then as an invoicing currency later.

The RMB has made significant progress as a settlement currency for commodities in recent years. In particular, cross-border RMB settlement in the field of commodities trading witnessed rapid growth. According to the 2022 *RMB Internationalization Report* released by the PBoC, cross-border RMB receipts and payments in the commodity trade field maintained rapid growth in 2021. Cross-border RMB settlement for trade in major commodities (i.e., crude oil, iron ore, copper, and soybeans) reached Rmb405.47 bn, a YoY increase of 42.8%. Cross-border RMB settlement for trade in new energy metals (i.e., lithium, cobalt, and rare earths) totaled Rmb100.56 bn, a YoY increase of 27.7%. In 2021, trading of the seven specified varieties of futures listed in China—namely, crude oil, iron ore, purified terephthalic acid (PTA), TSR 20, low-sulfur fuel oil, international copper, and palm oil—developed steadily and played a role in providing benchmarks for invoicing and settlement of commodity trading in RMB.

Countries' willingness to advance the use of the RMB as a settlement and invoicing currency has increased. In the energy market, China completed its first purchase of liquefied natural gas (LNG) using cross-border RMB settlement¹² on March 28, 2023, marking a key step toward promoting RMB settlement in oil and gas trading in the commodity market. Specifically, China National Offshore Oil Corporation (CNOOC) purchased a shipment of LNG from French-based Total Energies through Shanghai Petroleum and Natural Gas Exchange (SHPGX). The transaction volume was about 65,000 t, and the LNG was sourced from the United Arab Emirates. The transaction was conducted by a Chinese exchange and settled in RMB, with services provided by a European energy company and resources sourced from a Middle Eastern country.

¹² http://www.news.cn/fortune/2023-03/29/c_1129473352.htm.

Country	Area	Bilateral trade with China (US\$ bn)	Trade balance with China (US\$ bn)	Share of bilateral trade with China (%)	Share of resources in merchandise exports (%)	In which: Agricultural commodity (%)	In which: Energy (%)	In which: Mineral product (%)
Russian Federation	Europe	146.9	11.76	15.8	67.8	7.8	52.3	7.6
Indonesia	Southeast Asia	124.4	3.09	26.0	55.6	25.6	22.1	7.8
Saudi Arabia	Central Asia and Middle East	87.3	26.66	17.7	76.5	1.8	72.6	2
United Arab Emirates	Central Asia and Middle East	72.4	-15.28	12.4	65.1	4.7	40.6	19.8
Chile	Latin America	65.8	13.21	32.2	87	32.5	0.9	53.6
South Africa	Africa	54.3	12.11	23.1	57.3	12.9	10.3	34.1
Peru	Latin America	37.3	10.71	30.1	90.5	22.3	7.9	60.3
Iraq	Central Asia and Middle East	37.3	15.92	29.0	99.8	0.2	96.9	2.6
Oman	Central Asia and Middle East	32.1	25.00	38.8	73.5	5.2	59.9	8.3
Nigeria	Africa	25.7	-19.60	25.8	97.9	3.6	92.8	1.5
Kazakhstan	Central Asia and Middle East	25.3	-2.71	22.3	87.3	5.6	68.6	13.1
New Zealand	Oceania	24.7	7.59	20.1	79.4	73.7	1.9	3.8
Kuwait	Central Asia and Middle East	22.1	13.35	16.5	88	1.5	85.9	0.6
Egypt	Africa	20.0	-16.56	15.8	53.7	17.6	25.9	10.2
Ukraine	Europe	19.3	0.49	11.7	53.3	41.3	1.8	10.3
Myanmar	Southeast Asia	18.6	-2.46	53.9	61.1	27.9	22.9	10.3
Argentina	Latin America	17.8	-3.55	11.1	64.2	56.6	3.9	3.8
Qatar	Central Asia and Middle East	17.2	9.24	10.3	86.9	0.1	84.5	2.4
Iran	Central Asia and Middle East	14.8	-1.78	9.3	74.9	7.1	62.3	5.4
Congo (DRC)	Africa	14.4	8.88	32.3	95.2	3.1	6.7	85.4
Ecuador	Latin America	10.9	-0.02	20.1	93.9	49.7	41.7	2.5

Fig. 6.4 Countries with favorable economic conditions for promoting the use of RMB in commodity settlement and invoicing. *Note* We use 2021 data in the figure; data on total trade by country comes from World Bank; data on trade with China comes from General Administration of Customs of China. *Source* World Bank, General Administration of Customs of China, Wind, CICC Research

We believe endeavors to promote the use of the RMB as a settlement and invoicing currency for commodity trading with BRI countries still face considerable challenges. International futures exchanges are now dominated by European and US exchanges. For example, there are three major crude oil futures contracts in the world—West Texas Intermediate (WTI) on the Chicago Mercantile Exchange (CME), Brent Crude Oil on the Intercontinental Exchange, and DUBAI on the Dubai Mercantile Exchange. These contracts reflect crude oil supply and demand conditions in North America, Europe, and the Asia–Pacific region, and are denominated in USD.

China may continue to face a situation in which USD is the invoicing currency and RMB is the settlement currency, making it challenging for a breakthrough in developing the RMB as an invoicing currency. Therefore, the development of the RMB's functions as an invoicing currency and settlement currency might not be simultaneous. A complete set of services such as commodity freight and insurance are denominated in USD, and its use as the invoicing currency is supported by well-developed exchange rate instruments as hedging tools. In the absence of pricing power, the use of the RMB as a settlement currency could still incur exchange rate risk.

6.5 Reflections and Insights

In addition to traditional fundamental factors—i.e., inflation, liquidity, and foreign trade volume—the choice of international currencies should also take into account the network effect. The more countries in which a currency is used, the more universal it becomes. Therefore, the international monetary system is characterized by strong inertia. Although China's economy and trade volume are large enough, the use of the RMB in global trade settlement and foreign exchange transactions as a store of value and in other important dimensions still lags significantly behind. The evolution of international monetary choice usually requires shocks from major economic and social events to break the original inertia.

In the current era of deglobalization and definancialization, the foundation of the USD as the dominant global currency has faced shocks to some extent, and the shortcomings of the USD monetary system have been gradually magnified, in our opinion. Due to changes in the global economic and political environment, we believe the international monetary system is transitioning from a USD-dominated system to a more pluralistic one. Global events such as the COVID-19 pandemic and the Russia-Ukraine conflict have increased the need for currency diversification. These changes in the global landscape have presented historical opportunities for the internationalization of the RMB, in our view, and the international use of the RMB proportionate to China's share of the global economy and trade share may become an important development trend in the next stage.

China has extensive economic and trade ties with BRI countries. Against the background of ongoing deglobalization, many BRI countries may also need to reduce their reliance on the USD in an appropriate manner. Therefore, the rise in the level of RMB internationalization can also work to facilitate the high-quality development of the BRI. By analyzing the historical experience in currency internationalization in Germany and Japan, we find that the internationalization path of the DEM on the back of the country's competitive advantages in trade and regional cooperation provides an important reference for China to promote the internationalization of the RMB in BRI countries.

For China, competitiveness in trade is at the core of currency internationalization. Advancing RMB internationalization with a focus on current accounts and leveraging China's advantages in trade and industry chains might be the most suitable choice for China against the backdrop of deglobalization and definancialization. Considering that China's financial markets still have room for expansion in terms of depth and breadth, capital account opening is not a necessary condition in the early stage of monetary internationalization, while coordination can be taken to facilitate interest rate liberalization, exchange rate liberalization, and capital account convertibility.

In the context of partial convertibility of capital account, regional cooperation is an effective means for realizing currency internationalization. Political and institutional arrangements among European countries have played a positive role in driving the internationalization of the DEM. China has cultural commonality and close trade ties with many BRI countries, laying the foundation for regional cooperation and joint formulation of rules and arrangements for the use of the RMB.

In terms of specific measures to promote RMB internationalization in BRI countries, we believe three measures will play important roles: (1) The signing of bilateral currency swap agreements can promote the use of the RMB as a settlement currency; (2) the development of RMB-denominated commodity products could expand the use of the RMB as a invoicing currency; and (3) the development of foreign exchange markets is likely to strengthen the use of the RMB as a store of value. The signing of bilateral swap agreements is not only a liquidity replenishment mechanism that can help BRI countries reduce overall financing costs, but also a trade facilitation tool that creates a liquidity basis for bilateral trade settlement in the RMB. The establishment of a foreign exchange market in which the RMB directly trades with the local currencies of BRI countries can effectively reduce transaction costs and improve the efficiency of bilateral economic and trade transactions. Given that BRI countries are mostly resource-rich, we think the use of RMB for settlement and invoicing of commodity trade could become the starting point for promoting the use of RMB in trade settlement and invoicing.

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Chapter 7

Analysis of Sustainability of BRI Projects from an Industry Perspective



Abstract To achieve sustainable development of BRI projects, we think cooperating parties should complement each other at the industry level to bring mutual benefits and unlock the potential for win–win cooperation. In addition, an effective policy design is needed to allow BRI cooperation to improve people’s well-being and enable all stakeholders to benefit from this cooperation. International relations are the largest source of transaction costs in international economic and trade activities. Even if there is potential for win–win cooperation at the industry level, whether such potential can be transformed into sustainable cooperation depends on the extent to which relevant policies can improve international relations to reduce cross-border transaction costs.

There are two core areas from the perspective of win–win cooperation at the industry level, namely “overland bridge countries”, i.e., countries in the zone stretching from Eastern Europe, Central Asia, and West Asia to North Africa, and “maritime bridge countries”, which include Southeast Asia countries. For (1) Primary goods: Traditional energy sources such as oil and natural gas are mainly concentrated in overland bridge countries. Industrial metals and new energy metals are geographically dispersed. (2) Infrastructure construction and heavy industries: maritime bridge countries, which has large population, urbanization rate of 30–60%, and good environmental carrying capacity, has significant growth potential and willingness to develop these industries. (3) Equipment manufacturing: Southeast Asia has strong demand for construction machinery, while West Asia, North Africa, and South America have large market potential for renewable energy equipment such as solar photovoltaics (PV) and wind power. (4) Technological innovation: BRI countries can help provide diversified market demand incentives. (5) Consumer goods: Southeast Asia may be the key target market in terms of trade cooperation in consumer industries such as textiles & apparel, home appliances, and automobiles, followed by South Asia and North Africa. We think opening up China’s tourism and consumer markets to Southeast Asia would enhance China’s attractiveness to Southeast Asian countries.

The significance of policies for the sustainability of BRI projects can be understood from at least two perspectives: One is the building of a distribution mechanism that facilitates the sharing of the benefits of cooperation among different groups,

Author: XIE Chao, LI Tongyue, WU Yunjie, BAI Hao, LI Gen, YAN Xiaochang.

and the other is the reduction of cross-border transaction costs. We think the biggest transnational transaction cost comes from international relations. Managing relations with host countries is the core issue in lowering transnational transaction costs. In the two core areas of industry-level cooperation (i.e., in overland bridge countries and maritime bridge countries), a more comprehensive approach is needed to reduce cross-border transaction costs.

Chinese companies participating in BRI cooperation have both international transaction costs similar to those faced by companies in developed countries when they go global, and high intra-country transaction costs caused by the underdeveloped business environments of BRI countries. Therefore, China can provide stronger policy support to Chinese companies participating in BRI cooperation. In addition to policy-oriented financial support, China may also consider giving more support to chambers of commerce established by overseas Chinese enterprises. China could also provide employment training and guidance on laws, regulations, and labor arbitration so as to enhance the ability of Chinese enterprises to cope with risks.

The BRI has enjoyed remarkable success since it was launched in 2013, and the sustainability of BRI projects has received much international attention. President Xi Jinping stressed in November 2021 that the BRI should aim for high standards, sustainability, and people's well-being.¹ BRI projects have the aims of achieving the concept of "a community with a shared future for mankind" and promoting the sharing of global development achievements. An important factor in enhancing the sustainability of BRI projects lies in win-win cooperation at the industry level, which is premised on the idea that BRI countries complement each other. As of January 2023, 151 countries have signed cooperation documents with China to jointly build the BRI.² If BRI projects were distributed evenly among BRI countries, regions that complement each other more effectively may not realize maximum returns. In addition, regions that do not complement each other as well could suffer from low input-output efficiency, weakening the sustainability of BRI projects.

As Fig. 7.1 shows, the current distribution of BRI projects features both extensive geographical coverage and a clear regional focus. In this chapter, we will look at whether this distribution meets the requirements for complementarity at the industry level. Since requirements for complementarity vary among industries, we will also examine whether the existing distribution meets the needs of major industries. As the analysis in each section of this chapter shows, there is broad room for win-win cooperation between China and BRI countries at the industry level.

The key issue is how to turn this potential for win-win cooperation into returns from cooperation. According to the mainstream view on international economics and trade in the past few decades, the best way to realize the benefits of international economic cooperation and global trade is by minimizing policy intervention

¹ http://www.qsttheory.cn/yaowen/2021-11/19/c_1128081519.htm.

² <https://www.yidaiyilu.gov.cn/country>.

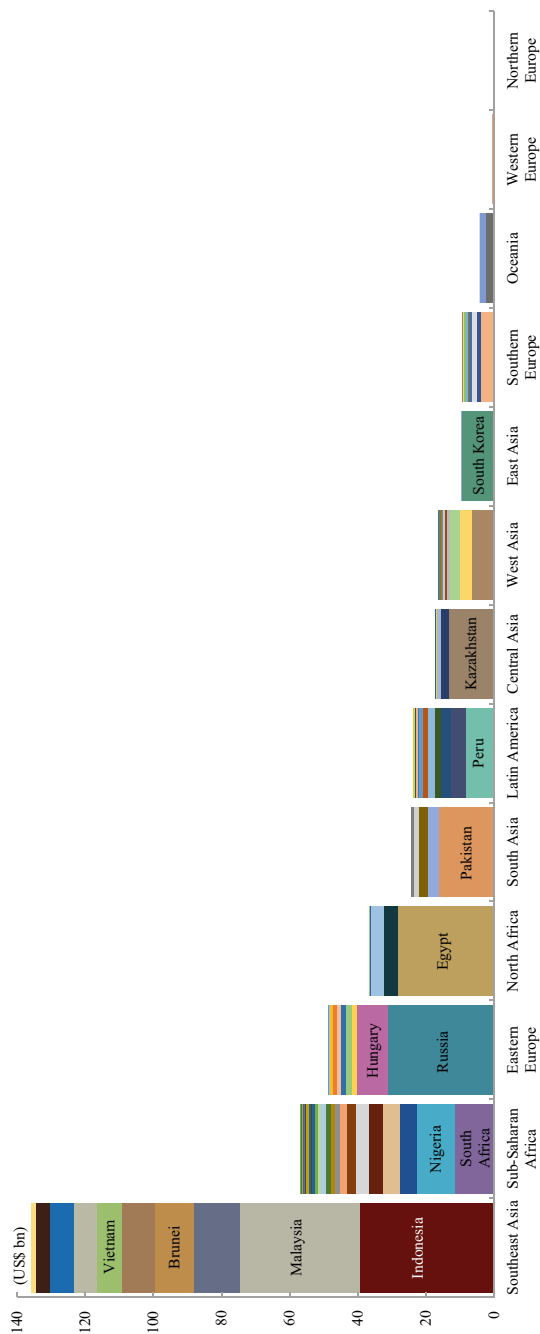


Fig. 7.1 Distribution of China's greenfield investment in BRI countries over 2013–2022. Source fDi Markets, CICC Global Institute

to promote free trade and investment. However, almost every chapter of this book discusses strengthening policy support. How should we understand this contradiction between popular opinion and industry-based analysis? In other words, what is the role of policy in the construction of BRI projects when there is room for spontaneous win–win cooperation at the industry level? This chapter will address these questions from three perspectives: (1) The industry foundation for win–win BRI cooperation; (2) the role and function of policy in sustainable and win–win cooperation; and (3) reflections and implications.

7.1 The Industry Foundation for Win–Win Cooperation

Some Chinese industries are facing notable supply shortages, while some are seeing oversupply. Meanwhile, BRI countries cover a vast geographical area, and differ in factor endowments and markets. This means that the implications of complementarity vary for different industries. For example, China accounts for a high proportion of global production capacity in low- and medium-tech manufacturing industries such as textiles & apparel, home appliances, lithium-ion batteries (LIB), construction machinery, and solar PV power equipment. China has the world's largest production capacity in many industries, and accounts for 70–80% of global production capacity for home appliances and alternative energy equipment. While there is no lack of policy support behind this, China's demographic dividend remains the determining factor. Now that the demographic dividend is fading, production capacity cooperation between China and BRI countries could help improve the return on investments in mature industries. For commodities that are in short supply, capital- or technology-intensive industries (such as autos), and products with regional characteristics such as tourism and agricultural goods, win–win cooperation under the BRI framework would look significantly different from that in industries such as textiles & apparel and home appliances.

From an industrial perspective, BRI countries would also benefit from cooperating with China on multiple levels. This can be understood from the following three perspectives:

First, economies of scale amid the deglobalization trend. During the era of globalization in the past few decades, both large and small economies have benefited from economies of scale brought by the unification of global markets. Amid the trend of deglobalization, the global unified market faces the risk of contraction. Small economies may be hit harder, while the economies of scale of large economies may become more prominent. As a large economy, China can provide BRI countries with demand-side mega-markets (e.g., importing agricultural products and tourism services from BRI countries) and supply-side economies of scale (e.g., exporting more cost-effective manufactured goods to BRI countries) amid deglobalization.

Second, the similar stages of development of China and BRI countries. Most BRI countries are developing countries. As the world's largest developing country, China has enjoyed remarkable achievements through reform and opening-up over the past four decades. Most BRI countries are at a similar stage of economic development as China relative to developed countries. As such, China's development experience may be a more suitable reference for BRI countries. For example, China could leverage its experience and capabilities to build out infrastructure in BRI countries, boosting their economic growth.

Third, the complementarity of factor endowments. Many BRI countries have abundant natural resources and young populations, but lack capital, technology, and management expertise. China's large industrial production capacity could complement the factor endowments of BRI countries through raw material imports and production capacity cooperation.

To analyze the industrial foundation of win–win cooperation under the BRI mechanism, we should both explore what different industries in China are seeking to achieve and take into account what BRI countries need from Chinese industries. We will discuss this in light of the major challenges and risks facing China's industrial system. As shown in Fig. 7.2, China now faces two major challenges from an industrial perspective: The fading demographic dividend within China, and intensifying international competition outside China.³ These two challenges create three risks at the industry level: The original industrial structure based on the demographic dividend may be unsustainable, and the intensified international competition leads to horizontal decentralization risks and vertical supply risks in industry chains.

From the perspective of industry cooperation between China and BRI countries, we see four ways to deal with these risks. On the supply side, efforts could be made to secure safer and more stable trade in commodities and to boost cooperation in production capacity. On the demand side, exploration of new markets for manufactured goods and efforts to open up the Chinese market could increase. Due to varying conditions in industries across global markets, individual industries may have different focuses. Detailed analysis is as follows.

7.1.1 Supply-Side Commodity Trade: Improving Security of Commodity Trade

Against the backdrop of deglobalization, Chinese industries face two types of supply risks, i.e., access to advanced technologies in fields such as semiconductors, and high reliance on imports of natural resources.⁴ At present, China relies heavily on imports

³ Xie, C., et al. (2022). Chapter 2: International Competition: The Great Illusion or the Great Game? In *Two-Pillar National System*. CICC Global Institute.

⁴ CICC Research & CICC Global Institute. (2024). Vertical and Horizontal Risks Along Industry Chains and a Dual-Pillar National System. In *The Reshaping of China's Industry Chains*. Springer, Singapore. https://doi.org/10.1007/978-981-97-1647-0_8

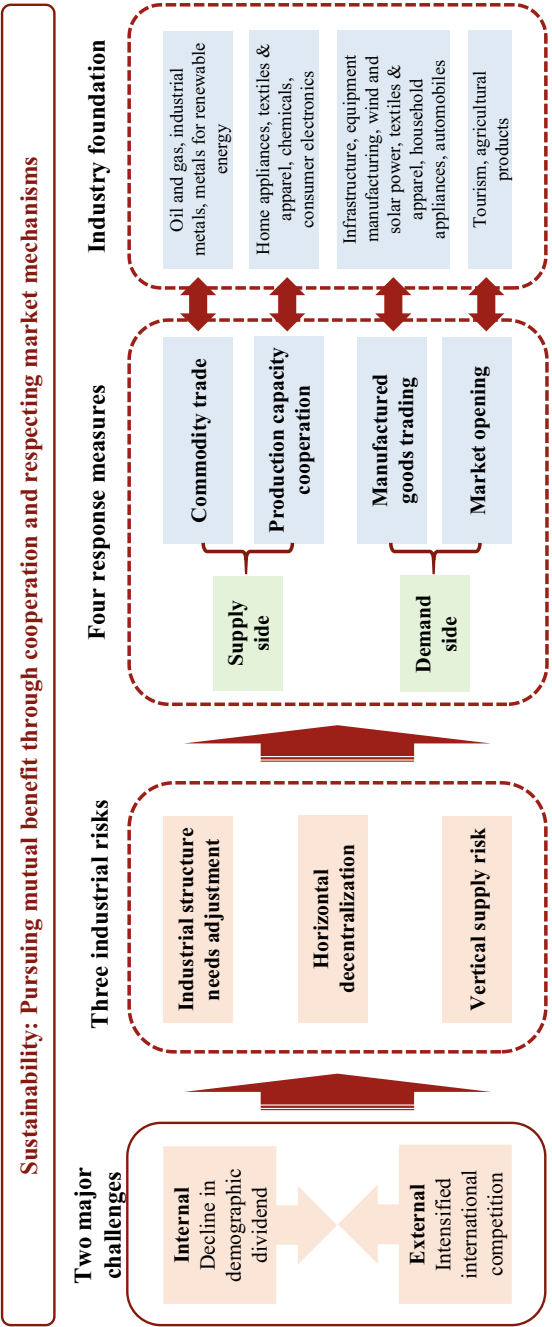


Fig. 7.2 Framework for sustainability analysis of BRI projects from an industrial perspective. *Source* CICC Global Institute

of three types of primary products: (1) Traditional sources of energy such as oil and natural gas; (2) industrial metals such as iron ore, copper, and aluminum; and (3) new energy metals such as nickel, cobalt, and lithium. Natural resources are unevenly distributed across BRI countries. Traditional sources of energy such as oil and natural gas are mainly found in Eastern Europe, South Asia, West Asia, and North Africa. The distribution of industrial metals is less concentrated. Russia is rich in mineral resources, with much larger iron ore reserves than other BRI countries. In addition, Russia has the third largest copper reserves among BRI countries, next only to Chile and Peru. Bauxite is mainly distributed in Southeast Asia, West Africa, and Latin America. New energy metals are geographically more dispersed. Southeast Asia, Southern Africa, and South America have much higher reserves of nickel, cobalt, and lithium.

Compared with the natural resources supply constraints, China faces greater supply risk in high-tech sectors. We believe that the fundamental response measure is to build a two-pillar system for mobilizing resources nationwide. That is, coordinating resources from governments, the market, the real economy, and financial sectors to address vertical risks (pillar 1). The key task is to improve “catch-up innovation” capabilities. Horizontal risk should be addressed through efforts in small- and medium-sized enterprises, institution building, and capital markets (pillar 2). The key task is to improve “frontier innovation” capabilities.⁵

However, this does not mean that cooperation with other countries is not important. While the fundamental solution is to improve the ability to innovate, strengthening international cooperation in technological innovation can enable China to better cope with such risks. For example, China is now a global leader in electrification of vehicles and has established a complete electric vehicle value chain with a large production capacity. However, electrification is not the endpoint for the alternative fuel vehicle (AFV) industry.⁶ We believe that intelligent vehicles have brighter prospects, driving strong demand for software and hardware such as high-end chips and AI algorithms. This means that if China cannot eliminate bottlenecks in advanced technologies in a timely manner, its ability to develop electric and intelligent vehicles may face setbacks. In the era of deglobalization, we believe it is advisable to increase scientific and technological cooperation with certain BRI countries that have abundant technological resources and enjoy friendly relations with major countries.

⁵ CICC Research & CICC Global Institute. (2024). Vertical and Horizontal Risks Along Industry Chains and a Dual-Pillar National System. In *The Reshaping of China's Industry Chains*. Springer, Singapore. https://doi.org/10.1007/978-981-97-1647-0_8

⁶ CICC Research & CICC Global Institute. (2024). China's Auto Industry to Grow From Large to Strong. In *The Reshaping of China's Industry Chains*. Springer, Singapore. https://doi.org/10.1007/978-981-97-1647-0_14

7.1.2 Supply-Side Production Capacity Cooperation: Combining Chinese Capital with Demographic Dividend of BRI Countries

Since China decided to establish a socialist market economy in 1992, the country's growth model has been similar to that of Japan's pre-1994 model. Fluctuations in both GDP growth and per-capita GDP growth are highly correlated with fluctuations in incremental working-age population. The labor force drove rapid economic growth over the past three decades, but the annual increase in China's population aged 20–59 has been slowing since it peaked at 14 mn in 2007. At present, the working-age population has been shrinking, a change not seen since the founding of the People's Republic of China in 1949.

From the perspective of the three-factor growth model of labor, capital, and technology, there are three main ways to mitigate the adverse impact of slower growth of the size of the working-age population on economic growth.⁷ One way is to cooperate with countries with relatively abundant labor. We think cooperation between Chinese capital and foreign labor in overseas markets is critical for mature industries such as textiles & apparel and home appliances in which China accounts for high proportions of global production capacity. Among BRI countries, countries in Southeast Asia, South Asia, and West Africa have the largest working-age populations. In 2021, BRI countries with working-age populations over 100 mn include Indonesia in Southeast Asia (190 mn), Pakistan (140 mn) and Bangladesh (115 mn) in South Asia, and Nigeria (115 mn) in Western Africa. As for cost of labor, East Africa has the lowest wages, while wages in Southeast Asia are at the lower-middle level.

However, wage data may be of limited reference value due to its low availability and technical issues such as exchange rate calculation. Meanwhile, wages are usually proportional to the average years of schooling, and the educational requirements in different industries also vary. For example, labor-intensive light manufacturing industries such as textiles & apparel and luggage & bag manufacturing have lower educational requirements but are labor intensive. We think Nigeria in West Africa, Indonesia in Southeast Asia, and Pakistan and Bangladesh in South Asia are suitable for developing these industries. However, for industries with higher educational requirements, such as home appliances, automobiles, and consumer electronics, the BRI countries in Eastern Europe and Central Asia may enjoy greater advantages.

Notably, carbon neutrality pledges have become a driving force for China to cooperate on production capacity with BRI countries. For example, Inner Mongolia has stopped approving new projects for calcium carbide, PVC, synthetic ammonia (urea), methanol, ethylene glycol, and caustic soda since 2021, and new projects (if necessary) are required to implement the replacement of production capacity and energy consumption.⁸ In recent decades, a global consensus has developed

⁷ Xie, C., et al. (2022). Chapter 1: Possible paths to cross the new demographic trap. In *Two-Pillar National System*. CICC Global Institute.

⁸ http://fgw.nmg.gov.cn/xxgk/zxzx/tzgg/202103/t20210326_1313895.html.

around the need to achieve carbon neutrality and environment-friendly development. Environmental protection requirements increasingly have to be considered in production capacity cooperation. Countries with laws aimed at achieving carbon neutrality usually have limited environmental carrying capacity. In contrast, countries that have only proposed or discussed carbon neutrality tend to have larger environmental carrying capacity. This latter group includes Indonesia in Southeast Asia, Kazakhstan in Central Asia, and some countries in Africa.

7.1.3 Demand-Side Manufactured Goods Trade: Coping with the Contraction of the Global Market Amid Deglobalization

Competition among large countries poses a challenge to China's industry chain in terms of not only technology and resource constraints on the supply side but also decentralization on the demand side.⁹ The essence of decentralization is the weakening of the previously closely linked relationship between US demand and Chinese supply. We think this may lead to the contraction of the global market. International division of labor at the industry level can boost efficiency thanks to the unification of the global market in the past few decades. This has allowed individual production links—which were unable to generate economies of scale in the past—to become profitable. In this case, deglobalization threatens the security and stability of the industry chain. In addition, the consequent contraction of the global market could also affect industrial efficiency. More importantly, even without the impact of competition among large economies, the Japanese experience shows that internationalization is the only way a country's mature industries can achieve sustained growth when its total population starts to fall.¹⁰ In particular, mature consumer goods industries such as textiles & apparel, home appliances, consumer electronics, and automobiles need to go global.

We visited manufacturers in northern Vietnam in March 2023. Most companies said that although nominal wages in Vietnam are 20–30% lower than in central China, overall production costs in Vietnam are not significantly lower after taking into account factors such as labor efficiency and water and electricity costs. These companies are relocating production capacity to Vietnam due to a shift in demand from the US amid trade frictions rather than due to rising labor costs in China. This means that amid deglobalization, rising labor costs may not be the determining factor as to whether the industrial value chain moves out of a country. On the contrary, demand plays a bigger role. To what extent a country can sell products has become

⁹ CICC Research & CICC Global Institute. (2024). Vertical and Horizontal Risks Along Industry Chains and a Dual-Pillar National System. In *The Reshaping of China's Industry Chains*. Springer, Singapore. https://doi.org/10.1007/978-981-97-1647-0_8

¹⁰ Huang, Y., & Xie, C. et al. (2020). An analysis of Japan's "tenbagger" stocks in the era of low growth.

more important. For China, we think measures can be taken to unleash consumption potential. In addition, China needs to explore new markets for manufactured goods to improve the stability of external demand and cushion pressure from the shrinking global market caused by deglobalization.

Compared with advanced economies, BRI countries are generally underdeveloped. However, the highly diversified market demand of BRI countries is conducive to guiding China's industrial innovation and diversification¹¹ given their large populations, vast area, and varying stages of development. The market potential of BRI countries as a whole also merits attention. According to the World Bank, BRI countries accounted for 47%, 58%, and 22% of the global population, area, and GDP in 2021. More importantly, exports of China's mature products can help BRI countries develop, which is a concrete manifestation of win-win cooperation between China and BRI countries.

For example, construction of infrastructure projects and exports of construction machinery to BRI countries with insufficient infrastructure could help improve the scale and quality of infrastructure construction in related countries and accelerate their economic growth. Some BRI countries are facing power shortages. Financing support for high-emission projects under the constraint of carbon neutrality pledges has also been significantly reduced, making it increasingly difficult for some BRI countries to solve power supply problems. China enjoys clear advantages in the solar PV and wind power value chains. Exporting products from these industries can help BRI countries strike a balance between environmental protection and economic growth, bridge the gap in power supply during the green transition, and improve economic growth potential and quality of life.

Demand from different BRI countries for Chinese products varies. For daily consumer goods such as textiles & apparel and home appliances, consumer demand from different groups is inelastic. Therefore, population size is an important factor in determining the potential size of textiles & apparel and home appliances markets in each country. Size of GDP is also a reference indicator for textiles & apparel and home appliances industries when choosing destination countries as income is the foundation of consumption. Southeast Asia, South Asia, and West Africa have large populations. The top five BRI countries in terms of population in 2021 were Indonesia, Pakistan, Nigeria, Bangladesh, and Russia. BRI countries in Eastern Europe, Southeast Asia, and West Asia tend to have higher GDPs relative to other BRI countries. The top four BRI countries in terms of 2021 GDP were South Korea, Russia, Indonesia, and Saudi Arabia. In summary, BRI countries in Southeast Asia, South Asia, and Eastern Europe have larger populations and higher GDPs than other BRI countries, and thus they have stronger demand for manufactured goods such as textiles & apparel and home appliances.

¹¹ CICC Research & CICC Global Institute. (2024). Vertical and Horizontal Risks Along Industry Chains and a Dual-Pillar National System. In *The Reshaping of China's Industry Chains*. Springer, Singapore. https://doi.org/10.1007/978-981-97-1647-0_8

For consumer discretionary goods such as automobiles, the market size depends not only on population but also on the stage of development of a country. Countries with higher per-capita GDP usually have saturated markets and limited room for further growth. In contrast, countries with lower per-capita GDP may lack sufficient demand for consumer discretionary items such as vehicles. For example, there is an S-curve relationship between vehicle ownership rate and per-capita GDP. A study shows that vehicle ownership per capita is highly sensitive to per-capita GDP when purchasing power parity-adjusted per-capita GDP is between 3000 and 10,000 international dollars. During this period of development, the unit growth of per-capita GDP can more effectively drive up vehicle ownership.¹² Southeast Asia, West Asia, South Asia, North Africa, and South America have more countries with per-capita GDP of 3000–10,000 international dollars than other BRI regions. Taking into account per-capita GDP and population, BRI countries in Southeast Asia and South Asia may have larger growth potential in the auto market.

Population and GDP are also important for infrastructure construction and related construction machinery. Generally, the potential return on infrastructure investment in a country is closely related to the country's population size. In countries with larger populations, infrastructure projects are more likely to generate better social and economic benefits. This means that infrastructure demand in countries with larger populations may be stronger. In addition, the urbanization rate also plays an important role in determining demand for infrastructure construction and related construction machinery. A study shows that there is an inverted U-shaped relationship between new infrastructure investment intensity (infrastructure investment/GDP) and urbanization rate.¹³ Analysis based on Chinese data¹⁴ shows that the vertex of the inverted U-shaped relationship corresponds to an urbanization rate of about 47%. This means when the urbanization rate is lower than 47%, the increase in the urbanization rate is accompanied by rising intensity of infrastructure investment. When the urbanization rate is higher than 47%, the increase in urbanization rate is often accompanied by falling intensity of infrastructure investment. We use an urbanization rate of 30–60% as the screening criterion, and believe that BRI countries with large infrastructure construction markets are mainly located in Southeast Asia, Western Africa, South Asia, and Central Asia. Together with the abovementioned GDP and population data of related BRI countries, Southeast Asia, South Asia, and Central Asia have larger demand for infrastructure investment, and the infrastructure and construction machinery markets in these regions may also have substantial growth potential.

The potential market sizes of alternative energy such as solar PV and wind power depend on both natural resources and electricity demand in related countries. In terms of solar energy resources, South America, North Africa, Southern Africa, and West

¹² Dargay, J., Gately, D., & Sommer, M. (2007). Vehicle ownership and income growth, worldwide: 1960–2030. *The energy journal*, 28(4), 143–170.

¹³ Li, Z. (2017). Infrastructure and Urbanization in the People's Republic of China; Arora, R., & Kaur, B. (2022). Is urbanisation sans infrastructure a myth? Evidence from India. *Economic Annals*, 67(232), 81–104.

¹⁴ Li, Z. (2017). Infrastructure and Urbanization in the People's Republic of China.

Asia have great potential for solar PV power generation,¹⁵ with the top five BRI countries being Chile, Bolivia, Namibia, Peru, and Yemen. In terms of wind energy resources, South America, North Africa, and West Asia have higher wind energy density, with the top five countries being Chile, New Zealand, Argentina, Croatia, and Austria. In terms of development potential, solar PV power stations are suitable in areas with many hours of sunlight and high solar thermal radiation intensity, while wind power stations are suitable for areas with high wind energy density.

However, development potential is not the same as willingness to develop. Without strong demand for electricity, even if a country has favorable conditions for the development of solar PV and wind power, the large potential is unlikely to be effectively translated into willingness to develop alternative energy sources. Considering the carbon neutrality pledges around the world, countries with strong electricity demand may be more willing to develop clean energy such as solar PV and wind power. BRI countries in Eastern Europe, Southeast Asia, West Asia, North Africa, and South America have higher electricity consumption. Taking into account the above factors, West Asia, North Africa, and South America may have sizable markets for alternative energy such as solar PV and wind power.

7.1.4 Demand-Side Market Opening-Up: Leveraging the Attractiveness of China's Mega-market to BRI Countries

An important strategy for dealing with the risks of decentralization is strengthening regional cooperation. In addition, frontier innovation capabilities hold the key to making the supply side more attractive to other countries.¹⁶ However, supply-side efforts alone are not enough to strengthen regional cooperation. We think China can also open up wider to the world, which could help increase the willingness of BRI countries to cooperate with China. Historical experience shows that China, Japan, Germany, and South Korea all benefited from external demand during their rapid growth stages. Our market survey in Vietnam also shows that the US serves as a major destination market for Vietnamese products and that the US market plays an important role in helping improve US-Vietnam relations.

¹⁵ The solar PV power generation potential of each region is profiled by the average daily electricity generation per unit of PV installation in each region (kWh/kWp). In 2020, the World Bank's Global Photovoltaic Power Potential by Country report calculated the solar PV development potential of each region based on factors such as lighting conditions, climate, and terrain. Given the significant differences in the solar PV power generation potential of different regions within a country, the World Bank recommends using the 75% percentile of the solar PV power development potential of different regions in a country to represent the country's overall potential.

¹⁶ CICC Research & CICC Global Institute. (2024). Vertical and Horizontal Risks Along Industry Chains and a Dual-Pillar National System. In *The Reshaping of China's Industry Chains*. Springer, Singapore. https://doi.org/10.1007/978-981-97-1647-0_8

Taking into account all factors, we believe that China may consider strengthening the opening-up of tourism and agricultural markets. The COVID-19 pandemic has taken a heavy toll on the tourism industry in various countries. Many countries have strong willingness to attract Chinese tourists as the impact of the pandemic subsides. At present, BRI countries with high Travel and Tourism Development Index (TTDI)¹⁷ ratings are concentrated in Western Europe, Northern Europe, and Southeast Asia. Given that Southeast Asia is relatively less developed, the region is more likely to find tourist inflows from China attractive.

The special agricultural products market is another area in which China could attract BRI countries. Agriculture is of vital importance to a country. To ensure independence and security, most economies protect their agriculture industry to some extent, while hoping other countries open their agricultural markets wider. This dynamic was particularly evident during the Doha Round¹⁸ of trade talks. At the Sixth WTO Ministerial Conference in 2005, the US explicitly opposed the elimination of cotton subsidies, but urged other countries to open their agriculture markets wider. This was a key reason behind the failure to make progress in the Doha Round.¹⁹ Therefore, the opening-up of agricultural markets can effectively facilitate international cooperation.

Of course, the extent of opening-up needs to take the financial conditions of domestic agricultural producers into account. We believe China may open up its fruit market wider to BRI countries as fruit-producing countries need to sell fruit within a short time to avoid rotting. In addition, fruit is unlikely to have a large impact on food security in importing countries. At present, fruit-producing countries that rely heavily on foreign markets are largely located in Southeast Asia, West Asia, and Eastern Europe. We believe that China can further open its fruit markets to BRI countries in these regions.

¹⁷ The World Economic Forum's Travel and Tourism Development Index (TTDI) examines the performance of a country's travel and tourism sector in five major areas and 17 sub-areas: (1) Business environment; safety and security; health and hygiene; human resources and labor market; information and communication technologies (ICT) readiness. (2) Travel and tourism policy: Prioritization of travel and tourism; international openness; price competitiveness. (3) Infrastructure: Air transport infrastructure; ground and port infrastructure; tourist service infrastructure. (4) Travel and tourism demand drivers: Natural resources; cultural resources; non-leisure resources (business travel, conferences, exhibitions, medical travel, etc.). (5) Travel and tourism sustainability: Environmental sustainability; socioeconomic resilience and conditions; travel and tourism demand pressure and impact. The above indicators are arithmetically averaged to obtain the TTDI.

¹⁸ Xie, C. (2018). Trump's War and Peace: What are the industry impacts? An analysis based on the US industrial structure.

¹⁹ Xie, C. (2018). Trump's War and Peace: What are the industry impacts? An analysis based on the US industrial structure.

7.1.5 Key Cooperation Regions in Different Industries: Overland Bridge Countries and Maritime Bridge Countries

From the perspectives of production capacity cooperation, commodity trade, manufactured goods trade, and market opening-up, key regions in which different Chinese industries achieve win-win cooperation may vary. Among them, two regions are of strategic significance: Overland bridge countries and maritime bridge countries. Overland bridge countries (stretching from Eastern Europe, Central Asia, and West Asia to North Africa) are rich in traditional fossil energy such as oil and gas. These countries are of special significance to the economic security of large industrial economies. Industrial metals are geographically dispersed. Russia, South Asia, and South America have large iron ore reserves. South America, Russia, and Central Africa are rich in copper ore. Bauxite is mainly found in Southeast Asia, West Africa, and Latin America. The distribution of metals used for renewable energy such as nickel, cobalt, and lithium is more dispersed, with nickel concentrated in Southeast Asia, cobalt in Central Africa, and lithium in South America.

Maritime bridge countries (mainly Southeast Asia) may be a key region in which Chinese industries such as transportation infrastructure can achieve win-win cooperation. As most Southeast Asian countries have urbanization rates of between 30 and 60% and large populations, we think infrastructure construction in these countries could generate higher economic benefits. Therefore, we believe increased infrastructure investment in maritime bridge countries—especially the Philippines, Thailand, Vietnam, and Indonesia—is an efficient way to improve people's well-being. In addition, countries with urbanization rates of 30–60% include Pakistan and Bangladesh in South Asia and Kazakhstan in Central Asia. These countries may have high infrastructure demand (see Chap. 8 for a more detailed discussion on infrastructure).

Heavy industries such as steel, cement, chemicals, and glass are highly correlated with infrastructure investment. Maritime bridge countries have strong demand for these industries. We believe the construction of heavy industrial capacity in Southeast Asian countries can satisfy both domestic demand from these countries as well as demand from the wider Southeast Asian market. In addition, considering that most Southeast Asian countries still have high environmental carrying capacity and strong motivation to develop heavy industries, cooperation with Chinese heavy industries could effectively boost local economic growth (see Chap. 10 for a more detailed discussion of heavy industries).

For the equipment manufacturing industry, we believe that China can both implement production capacity cooperation and directly sell products to BRI countries. We note that production capacity cooperation in regions with rich natural resources may

encounter the so-called resource curse.²⁰ Regions with weak economic fundamentals such as Southern Africa lack both the inherent requirements for the development of equipment manufacturing industries and the related industry and supply chains. In addition, the equipment manufacturing industry is also labor-intensive, requiring a large number of skilled workers. Given these three conditions, maritime bridge countries may remain important destinations for production capacity cooperation.

More specifically, the equipment manufacturing industry can be roughly divided into two categories. (1) Construction machinery, the demand for which is closely correlated to infrastructure investment. Maritime bridge countries are the key target markets. (2) Solar PV and wind power equipment, which is closely correlated to the distribution of resources and electricity demand. We see large market potential for solar PV and wind power industries in West Asia, North Africa, and South America (see Chap. 11 for a more detailed discussion on the development of equipment manufacturing industries such as construction machinery and new energy under the BRI).

In the technology-intensive high-end manufacturing sector, we believe establishing a two-pillar system for mobilizing resources nationwide is the fundamental way for China to accelerate technological innovation. However, this does not mean that China should adopt a closed-door policy in innovation. On the contrary, if China can cooperate in some high-tech fields with BRI countries that have certain scientific research strengths, then innovation resources and achievements are likely to spread. This could help China better cope with supply chain risks. Overall, BRI countries as a whole do not have obvious advantages in technological innovation resources. We believe that diversified demand and the potential market size of BRI countries merit greater attention for the development of China's innovative industries (see Chap. 2 for a detailed discussion).

We believe that there is considerable potential for cooperation between China and Southeast Asian countries in the trade of consumer goods such as textiles & apparel, home appliances, and automobiles. The potential for cooperation with BRI countries in South Asia and Eastern Europe in the textiles & apparel and home appliances industries also merit attention. In some consumer sectors, China could open markets wider to strengthen cooperation with BRI countries. From this point of view, maritime bridge countries remain the key target area when China opens up its tourism and fruit markets to the world (see Chap. 12 for a detailed discussion on the automobile sector, and Chap. 13 for a detailed discussion on other consumer sectors).

In summary, the focus of the win-win cooperation between China and BRI countries varies for different industries. Overland bridge countries and maritime bridge countries are the key regions. While overland bridge countries are the core regions

²⁰ The resource curse is an economic theory that refers to a paradoxical situation in which countries and regions rich in natural resources are less willing to develop other industries and invest in human capital due to their overreliance on resource industries. As a result, the development of industries other than resource industries is relatively backward, and the long-term economic growth rate is also much lower than that of countries and regions with relatively few resources. This theory was first proposed in the 1990s and has been verified in many countries and regions.

for the traditional fossil energy trade, the market potential for consumer discretionary also merits attention. Maritime bridge countries have strong demand for cooperation in infrastructure construction and almost all manufacturing industries.

7.2 The Role of Policy in BRI Project Sustainability

We have discussed the probability and key directions of BRI cooperation from an industrial perspective. This is only the basis for sustainability of cooperation under the BRI. Whether win–win cooperation itself is sustainable remains an issue to be discussed. The above analysis only shows that cooperation can bring win–win results to both sides as a whole, and does not consider differences within individual countries. Each country has groups with different interests, such as government, society, and businesses. Therefore, when examining the impact of economic cooperation between countries on international relations, we should not only consider countries as a whole, but also the structural implications of international cooperation.

We use game theory matrix analysis, as shown in Fig. 7.3, in the context of international cooperation bringing considerable economic benefits to both countries. We see that cooperation may be unsustainable if the benefits of cooperation are not appropriately distributed within a country. In other words, the sustainability of BRI projects depends on whether cooperation can improve the well-being of various groups. Ensuring that different groups within a country share the benefits of BRI cooperation likely requires policy intervention to build a reasonable sharing mechanism.

In fact, the role of policy intervention is not only to enable industrial cooperation to improve the well-being of stakeholders, but also to maximize the extent that win–win cooperation potential can be translated into actual benefits. As mentioned

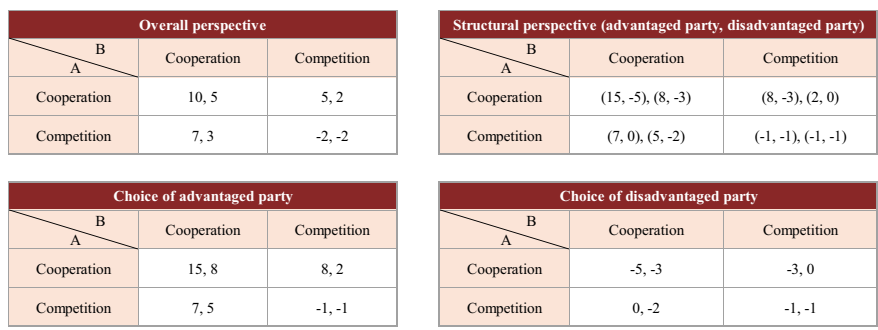


Fig. 7.3 Analysis of international cooperation income matrix from overall and structural perspectives.²¹ Source CICC Global Institute

²¹ Xie, C. et al. (2022). Chapter 2: International Competition: The Great Illusion or the Great Game? In *Two-Pillar National System*. CICC Global Institute.

above, although priorities for cooperation vary across different industries, we think most Chinese industries have a foundation for spontaneous win–win cooperation with BRI countries. During our market surveys, we have seen that many companies go global on their own initiative, with workshops or industrial parks built before the introduction of the BRI. Some have been recognized as BRI projects after the fact. Since there is a basis for spontaneous win–win cooperation at the industry level, is policy intervention necessary?

For international cooperation, productivity factors such as technology only offer possibilities. It is the good relations between countries that make such possibilities a reality.²² Unlike the economic activities within a country, international trade must overcome transaction costs related to international relations. We note that international relations are frequently the biggest transaction cost in trade activities. In addition to explicit tariff and non-tariff barriers, there are many hidden transaction costs. For example, international relations often affect people's preference for products and companies from different countries. Therefore, only if cross-border transaction costs are reduced can people and companies in different countries conduct economic activities and achieve win–win cooperation.

For example, the US spent nearly US \$50 bn on the *Lend-Lease Act* during the Second World War, accounting for 36% of US fiscal revenue and about 5% of GDP, and about US \$1.3 bn on the post-war Marshall Plan, which accounted for about 8% of US fiscal revenue and 1–2% of GDP over 1948–1951.²³ The US government did not directly benefit from these projects. However, US products, culture, standards, and currency spread throughout the world as a result of these initiatives, and the scope of international economic and trade activities that US people and companies could conduct also expanded. The US also managed to grow its economy.²⁴ The US government indirectly obtained tax revenue by funding seemingly loss-making projects that improved the sustainability of international cooperation.

In international economic and trade activities, the US attaches great importance to financial instruments. It provides guarantees and financing support to foreign investment enterprises through policy financial institutions such as the Export–Import Bank and the Overseas Private Investment Corporation (OPIC) to reduce cross-border transaction costs. However, the US experience may be difficult to replicate. Looking at the Marshall Plan as an example, many countries were hit hard by the Second World

²² CICC Research & CICC Global Institute. (2024). Vertical and Horizontal Risks Along Industry Chains and a Dual-Pillar National System. In *The Reshaping of China's Industry Chains*. Springer, Singapore. https://doi.org/10.1007/978-981-97-1647-0_8

²³ <https://www.loc.gov/item/today-in-history/october-23/>; <https://www.archives.gov/milestone-documents/marshall-plan>; <https://fred.stlouisfed.org/series/GDPA>; <https://fred.stlouisfed.org/series/FYFR>; https://web.worldbank.org/archive/website01306/web/marshall_plan.html.

²⁴ Fu, M. (2004). *Discourses on American Economic History*. Beijing: University of International Business and Economics Press. “Over 1948–1951, the US government spent about US \$13 bn (US \$143 bn in 2017 dollars) under the Marshall Plan, about 1.1% of the US GDP during the same period. After WWII, especially after European currencies were restored to free convertibility in 1958, large US companies began to invest across borders on a large scale. By 1965, there were 3300 US multinational corporations, controlling about 23,000 overseas branches and 60% of global foreign investment”.

War, and the US launched this plan by leveraging its clear advantages over other countries. It focused on European countries with better business environments and lower internal transaction costs than might be seen in many BRI countries today. We think the business environment in many BRI countries needs to be improved, meaning the sustainability of win–win cooperation faces greater challenges. Therefore, we think China can overcome cross-border transaction costs through policy intervention, and by reducing or compensating for additional transaction costs within the host country by providing policy support.

In this regard, the experiences of Germany and Japan in promoting international economic cooperation and global trade after the Second World War may merit greater attention. Compared with the US, the German and Japanese governments provided much stronger support to their enterprises in international economic and trade activities. For example, a system of supporting institutions for overseas investment and cooperation was formed in West Germany, with the Federal Ministry of Economic Cooperation and Energy as the overseeing authority and the Germany Trade and Invest (GTAI), the German Chamber of Commerce and Industry (DIHK), and the German Chambers of Commerce Abroad (AHK) as important pillars.²⁵ Providing services for SMEs to explore overseas markets is a notable feature of German policies. German Centres sponsored by the German government were established in key emerging market countries, bringing together the strengths of the German federal and state governments²⁶ to provide office space for SMEs to develop overseas markets, connect German enterprises with local enterprises via seminars and forums, and provide consulting and information services to help German enterprises go global.²⁷ Although the US has similar information service platforms for SMEs, it does not provide services such as office space for US companies in host countries.

As Japan's outward direct investment (ODI) mainly targets developing economies, Japan offered stronger policy support for Japanese companies going global than the US or Germany. For example, the Japan Bank for International Cooperation (JBIC) is the Japanese government's main tool for providing policy support for Japanese companies. Similar to JBIC, the US OPIC and Germany's KfW also provide policy-based financial support for OFDI. The US is the strictest of the three countries in terms of financing conditions. US policies target only small enterprises, and have restrictions to ensure that the investments do not affect US employment and workers' rights. Germany's conditions are looser than those of the US, and all small businesses are eligible. Japan has the loosest conditions, with no special restrictions. Judging from the proportion of OFDI loans issued by policy financial institutions in total OFDI, Germany's support is nearly seven times that of the US and Japan's is nearly 20 times that of Germany's (Fig. 7.4).

²⁵ <http://de.mofcom.gov.cn/article/ztdy/201810/20181002796345.shtml>.

²⁶ <https://www.germancentre.com/en/>.

²⁷ Bormann, A. (1996). Direct investment in Asia by German small and medium-sized enterprises. *Intereconomics*, 31(5), 241–247; Helmold, M., Yilmaz, A. K., Flouris, T., Winner, T., Cvetkoska, V., & Dathe, T. (2022). *Lean Management, Kaizen, Kata and Keiretsu: Best-Practice Examples and Industry Insights from Japanese Concepts*. Springer Nature.

Country	Institution	Function	Conditions for OFDI financing	OFDI loans /total OFDI	Proportion of OFDI invested in developing economies (2021)
US	Overseas Private Investment Corporation (OPIC)	Investment insurance, direct loans, loan guarantees	Direct lending to small businesses only, and projects must not negatively impact US jobs, exports, environment, and the rights of local workers	0.08% (1971-1992)	12.9%
(West) Germany	Kreditanstalt für Wiederaufbau (KfW)	Domestic investment, foreign aid, exports, foreign direct investment, and project financing	Only for small businesses	0.53% (1963-1999)	13.8%
Japan	Japan Bank for International Cooperation (JBIC)	Exports, imports, foreign direct investment, project financing, unconditional loans, foreign aid	None	10.3% (1953-1999)	19.1%

Fig. 7.4 Institutions providing policy-based financial support for outward foreign direct investment (OFDI) in the US, Japan, and (West) Germany. *Source* OECD, Solis, M. (2003). The politics of self-restraint: FDI subsidies and Japanese mercantilism. *World Economy*, 26(2), 153–180, CICC Global Institute

As mentioned above, the cross-border transaction costs that Chinese companies need to overcome in order to cooperate with BRI countries include the following: (1) General international transaction costs (e.g., tariffs) that companies in developed countries such as the US, Japan, and Germany face when they go global; and (2) intra-country transaction costs related to the general need for improvement in the business environment of BRI countries, such as legal settlement costs of contractual disputes and country-specific political risks. We think China could provide policy support to companies to help them overcome transaction costs between China and BRI countries and within BRI countries.

In addition to conventional financial support, Chinese companies doing business in BRI countries may need other types of policy support. For example, overcoming information asymmetry in cross-border transactions is a top priority, according to feedback from non-state-owned enterprises doing business overseas to the federations of industry and commerce. In 2019, a total of 40.6% of non-state-owned enterprises hope that relevant Chinese authorities can provide training and services on laws, regulations, and labor arbitration in BRI countries.²⁸ During our visit to Vietnam, Chinese companies said that they need two types of policy support. (1) Overseas Chinese companies established chambers of commerce that played a pivotal role in helping them overcome challenges during the COVID-19 pandemic. These chambers of commerce require more support to enhance the ability of overseas Chinese companies to cope with challenges such as natural disasters. (2) The Chinese companies also wanted more industrial parks to be built, backed by the Chinese government, to enhance their ability to cope with country-specific political risks.

²⁸ <https://www.yidaiyilu.gov.cn/wcm.files/upload/CMSydyIgw/201912/201912060530002.pdf>.

7.3 Reflections and Insights

We believe the sustainability of BRI projects depends on complementary advantages at the industry level to realize the potential for win–win cooperation. In addition, a reasonable policy design is needed to ensure that various stakeholders within a country can share the benefits of international cooperation. In other words, benefiting people’s well-being is an important guarantee for the sustainability of BRI projects. Policy intervention can also play an important role in helping to lower cross-border transaction costs. Specific reflections and implications are as follows.

First, the potential for win–win cooperation at the industry level is the foundation for the sustainability of BRI projects. In terms of production capacity, trade, and market-opening, priorities for cooperation vary for different industries.

- (1) **Primary products:** Traditional fossil fuels such as oil and gas are concentrated in Eastern Europe, Central Asia, West Asia, and North Africa. Russia, South Asia, and South America have large iron ore reserves. South America, Russia, and Central Africa are rich in copper ores. Bauxites are distributed in Southeast Asia, West Africa, and Latin America. Nickel, cobalt, and lithium are geographically dispersed, with nickel mainly in Southeast Asia, cobalt in Central Africa, and lithium in South America.
- (2) **Infrastructure construction and related heavy industries** such as steel and chemicals: Regions with large populations, urbanization rates of 30–60%, and high environmental carrying capacity tend to be more willing to develop these industries. This includes Southeast Asia, Pakistan and Bangladesh in South Asia, and Kazakhstan in Central Asia.
- (3) **Equipment manufacturing:** Both production capacity cooperation and manufactured products trade are needed. Taking into account the resource curse, value chain and supply chain support, and labor endowment, we think Southeast Asia has greater potential for cooperation in construction machinery, and West Asia, North Africa, and South America have stronger demand for the development of the solar PV and wind power equipment industries.
- (4) **Technology-intensive high-end manufacturing sectors:** The diversified markets of BRI countries may help increase the diversity of innovation in China.
- (5) **Consumer sectors:** Southeast Asia has significant room for product trade and production capacity cooperation in the textiles & apparel, home appliances, and automobile industries, followed by South Asia and Eastern Europe. Opening up China’s tourism and consumer markets wider to Southeast Asia should help strengthen China’s attractiveness to Southeast Asian countries.

Second, we think close attention can be paid to overland bridge countries and maritime bridge countries to achieve win–win cooperation at the industry level. Maritime bridge countries are mainly composed of Southeast Asian countries. This region is a key corridor for China’s maritime connectivity with other BRI countries. To strengthen regional cooperation to cope with decentralization risks, China can cooperate with Southeast Asian countries. Except for the traditional energy and

high-tech manufacturing industries, maritime bridge countries are the main target region for cooperation in almost all manufacturing industries, as well as for new energy metals, tourism, and other service industries, according to our industry-based analysis.

Although most overland bridge countries do not directly border China, these countries are rich in traditional energy sources that are irreplaceable in the short term, and are also a key land corridor between Europe and Africa. We believe Europe and Africa can play an important role in easing the intensity of great power competition. In particular, such competition may affect the safety of traditional maritime corridors. We advise paying attention to both the economic significance of overland bridge countries in traditional energy fields and to their strategic significance from the perspective of great power competition.

Third, we think China can achieve win-win cooperation with BRI countries from an industrial perspective. However, whether the cooperation itself is sustainable depends on policy intervention. The significance of policies for the sustainability of BRI projects can be understood from at least two perspectives. First, a distribution mechanism is needed to facilitate the sharing of benefits of cooperation among different groups within a country. Based on a game theory matrix analysis, in the context of international cooperation bringing considerable economic benefits to both countries, cooperation may be unsustainable if benefits are not appropriately distributed within either country. In other words, the sustainability of BRI projects depends on whether cooperation can improve the well-being of stakeholders. Ensuring that different groups within a country share the benefits of BRI cooperation likely requires policy intervention to build a reasonable sharing mechanism.

On the other hand, we believe the extent that potential for win-win cooperation at the industrial level can be translated into actual benefits of cooperation depends on cross-border transaction costs. The biggest transaction cost in international economic and trade activities is related to international relations, which not only determine explicit transaction costs such as tariffs, non-tariff barriers, and market access restrictions, but also affect implicit transaction costs such as the preferences of local consumers and businesses. Therefore, managing diplomatic relations with host countries is vital in reducing international transaction costs.

When cooperating at the industry level in overland bridge countries and maritime bridge countries, transaction costs occur in both host countries and also in countries with deep influence on these regions. Therefore, a comprehensive approach is needed to reduce cross-border transaction costs in these regions. Moreover, increasing support for small enterprises and creating a policy environment is conducive to the fair participation of all types of enterprises in international competition. As small firms are less able to withstand macro risks, countries such as the US, Japan, and Germany all offer special support to small enterprises going global, including consultation services and policy-based finance.

Chinese companies expanding abroad face international transaction costs similar to those faced by developed countries, and also have high intra-country transaction costs due to the less-developed business environments of BRI countries. Therefore, we believe greater policy support is needed for Chinese firms participating in

BRI projects. In addition to learning from the experience of developed countries in providing financial support, more support could be given to Chinese chambers of commerce established by Chinese enterprises abroad. In addition, services such as educational training on the laws and regulations of host countries and local labor arbitration could be provided to reduce information asymmetry.

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Chapter 8

Building BRI Infrastructure to Drive Common Development



Abstract In the past decade, China has deepened its involvement in the development of infrastructure in BRI countries, with a growing number of Chinese companies involved in BRI projects. According to China's Ministry of Commerce, from the launch of BRI in 2013 to 2021, the annual value of newly signed contracts of BRI projects by Chinese companies increased from US \$72.3 bn to US \$134 bn. Within this period, the total value of newly signed contracts of BRI projects by Chinese companies reached US \$1.1 trn, accounting for around 51% of the total value of newly signed contracts of foreign projects by Chinese companies.

Chinese engineering contractors are already internationally competitive. According to Engineering News-Record (ENR), the proportion of Chinese companies in ENR's Top 250 International Contractors rose from 13% in 2012 to 28% in 2021 in terms of total turnover. In 2021, Chinese companies among the ENR Top 250 International Contractors had a market share of 59% in Asia (by turnover), 55% in Africa, and 40% in the Middle East.

Sustainability is the prerequisite for promoting the high-quality development of the BRI, and for infrastructure construction, sustainability not only includes economic benefits, but also policy communication and improving people's quality of life. China's engagement in BRI infrastructure projects usually takes three forms, i.e., contractual cooperation, investment, and operation. Projects under the contractual cooperation model could be profitable, but the economic performance of different projects under the investment and operation models could diverge. For example, some BRI power grid projects have higher investment returns than domestic ones, while investment returns from some projects with high risks miss expectations. Transportation infrastructure projects generally have long payback periods, but they are important for improving connectivity within regions, people's quality of life, and policy communication (e.g., Jakarta-Bandung High-Speed Railway).

To address the challenges for the sustainable development of BRI infrastructure projects, cooperation and competition ("co-opetition") among companies can be encouraged, and the supporting industries and infrastructure can also be improved. This could facilitate project implementation, boding well for the achievement of

Author: YANG Xin, CHEN Yan, ZHENG Kuan, ZHANG Wenjie, KONG Shu, LIU Jiani, WANG Weiyue, GU Yuanfan.

inclusive, high-quality development that improves people's quality of life and increases economic benefits.

We believe the following measures can be taken to improve the sustainability of BRI projects: First, channeling resources to high-quality projects and focusing on the development of sustainable projects that improve people's quality of life. Second, building a development mechanism that combines guidance from the government with coordination and cooperation among companies. Third, improving capabilities of existing insurance institutions and facilitating the diversification of financing channels, e.g., strengthening the insurance capabilities of China Export & Credit Insurance Corporation for overseas investment and promoting innovative financing models such as public-private partnership (PPP) and hybrid financing.

8.1 Remarkable Achievements Have Been Made in BRI Infrastructure Development

In this section, we first analyze the positioning of infrastructure in BRI, its role as the foundation of the “five pillars of the BRI”—namely, policy coordination, infrastructure connectivity, unimpeded trade, financial integration, and closer people-to-people ties¹—as well as its importance and necessity. We then assess the progress of China's infrastructure development under the BRI.

8.1.1 Positioning of Infrastructure in BRI Development

Infrastructure is the physical basis for the provision of public services for social production and people's everyday life, as well as a public service system aiming at ensuring the normal social and economic activities of a country or region. Infrastructure, as defined by the World Bank, includes, among others, services from public utilities (power, telecommunications, piped water supply, sanitation and sewage, solid waste collection and disposal, and piped gas), public works (roads and major dam and canal works for irrigation and drainage), other transport sectors (railways, urban transport, ports, waterways, and airports), education, and health care.² According to the American Enterprise Institute for Public Policy Research (AEI), transportation, energy, power, and related projects accounted for 60–80% of China's infrastructure investment in BRI countries over 2013–2020. Therefore, the infrastructure investment covered in this section mainly refers to the above fields.

Since China put forward the BRI in 2013, infrastructure connectivity, as the physical foundation of the “five pillars of the BRI”, has been a priority and an important starting point for promoting the sustainable development of the global expansion of

¹ http://english.scio.gov.cn/whitepapers/2023-10/10/content_116735061_5.htm

² World Bank. (1994). World Development Report: Infrastructure for Development.

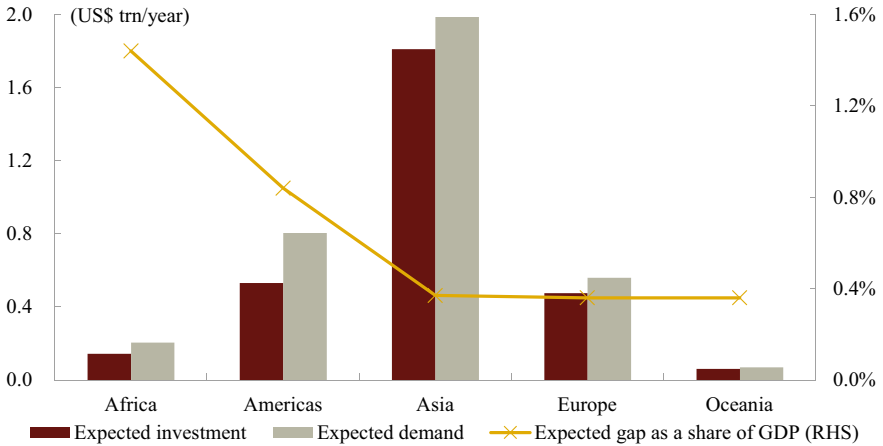


Fig. 8.1 Infrastructure investment demand and investment gap in 2030 in different continents. *Source* Global Infrastructure Hub, CICC Global Institute

various Chinese industries. To understand the importance and necessity of infrastructure construction for the BRI, we can take a closer look at the needs of BRI countries, China’s own strengths, and the current growth momentum of companies.

First, as BRI countries generally lag in infrastructure construction and have limited local investment capacity, they have urgent need for “external” infrastructure capacity. According to Global Infrastructure Hub,³ Asia has the highest potential infrastructure investment demand, with annual investment expected to grow from about US \$1.6 trn in 2022 to nearly US \$2.1 trn in 2030. Although the total demand for infrastructure investment in Africa is limited, it faces a large funding gap due to insufficient local supply capacity. Such a funding gap is expected to account for 1.44% of the continent’s total GDP in 2030, much higher than the rest of the world (Fig. 8.1).

Except for a few countries such as Singapore, most BRI countries face large infrastructure investment gaps and widespread demand for “external” capacity, especially Myanmar, Russia, Egypt, and South Africa. We expect the infrastructure investment gap to account for 1.53–3.01% of their GDP in 2030, much higher than the global average of 0.55%. We believe addressing the investment gap will be the focus of China’s overseas infrastructure investment (Fig. 8.2).

Second, as a country with strong infrastructure construction capability, China has accumulated extensive experience in construction management and operation. Thanks to the large number of infrastructure projects at home and abroad, China has gained competitive advantages across the entire industry chain from planning to design, construction, operation, and management. Globally, it ranks highly in terms of installed capacity of power generation and mileage of expressways and high-speed railways (HSR).

³ <https://outlook.gihub.org/>.

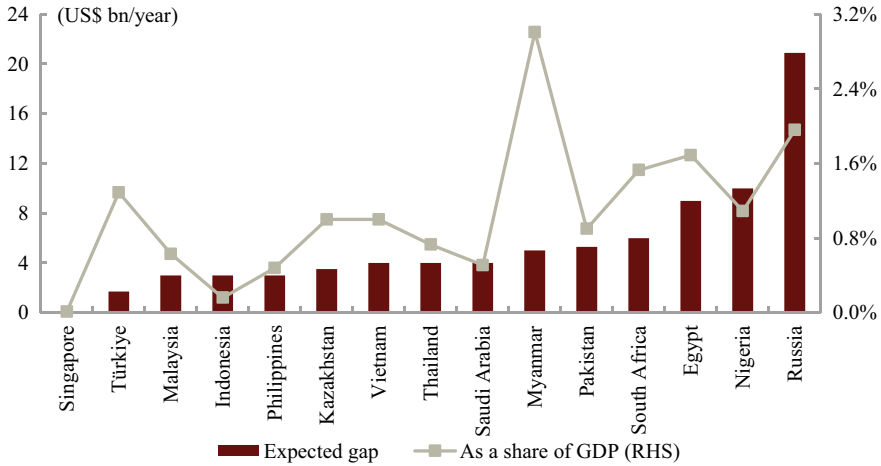


Fig. 8.2 Infrastructure investment gap in some countries in 2030. *Source* Global Infrastructure Hub, CICC Global Institute

China's strong construction capability is attributable to several factors. The country has a diversified and stable raw material supply system. According to data from ccement.com and the World Steel Association, China has the largest production capacity in the world for major raw materials such as cement and crude steel, accounting for 55% and 53% of the global output in 2021. China also has a large number of internationally competitive high-quality companies. According to Fortune magazine's list of the world's 500 largest companies in 2022,⁴ of the 16 companies in the engineering and construction industry in the list, 12 were Chinese, including all the top 6. According to ENR, Chinese contractors rank No. 1 in terms of construction revenue in Africa, Asia, and the Middle East, accounting for more than 60% of the total revenue in Africa.⁵

Lastly, from the perspective of companies' growth momentum, as competition in the domestic infrastructure construction sector is increasingly fierce, companies are more willing to expand overseas. According to the National Bureau of Statistics (NBS) of China, annual revenue growth of Chinese construction companies has slowed in recent years, from a high of more than 20% in 2010 to less than 10% by the early 2020s. Meanwhile, the number of construction companies has been growing rapidly, and domestic construction companies are facing mounting competitive pressure, with their gross margins on a downtrend.

⁴ https://www.fortunechina.com/fortune500/c/2022-08/03/content_415683.htm.

⁵ <https://www.enr.com/toplists/2021-Top-250-Global-Contractors-Preview>.

8.1.2 China's Infrastructure Development in BRI Countries

- (1) *China's BRI projects have been expanding in the past decade, with Asia and Africa currently two major target regions of investment*

The scale of BRI projects with Chinese involvement has continued to grow in the past decade. In 2021, the value of the newly signed contracts of BRI projects signed by Chinese companies reached US \$134 bn, accounting for 52% of the total value of newly signed contracts of foreign projects signed by Chinese companies. In the same year, China's direct investment in BRI countries reached US \$24.2 bn, accounting for 14% of its total outward foreign direct investment. Both figures grew at fairly high rates, recording 2012–2021 CAGRs of 8.7% and 6.8%, respectively.

Structurally, Asia and Africa are the main target regions for investment, while transportation, construction, and power are the main target industries. In 2021, Asia and Africa accounted for 47 and 30% of the total value of newly signed contract of China's foreign projects (including non-BRI countries). In 2021, projects focusing on transportation construction, general buildings, and power engineering construction accounted for 25, 20, and 19% of the newly signed contract value of China's foreign projects, translating into a combined share of 63% (Fig. 8.3).

- (2) *BRI projects have undergone three stages of development, with a greater current focus on high-quality development*

The development of China's overseas projects in BRI countries can be divided into three stages: The first stage of preliminary development (when the going global strategy was first proposed); the second stage of steady growth (when the BRI was launched), and the current third stage of high-quality development (the standards required of BRI projects have been raised).

The first stage of preliminary development covers the period from the formulation of the “going global” strategy to the introduction of the BRI. The strategy of going global was officially proposed during the third session of the 9th National People's

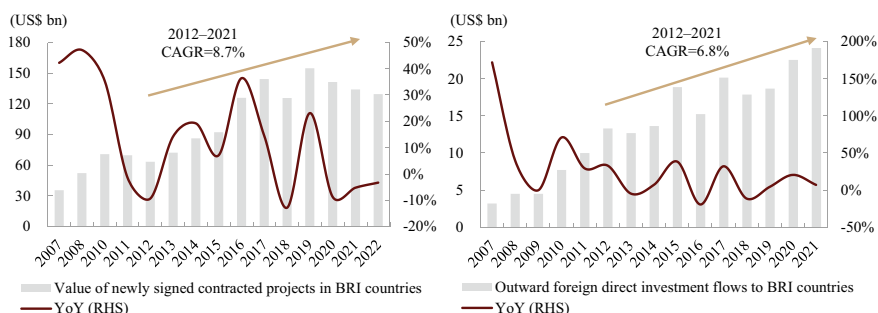


Fig. 8.3 New contract value of China's foreign contracted projects and direct investment value grew at a CAGR of 8.7% and 6.8% over 2012–2021 under the BRI. *Source* Wind, Ministry of Commerce of the People's Republic of China, Statistical Bulletin of FDI in China, CICC Research

Congress (NPC) in March 2000, and was subsequently clarified at the Fifth Plenary Session of the 15th CPC Central Committee in October 2000. According to the Ministry of Commerce and Statistical Bulletin of FDI in China, the value of China's contracted projects in BRI countries increased from US \$14.6 bn to US \$72.3 bn over 2005–2013, a CAGR of 22.1%.

The second stage saw the official launch of the BRI in 2013, with project scale growing steadily. In this stage, the two concessional facilities, i.e., Chinese Government Concessional Loans and Preferential Export Buyer's Credit, provided robust financial support for companies to carry out foreign contracted projects, and the contract value of new projects entered a phase of rapid growth. According to the Ministry of Commerce and the Statistical Bulletin of FDI in China, the value of newly signed contracts of BRI projects by Chinese companies increased from US \$72.3 bn to US \$134 bn over 2013–2021, a CAGR of 8.0%.

The third stage focuses on high-quality development. At the third symposium on the development of the BRI held on November 19, 2021, President Xi Jinping⁶ stressed full, accurate, and comprehensive implementation of the new development philosophy. According to his speech, the BRI aims at high standards, sustainability, and improved living standards by raising cooperation standards, effectiveness of investment, the quality of investment and production, and resilience of development, and to make new achievements in promoting the high-quality development of the initiative. During this period, China has paid more attention to the high standards and sustainability of projects under the BRI, as well as to improving people's quality of life, shifting from volume-driven to quality-driven development.

(3) *Chinese construction companies' share of the ENR Top 250 International Contractors list gradually rising*

Chinese construction companies' share of overseas contracted project turnover has continued to rise over the past decade. In 2021, 79 Chinese mainland companies were on the ENR Top 250 International Contractors list, surpassing the US (41), Türkiye (40), Italy (12), Japan (11), and South Korea (11). International turnover of Chinese mainland companies on the list reached US \$113 bn, accounting for 28% of the combined total of the 250 companies, up from US \$67.2 bn and 13% in 2012. Central SOEs such as China Communications Construction Company (CCCC), CSCEC, and China Railway Group (CREC) have become the contractors of a number of key projects in the international market. For example, CCCC has independently completed the design and construction of the Mombasa-Nairobi Standard Gauge Railway (SGR) in Kenya, CSCEC has undertaken the central business district project in the new capital of Egypt, and CRG built the China-Laos Railway (Figs. 8.4 and 8.5).

Although Chinese construction companies started taking on overseas projects later than Japanese firms, their contract value has grown more quickly. Japan became involved in infrastructure construction in developing countries through channels such

⁶ https://www.gov.cn/xinwen/2021-11/19/content_5652067.htm.

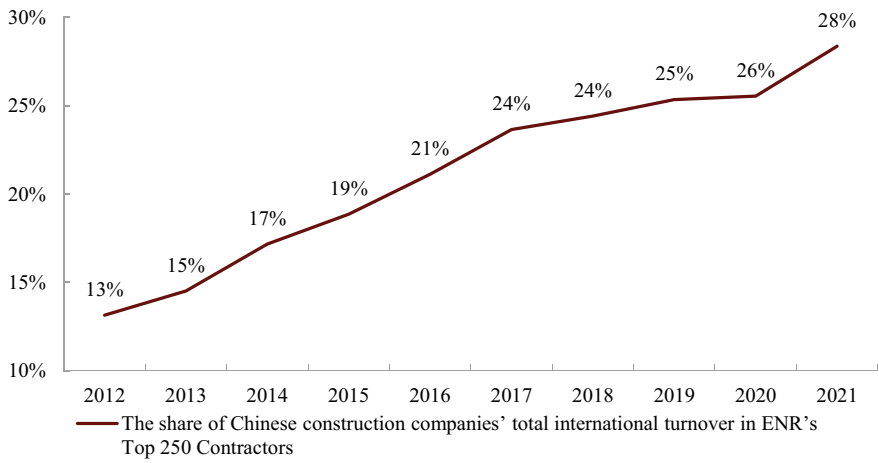


Fig. 8.4 Chinese construction companies continued to gain market share among international contractors over 2012–2021. *Source* China International Contractors Association, CICC Research

Company	ENR's International Contractors Ranking	Overseas turnover (US\$ mn)	As a share of total international turnover in ENR's Top 250 Contractors
China Communications Construction Company	3	21,905	5.5%
Power Construction Corporation Of China	6	13,703	3.4%
China State Construction Engineering Corporation	7	12,316	3.1%
China Railway Construction Corporation	10	9,012	2.3%
China Railway Group	11	7,421	1.9%
China Energy Engineering Corporation	17	5,365	1.3%
China National Chemical Engineering Group Corporation	20	4,861	1.2%
China National Machinery Industry Corporation	28	3,432	0.9%
China Petroleum Engineering Corporation	30	3,313	0.8%
Shanghai Electric Group Company	40	2,367	0.6%

Fig. 8.5 Overseas turnover of China's top 10 firms on the ENR's top 250 international contractors list in 2021. *Source* Wind, ENR, Corporate filings, CICC Research

as official development assistance as early as the 1970s, and introduced the “Infrastructure System Export Strategy” in 2013. In 2015, Japan announced Partnership for Quality Infrastructure (PQI), and in 2016, it launched the Action Plan for the Overseas Development of Infrastructure Systems, expanding the scope of infrastructure system export from Asia to the world. In 2018, it was clarified for the first time that Japan would cooperate with China on infrastructure projects in third-party countries, and that it would connect its infrastructure system export strategy with

the BRI.⁷ In comparison, China only started exploring overseas markets later with the rollout of the going global strategy in 2000, yet the scale of Chinese companies' overseas projects has grown rapidly, underpinned by extensive project construction experience, advanced technology, and financial support.

(4) *BRI infrastructure construction facilitates local economic development and boosts international trade*

As mentioned earlier, infrastructure is a social public good with positive externalities. BRI infrastructure projects in which China has been engaged have facilitated local economic development, boosted employment, improved living standards, promoted international trade, and driven the development of upstream and downstream sectors of the infrastructure industry chain. Over the past decade, the BRI has facilitated over 3000 cooperation projects, created more than 420,000 jobs in BRI countries, and helped lift almost 40 mn people out of poverty.⁸ For example, the Mombasa-Nairobi Standard Gauge Railway project boosted local economic growth by more than 2ppt.⁹

Moreover, backed by supporting infrastructure, capacity cooperation among countries can help overcome the constraints imposed by limited geographical space. Since the BRI was launched in 2013, China has established cargo freight links with more than 600 ports globally. The China–Europe Railway Express operated a total of about 16,000 train trips in 2021, a significant increase from 80 in 2013.¹⁰ More than 1200 new international air routes have been opened between China and BRI countries over 2014–2020.¹¹ According to the Ministry of Commerce, annual trade in goods between China and BRI countries expanded from US \$1.04 trn in 2013 to US \$2.07 trn in 2022, with a CAGR of 8%.

8.2 Sustainability of BRI Infrastructure Contains “Economic Benefits” in a Broader Sense

China's engagement in BRI infrastructure projects usually takes three forms: (1) Contractual cooperation (completing construction as the project contractor, without participating in investment and subsequent operation); (2) investment (as an investor and owning the operation rights); and (3) operation (with the China–Europe Railway Express as a typical example).

⁷ https://www.thepaper.cn/newsDetail_forward_2080798.

⁸ <https://english.news.cn/20231020/6ee6241b9dd44933bc98c802178afcb6/c.html>.

⁹ *Answering questions from Chinese and foreign media on “China's foreign policy and foreign relations”* on March 7, 2023.

¹⁰ <https://www.globaltimes.cn/page/202310/1299606.shtml>.

¹¹ BRI Research Group of the Development Research Center of the State Council. Building B&R Industrial Cooperation Network.

We analyze the economics of a typical project in this section because, in our view, economic benefits are essential to the sustainable development of BRI infrastructure projects. In fact, we note that these projects are mainly market-oriented, and that companies take economic value into account before engaging in them. However, does this mean that infrastructure projects that bring limited economic benefits are “unsuccessful”? While the economic benefits might not be reflected at the project level, the “internalization” of the projects through FDI, trade, and RMB internationalization, among others, also reflect economic benefits of these projects, albeit in a broad sense. Moreover, the positive example set by these projects encouraging further economic development should not be overlooked.

8.2.1 Contractual Cooperation: Chinese Companies’ Competitive Advantages Underpin Sound Economic Performance

For the comprehensive central construction SOEs and central construction SOEs specializing in international projects, we calculate the gross margins of their overseas businesses and compare them to the gross margins of their domestic operations. Overseas businesses at CSCEC, CREC, CRCC, CCCC, and Power Construction Corp of China had gross margins of 8–11% in 2021, and overseas businesses at China CAMC Engineering, Sinoma International (overseas cement engineering), and Sinosteel International (overseas metallurgical engineering) had gross margins of 6–17%. Gross margins of overseas projects vary due to differences among companies in terms of competitive advantages and project control capabilities. In addition, profitability of project contractors does not typically represent the overall profitability of the projects.

Chinese construction companies have competitive advantages in terms of experience in large infrastructure projects, cost control, and support from investment and financing systems.

First, after operating in China amid decades of urbanization, Chinese companies have accumulated extensive experience in the construction of domestic infrastructure projects, trained a large number of talented people, and developed a sound market foundation. They have strong technological capabilities and competitive advantages in transportation engineering (HSR, sea-crossing bridges, tunnels, ports, airports, etc.), power engineering (alternative energy such as solar power and wind power, energy storage, etc.), housing construction (ultra-high-rise buildings), communication engineering, and industrial production and manufacturing. Chinese equipment, technologies, and construction capabilities have received recognition from an increasing number of property owners and partners.

In addition, China has a vast territory, and its engineering companies have built some of the world’s largest infrastructure construction projects in complex environments, such as the Qinghai-Tibet Railway, a plateau railway featuring the highest

altitude and longest distance in the world, and the Beijing-Guangzhou Railway, the longest HSR in the world measured by operating mileage. In summary, Chinese companies are highly competitive internationally in construction and management of large-scale projects.

Second, Chinese companies enjoy price advantages in some areas. For example, in the power business, Chinese companies have mature technologies and supply products at low prices, and their complete power equipment is well received in the market. This bodes well for the development of Chinese companies' alternative energy projects (e.g., photovoltaic projects) in the international market.

Third, in addition to funding support from the Two Concessional Facilities, the improvement in China's diversified investment and financing system in recent years has also offered support to the development and settlement of overseas projects. These are both important aspects of the development and implementation of overseas projects. According to the Belt and Road Portal, as of end-July 2022, China had established bilateral local currency swap arrangements with more than 20 BRI countries and RMB clearing arrangements in more than 10 BRI countries.¹² The Multilateral Cooperation Center for Development Finance (MCDF) fund was established in 2020, in which 10 global financial institutions are participating. The business volume and influence of the RMB Cross-border Interbank Payment System (CIPS) have also been steadily increasing.

8.2.2 Investment: Investment Return Diverges Among Different Projects, but Such Projects Play a Role in Improving Policy Communication and People's Wellbeing

- (1) *Power investment projects: Characterized by scattered distribution and diverging investment returns; investment targets shifting from traditional to alternative energy projects*

Power investment projects in BRI countries can bring certain economic benefits. Some BRI countries have a weak industrial base, as well as lower per-capita installed power generation capacity and power consumption than the global average, implying significant potential for cooperation between BRI countries and Chinese power companies in this area. Chinese power companies have earned some returns from global expansion, but the level of returns has diverged among companies as a result of political and economic risks. Power grid companies such as State Grid moved early to expand business overseas, and earned solid investment returns overall. According to the State-owned Assets Supervision and Administration Commission (SASAC), all of State Grid's overseas investment projects were profitable over 2009–2016.

¹² <https://www.yidaiyilu.gov.cn/xwzx/gnxw/269621.htm>.

In the Philippines and other BRI countries, investment projects in state power transmission networks delivered returns of about 16–18%, around 3–5 times that in China.¹³ Specifically, Huaneng Hydropower’s hydropower investment projects in Southeast Asia have registered higher gross margins than those in Yunnan province, earnings from Huaneng Power International and China Shenhua’s thermal power projects have continued to grow, and Longyuan Power’s wind power investment in South Africa has also generated high returns. However, some risky projects have failed to meet expectations for investment return.

Power investment in BRI countries peaked over 2015–2018, and as of end-January 2023, according to incomplete statistics from the CICC Research public utilities and environmental protection team, key central independent power producers (IPPs), namely China’s big five power producers, Three Gorges, State Development & Investment Corp., Ltd. (SDIC), China National Nuclear Corporation (CNNC), and China General Nuclear Power Corporation (CGN), had invested in 113 projects in BRI countries with total installed capacity of more than 74.3GW.

Types of energy sources are expanding from hydropower and thermal power to wind and solar power, while investment in thermal power has peaked. For thermal power, early investment was concentrated in Southeast Asian countries, which are rich in fossil energy. However, China will no longer build overseas coal-fired power projects due to concerns about global energy transition and economic efficiency.¹⁴ For hydropower, it is the second largest source of energy in terms of the installed capacity of China’s overseas investment projects, mainly because Southeast Asia is rich in water resources and is the location of the middle and lower reaches of many rivers. For alternative energy, leading operators’ existing overseas installed wind and solar power capacity is mainly located in countries with abundant wind resources or ample sunlight and that are making rapid progress in energy transformation. With the implementation of energy transition policies and easing geopolitical tensions, more investment opportunities may emerge for power companies and equipment manufacturers in countries with robust wind and solar resources.

Looking ahead, policy support for energy transition in BRI countries and abundant wind and solar resources may generate more investment opportunities. On the policy side, as BRI countries have generally set guidelines for reducing the proportion of thermal power and increasing the installation of renewable energy facilities, wind and solar power projects will likely increase substantially by 2030. According to the *Research on Wind and PV Resources Assessment in BRI Countries* released by the Global Energy Interconnection Development and Cooperation Organization (GEIDCO) in May 2022, onshore wind power and solar power projects in BRI countries account for 70% and 76% of the global total. Given the high utilization hours and low development costs for wind power projects in Kazakhstan, Uzbekistan, and Sudan, and solar power projects in Chile, Namibia, and Saudi Arabia, these countries are ideal for renewable energy development.

¹³ <http://www.sasac.gov.cn/n2588025/n2588124/c3833296/content.html>.

¹⁴ http://www.news.cn/english/2021-09/22/c_1310201218.htm.

(2) *Transportation infrastructure projects: Strengthening connectivity and enhancing international influence with infrastructure as a link*

We believe the global expansion of transportation infrastructure will help enhance China's international influence. Transportation infrastructure investment projects under the BRI framework are mainly railway, road, and port projects such as the China-Laos Railway and Phnom Penh-Sihanoukville (PPSHV) Expressway. Compared with projects in the traditional contracting model, investment projects in general involve engagement in front-end investment and development as well as back-end operation and management, and can facilitate the global expansion of related industries. However, transportation infrastructure projects often feature long payback periods and unstable risk-to-reward ratios. The significance of the global expansion of investment projects in transportation infrastructure lies more in strengthening economic and trade connectivity with BRI countries and enhancing China's international influence through technology "exports" and experience sharing in infrastructure construction.

We analyze the significance of transportation infrastructure investment with the Jakarta-Bandung High-Speed Railway as an example given its important demonstration effect as China's first overseas HSR project. The Jakarta-Bandung HSR connects Jakarta, Indonesia's capital, with Bandung, the country's fourth largest city. It is the first overseas construction project that fully uses Chinese railway systems, technology, and industrial components. According to the president director of PT KCIC,¹⁵ the project is funded by a joint venture between China and Indonesia with a concession period of 50 years, and it could take 40 years for the project to break even. The significance of the commencement of the Jakarta-Bandung HSR lies in the following aspects:

For Indonesia, the construction and commencement of the HSR will help increase income, create jobs, and boost economic growth in regions along the route. HSR can increase economic benefits and create jobs during the construction stage. In the Jakarta-Bandung HSR project, the total purchase value of raw materials such as steel and cement, as well as machinery and equipment produced locally in Indonesia, was US \$5.12 bn. During the construction period, the project created 51,000 local jobs, and it could create 30,000 jobs per year in the service industry after the completion and commencement of the project.¹⁶ The commencement of the railway will also facilitate the flows of people and improved logistics, boding well for the development of industrial parks and boosting economic development in regions along the route.

For China, overseas expansion of HSR projects can help related industries go global and enhance policy communication and people-to-people connection with Indonesia. The Jakarta-Bandung HSR project is a landmark project for China's

¹⁵ China-backed Indonesian rail link seen taking 40 years to breakeven, Reuters, <https://www.reuters.com/article/indonesia-railway-china-idCNL4N2UJ25U>.

¹⁶ Construction of Jakarta-Bandung HSR progresses smoothly, Economic Daily, http://paper.ce.cn/p/content/202211/24/content_264665.html.

first full-industry-chain expansion overseas, demonstrating that China’s HSR has advantages in terms of technology, cost, and coverage of the entire industry chain, thus having a positive impact on future overseas expansion. In addition, HSR can also drive the global expansion of related industries. More importantly, it can enhance China’s international influence, economic and trade cooperation, policy communication, and people-to-people connection between China and Indonesia.

8.2.3 Operation: Enhancing International Cooperation, with China–Europe Railway Express as a Successful Example

As an international intermodal train project, the China–Europe Railway Express has set a benchmark for China’s active engagement in international cooperation. It runs through nearly 40 countries and regions in Eurasia, including China, Kazakhstan, Mongolia, Russia, Belarus, and Poland.¹⁷ According to China National Railway Group, the number of train trips operated by China–Europe Railway Express in both directions increased from 80 in 2013 to about 16,000 in 2022, and the categories of goods transported expanded from IT products such as mobile phones and laptops to more than 50,000 types of products, including auto and auto parts, chemicals, and grain. The railway has become an effective channel for connecting China and BRI countries, thus facilitating regional economic and trade cooperation as well as cultural exchanges.

Backed by its short transport distance, high speed, and impeccable safety record relative to sea transportation, the China–Europe Railway Express provides a complementary form of transportation. Although marine shipping remains the main mode of freight transportation due to high freight volume and low freight rates, the railway still plays an important role in deepening cooperation between China and BRI countries, and has a notable demonstration effect for international cooperation.

First, the railway sets a benchmark for cooperation and coordination between countries with the use of one single waybill covering the entire journey. International trains travel through different countries, which usually requires different transport documents. As a result, there may be problems such as cumbersome inter-country arrangements and procedures and low operating efficiency. However, the China–Europe Railway Express is characterized by one-off entrustment, one-off quotation, one waybill, and one-off invoicing, which not only mitigates the need for multiple waybills, but also reduces operating time and costs. Unified standards have helped strengthen cooperation and coordination between China and BRI countries.

Second, the railway promotes trade development and industrial agglomeration in hub cities. For example, according to China Railway Group, trains departing from Chengdu and Chongqing accounted for 30% of the total number of trains operated

¹⁷ http://wap.china-railway.com.cn/crcwapEnglish/InternationalCooperation_1299/CRexpress/201904/20190409_93060.html.

by China–Europe Railway Express in China in 2021, with the value of the transported goods exceeding Rmb200 bn, and trains arriving at Chengdu and Chongqing accounted for 55% of the national total. Therefore, Chengdu and Chongqing handle the largest number of China–Europe Railway Express trips, feature the most balanced distribution of trains and the highest value of goods transported, and have an optimal structure of goods supply.

The China–Europe Railway Express has also facilitated the development of industries closely related to railway transport and the European market, such as electronics, automobiles, and machinery in western China. Commencement of the railway project could help hub cities promote international trade and attract agglomeration of industries through trade.

8.3 Addressing the Challenges for the Sustainable Development of BRI Infrastructure Projects

Some problems still need to be addressed to improve the sustainability of BRI infrastructure construction. Essentially, without comprehensive planning for the implementation of infrastructure projects, there may be a disconnect between policy intentions and corporate actions. As a result, there is room for improvement in co-opetition among companies, as well as in supporting industries and infrastructure. Underdeveloped financing and insurance channels are also one of the pain points in infrastructure project development. In this section, we analyze the current issues to be addressed to support the sustainable development of BRI infrastructure projects.

8.3.1 Further Coordination Between Multiple Parties to Enhance Synergies Between Projects

BRI projects rely on synergies between multiple entities to maximize benefits and bring about sustainable development. On top of the existing synergies, we believe the synergy effect of the projects may increase further if more efforts could be made to improve coordination, including coordination between: (1) Local governments; (2) enterprises; (3) projects and financial institutions; and (4) infrastructure and industrial support.

(1) Cooperation between local governments in China

Local governments' active participation and engagement in the development of the BRI will lead to varying degrees of competition in the implementation process, and such competition between local governments has both positive and negative effects. Positive effects might include accelerating the improvement in regional infrastructure and strengthening the ability to handle foreign affairs at local levels, while negative

effects could include redundant construction in the absence of effective coordination and excessive subsidies. Despite the achievements that have been made so far under the BRI framework, if local governments make plans that cater to their own needs rather than to the interests of the broader community, this may partially lead to resources being wasted and an oversupply of subsidies.

For example, the China–Europe Railway Express developed quickly after 2016. In 2016, the National Development and Reform Commission (NDRC) announced the development plan for the China–Europe Railway Express over 2016–2020, aiming to increase train trips to 5000 each year by 2020. In fact, according to China Railway Group, more than 5000 trips were made in 2018 (6363), and the number of trips reached 12,406 trains in 2020, equivalent to 248% of the previous target. According to the 2021 China–Europe Railway Express Development Report, the number of Chinese cities covered by the China–Europe Railway Express logistics network rose from 27 in 2016 to 91 in 2021. While the rapid development of this project demonstrates the potential advantages from aligning policy communication standards between China and BRI countries, in-depth coordination between local governments in the operation of China–Europe Railway Express is necessary to help improve the sustainability of the project. For example, hub cities could play a role in driving the shift from “point-to-point” to “hub-to-hub” transport networks, allowing some train routes to be merged, or some to cease operations and exit the project when there are insufficient sources of freight.

(2) Coordination between companies

Chinese construction companies still have substantial room for improvement in creating synergies with overseas projects. It is still necessary for them to improve the mechanisms for coordination and cooperation in the process of acquiring, undertaking, and completing projects overseas. If Chinese companies can make further improvement in the going global model and in project arrangements, stronger synergies could be created.

The model of “joint global expansion” could develop quickly. Some overseas infrastructure projects (e.g., ports) include a wide range of businesses, involve long periods of project development, and feature complex contractual structures, all of which impose high requirements on companies’ business capabilities and risk-bearing capacity. If it is difficult for a single company to meet the requirements of full-cycle project management, groups of companies may therefore consider “joint global expansion” to leverage their respective advantages and create synergies. If central construction SOEs, local construction companies, and non-state-owned enterprises—which have different competitive advantages—can jointly fund, construct, or participate in the operation of a project and jointly undertake and share the workload and related risks, such a model could help prevent risks, reduce losses, and improve the quality and profitability of the project, in our view.

(3) Coordination between companies and financial institutions

For companies going global, financing channels for infrastructure projects need to be improved further. The financing cost of China’s overseas infrastructure projects

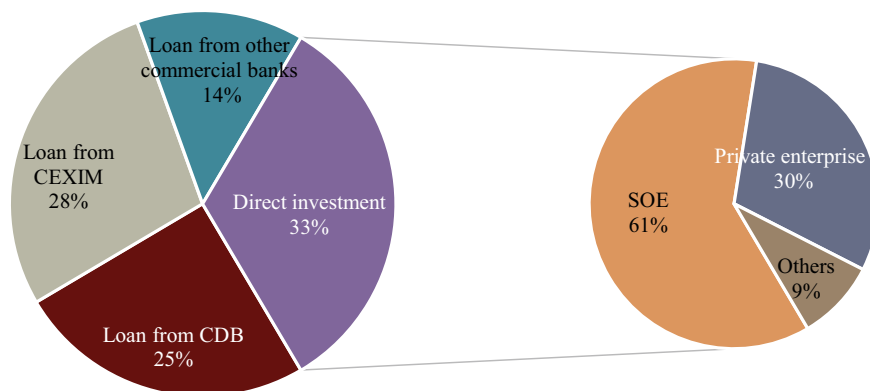


Fig. 8.6 Statistics on China's investment and financing in BRI countries over 2013–2021. *Note* China's direct investment in BRI countries is estimated based on the amount of investment projects over 2013–2021 calculated by AEI, and loans are estimated based on the difference between China's balance of payments at end-2021 and end-2012; CDB stands for China Development Bank, and CEXIM stands for China Export–Import Bank. *Source* SAFE, AEI, CICC Research

is relatively high as the number of lenders available is limited. Due to the large investments required and long payback periods of infrastructure projects, coupled with the high risks associated with overseas investment, China's main financing and investment channel for BRI infrastructure projects is loans. According to the State Administration of Foreign Exchange (SAFE) and the AEI, for the financing of BRI infrastructure projects, the value of loans is about twice the value of direct investment, and 80% of the loans are originated by policy banks. Direct investment is dominated by SOEs (61%), while the share for private enterprises is about 30%.

In terms of interest rates, China's policy banks are able to offer prime lending rates of about 2–3%, while Japan International Cooperation Agency's (JICA) lending rates are less than 2% at the highest.¹⁸ The main reason for this is that besides the low base rate in Japan, JICA also secures significant funds through government financing and fiscal allocation, which account for about 50% of the total funds, greatly reducing the financing cost.

While Chinese policy banks also receive government-subsidized loans, the proportion of such loans is not high (only about 5%), indicating that there is still a downside for the financing cost. For example, for the Mumbai-Ahmedabad High Speed Rail project in India, China offered loans at interest rates of 2–2.5%, while Japan offered loans at an interest rate of only 0.1% (Fig. 8.6).¹⁹

Financing channels for infrastructure projects can be improved in the following ways:

¹⁸ Chen, M. (2020). China vs. Japan: Infrastructure investment and financing by latecomers. *Japan Studies, Issue No. 2*.

¹⁹ <https://www.dw.com/en/japans-bullet-train-to-speed-up-indias-shabby-railways/a-40493183>.

(1) *Diversifying the financing channels*

For example, developed economies exhibit certain competitive advantages in cooperation with international multilateral development banks. In Asia, developed countries make full use of the Asian Development Bank (ADB) as a supplementary source of financing. ADB participates in many of their projects and coordinates loan issuance and financing activities, and even offers grants. Although China has stepped up cooperation with multilateral financial institutions such as the Asian Infrastructure Investment Bank (AIIB) in recent years, the country remains a laggard in terms of the number and scale of projects, especially in terms of its influence on financing and lending policies of multilateral banks.

Japan has advanced a series of reforms at the ADB to make better use of its infrastructure investment and financing functions, e.g., consolidating and improving the ADB's internal infrastructure fund, and establishing various funds such as the Asian Development Fund, the Asia Pacific Project Preparation Facility (AP3F), etc. In addition, Japan expanded financing coordination with governments of other countries, and has worked jointly with Canada and Australia to help the private sector participate in infrastructure projects. It also set up the Office for Private Sector Partnership to strengthen public-private sector collaboration and private financing. These reform measures have further expanded ADB's financing channels and increased funding support for Japan's overseas projects.

(2) *Improving the insurance mechanism*

Currently, Chinese companies rely on a single insurance channel, with private SMEs having limited access to sources of insurance funds. China Export & Credit Insurance Corporation is the only policy-oriented overseas investment insurance institution in China, and its source of funds is the export credit insurance risk fund, which is supported by government budget. China Export & Credit Insurance Corporation mainly offers insurance policies to large SOEs in China. Although it has ramped up support for SMEs in recent years, data shows that the insured amount for private SMEs via financing credit enhancement instruments remains relatively limited.²⁰

(3) *Develop risk-sharing mechanisms*

BRI infrastructure projects generally involve large amounts of financing, but Chinese banks mostly prefer to be the sole lender or to originate loans jointly with two or three banks, while they lack the ability to organize syndicated loans by international banks or other financial institutions. Therefore, Chinese financial institutions usually bear most of the risks. Infrastructure loans in China mainly come from two policy banks, namely the China Development Bank and the China Export-Import Bank. The two banks usually originate loans to BRI infrastructure projects either alone or together with domestic commercial banks. By contrast, developed countries tend to organize syndicated loans offered by international lenders to share risks associated with the projects. Accordingly, Chinese financial institutions bear most of the risks, which imposes higher requirements for project review (Fig. 8.7).

²⁰ <https://www.sinosure.com.cn/xwzx/ndbd/index.shtml>.

Leading country	Country or region	Project	Loan amount	Source of loan
China	Vietnam	Vinh Tan Coal-fired Power Plant I	US\$1.67bn	Export-Import Bank of China, Bank of China, Industrial and Commercial Bank of China, and China Construction Bank
	Vietnam	Vinh Tan Coal-fired Power Plant II	US\$2.7bn	China Development Bank, CLP Power Hong Kong
	Vietnam	Vinh Tan Coal-fired Power Plant III	US\$2.7bn	China Development Bank, CLP Power Hong Kong
	Pakistan	Engro Thar Block II power plant	US\$498mn	China Development Bank, HBL
	Pakistan	100MW UEP Wind Farm	US\$250mn	China Development Bank
Developed countries	Vietnam	Mong Duong II Power Plant	US\$2.1bn	BNP Paribas, Cr�dit Agricole, HSBC (China-foreign joint venture), ING, Natixis, Sumitomo Mitsui Bank, Standard Chartered Bank, Mizuho Bank, UniCredit
	Vietnam	Mong Duong I Power Plant	US\$2.1bn	BNP Paribas, Sumitomo Mitsui Bank of Japan, Standard Chartered Bank, Mizuho Bank, UniCredit
	Pakistan	National Highway Network Development in Balochistan Project	US\$235mn	Asian Development Bank, UK Department for International Development, Pakistan
	Pakistan	Tenaga Generasi Wind Farm Phase 2	US\$100mn	American Overseas Private Investment Corporation, Soneri Bank, World Bank, HBL
	Pakistan	Pakistan: National Trade Corridor Highway Investment Program Phase 2	US\$238mn	Asian Development Bank, UK Department for International Development, Pakistan
	Bangladesh	South Asia Subregional Economic Cooperation Road Connectivity Project	US\$259mn	Japan Fund for Poverty Reduction, Asian Development Bank, OPEC Fund for International Development, Abu Dhabi Fund for Development, Bangladesh

Fig. 8.7 Comparison of sources of loans for select infrastructure projects in BRI countries. *Source* CSIS, CICC Research

(4) *Coordination between capacity and infrastructure*

Infrastructure construction cooperation could be separated from capacity cooperation. First, BRI countries may launch tenders separately. Second, the coordination mechanism may need to be improved as infrastructure construction and production capacity “exporters” are often not the same entities. For BRI countries, underdeveloped infrastructure and supply chains could restrict their ability to participate in the international division of labor, and they need to improve their infrastructure and value chains to enhance their competitiveness. For “exporters”, the development of regional manufacturing clusters could trigger stronger derivative demand and strengthen their ability to fund investment in infrastructure construction. Therefore, coordination between production capacity and infrastructure construction would be of great significance.

8.3.2 *How Can China Replicate Its Domestic Success in Infrastructure Construction in BRI Countries?*

Japanese and US experience can serve as a reference mainly from the perspective of other countries’ overseas infrastructure development. As one of the countries witnessing the fastest infrastructure development, how can China “replicate” its success in domestic market in overseas countries?

China has made notable achievements in infrastructure construction. Data from the NBSC shows that China’s highway and railway mileage stood at about 5.28 mn and 151,000 km in 2021 (ranking No. 3 and No. 2 in the world), 100% of urban and rural areas were electrified, and the 4G network covered 99% of the country’s territory. According to the World Economic Forum, China ranked No. 36 globally

in terms of infrastructure in 2019,²¹ higher than the country's ranking for per capita GDP (65th). We believe China's experience in infrastructure construction can provide a reference for infrastructure development under the BRI framework in three aspects.

First, China's infrastructure construction in its early stages mainly focused on production-oriented infrastructure (e.g., electricity and transportation), which generated stable profits. Data from the NBSC shows that production-oriented infrastructure accounted for more than 70% of China's total fixed-asset investment (FAI) before 2008. Thanks to China's advantages in economies of scale, such infrastructure projects were able to deliver reasonable returns despite undemanding prices. For example, Beijing-Shanghai High Speed Railway's attributable net profit margin was 36% and ROE was 7.8% in 2019,²² largely comparable to projects of Japan Railways.

Second, infrastructure investment was initially concentrated in developed regions with relatively high population density, before gradually spreading to regions with lower population density. According to the NBSC, the proportion of FAI in infrastructure construction in eastern China stayed above 40% before 2006. In December 2006, the State Council executive meeting deliberated on and approved the Eleventh Five Year Plan for Western Development.²³ After that, the proportion of infrastructure FAI in western China rose 8ppt over 2006–2017. According to the NBSC, the density of HSR (km/sq km) in eastern China was 1.3 and 8.5 times that in central and western China in 2021 (vs. 1.5 and 87.5 times in 2010), and the density of expressways in eastern China in 2021 was 1.4 and 5.4 times that in central and western China (vs. 1.8 and 11.9 times in 2005).

Third, government planning is of great importance. Infrastructure plays a fundamental and leading role in supporting economic and social development, and China's infrastructure development is in line with the need to ensure national development and security. Chinese ministries and commissions issue guidance on the development of various areas of infrastructure, while local governments release documents to provide overall planning and coordinate with the central government.

8.4 Reflections and Insights

The key to promoting the high-quality development of the BRI is carrying out high-quality projects. In terms of mechanism for and path of development, related parties should adhere to the principle of generating shared growth through consultation and collaboration, and fully leverage the role of the market and companies. At the project

²¹ The World Economic Forum ranked 141 economies based on a series of indicators for transportation and utility infrastructure, such as road connectivity, railroad density, airport connectivity, electricity access, and water reliability.

²² Source iFind.

²³ https://www.gov.cn/govweb/ztlz/yzn/content_479426.htm.

level, measures can be taken to adopt high standards, improve quality of life, and pursue sustainable development. Specifically, the following measures can be taken.

First, focusing on key countries, industries, and projects, and channeling resources to develop high-quality projects. Related parties shall determine the general direction of development of BRI infrastructure projects according to the characteristics and needs of the BRI country and to China's construction-related strengths. Existing facilities, channels, and networks can be fully utilized to drive more resources to the construction of high-quality projects. Moreover, more attention can be paid to high-quality livelihood projects that enhance quality of life, improve the sense of achievement and happiness of people in the host country, and generate both economic and social benefits.

Second, building a mechanism of development that features guidance from the government as well as cooperation between companies. The government is mainly responsible for the top-level design of infrastructure cooperation with host countries, building China's international reputation, providing information services, and guiding legislation. It encourages, guides, and supports companies' participation in BRI infrastructure development. The government can also strengthen the mechanism of cooperation and effective guidance of infrastructure projects. Efforts can be made to enhance comprehensive coordination for key countries, industries, and projects, including coordinating government-corporate cooperation (e.g., fully taking into account the interests of enterprises and jointly formulating a cooperation framework), coordinating the co-petition between companies to avoid price undercutting and excessive competition, and coordinating the cooperation of production capacity and infrastructure projects (further improving infrastructure investment blueprints around key regions and industry chains under the overall principle of promoting BRI production capacity cooperation).

Third, improving capabilities of existing insurance institutions and facilitating the diversification of financing channels. First, the insurance capabilities of China Export & Credit Insurance Corporation for overseas investment can be strengthened, and other financial institutions can be encouraged to expand into overseas investment insurance. Second, effort can be made to promote innovative financing models such as PPP and hybrid financing, and to improve the ability to organize syndicated loans from international banks or other financial institutions on the premise of improving the overseas investment protection mechanism.

Fourth, focusing on "soft connectivity" between international rules and standards and national development policies. This includes reducing institutional transaction costs through customs collaboration, mutual recognition of standards, rule bridging, system compatibility, and information sharing. In addition, the technical standards for engineering construction by Chinese firms can be gradually promoted. Given the high market barriers in some developed countries and regions (e.g., Europe), China has been working to play a leading role in establishing standards in less developed regions and gradually become a world-leader in the setting of technical standards.

Fifth, for China-Europe Railway Express, measures could be taken to: (1) Merge some train lines, having hub cities play a bigger role, and transiting from the point-to-point to the hub-to-hub model; (2) formulating and implementing a train line

exit mechanism, e.g., allowing train lines to suspend operation in case of insufficient sources of goods, allowing trains to exit a project in case of poor operational performance, etc.; and (3) introducing indicators such as full load rate and tax contribution to improve the evaluation metrics for China–Europe Railway Express—with emphasis laid on boost to local job markets, tax revenue, and industrial cultivation—to encourage the project to focus more on “benefits”.

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Chapter 9

Breaking the “Resource Curse” and Achieving Mutual Benefit Through BRI Cooperation



Abstract Looking back, developing countries with rich natural resources have mainly played the role of exporters of commodity raw materials in the process of industrialization and globalization. The high volatility of the terms of trade have had a far-reaching negative impact on their economic growth and structure. We believe that the industrial comparative advantages of China and BRI countries in commodity raw materials are, to a large degree, mutually complementary. We believe BRI cooperation in the commodity raw materials sector, which differs from the resources trade in the past, brings opportunities to help BRI countries break the resource curse (The economic concept of “resource curse” first appeared in Richard M. Auty’s book *Sustaining development in mineral economies: The resource curse thesis*, published in 1993. Through extensive cross-country comparative studies, the author shows that abundant natural resources may be a curse rather than a blessing to economic development, and that most countries with an abundance of natural resources have lower economic growth than countries with fewer natural resources) and achieve win–win results. It is also important for China to ensure the supply of key raw materials and transfer of production capacity. In addition, we expect BRI cooperation to facilitate the industrialization process in BRI countries, stimulate global commodity demand, and initiate a new super cycle for commodities.

We divide China’s cooperation with BRI countries in the commodity raw materials sector into three stages—the initial exploration stage, the accelerating cooperation stage, and the high-quality development stage. In 2013, the BRI was rolled out, marking a new stage of high-quality development for China’s international cooperation.

Experience in BRI cooperation includes: (1) Establishing a cooperation mechanism based on complementary industrial advantages and mutually beneficial cooperation; (2) empowering BRI cooperation with China’s established manufacturing sector, strong overseas capabilities in engineering and technologies, and capital strength; and (3) contributing Chinese wisdom and solutions to environmental, social, and governance (ESG) and poverty eradication in BRI countries.

Lessons from BRI cooperation include: Some Chinese companies do not have flexible decision-making mechanisms, and their international operation and risk control

Author: QI Ding, QIU Xiaofeng, CHEN Yan, GUO Chaohui, YAN Beina.

capabilities need to be improved further. The lack of supporting institutions and service systems for overseas mining investment also brings uncertainties.

We make an assessment on key BRI countries in commodity raw material industries based on the World Bank’s Political Stability and Absence of Violence/Terrorism indicator and ease of doing business score. According to our analysis, BRI cooperation faces major challenges on three fronts. First, geopolitical risks are rising against the backdrop of de-globalization. Second, underdeveloped supporting infrastructure brings a high level of uncertainty to international operations. Third, ESG, community conflict, and public security risks could be rising.

We provide the following recommendations to the Chinese government and enterprises. First, improving the public service system for BRI cooperation. Second, advancing RMB settlement and invoicing to facilitate the internationalization of the RMB. Third, attaching great importance to the integration of ESG and cultural values, and building an ESG evaluation system for BRI cooperation with Chinese characteristics.

9.1 The Basis for Achieving Mutual Benefit in the Commodity Raw Materials Sector

9.1.1 The “Resource Curse”

Historically, developing countries with rich natural resources have often played the role of exporters of commodity raw materials in the process of industrialization and globalization, making their terms of trade susceptible to sharp fluctuations in commodity prices. While the boom cycle of commodities can improve the terms of trade for raw material exporting countries and temporarily boost their economic growth, it may have far-reaching negative impacts on economic and social structures in the long term. Meanwhile, the high volatility of commodity prices tends to make raw material exporting countries’ terms of trade more volatile than those for industrial countries, which may dampen their economic growth and optimization of economic structure over the long term.

First, in commodity boom cycles, although raw material exporting countries may witness an improvement in terms of trade, they could face pressure from deindustrialization. Since improving the terms of trade provides incentives to the raw materials industry, it also means lower relative prices of imported manufactured goods, thus impeding the development of the manufacturing industries of such countries, and making it difficult for them to embark on the development path to industrialization.¹ By contrast, industrialized countries could reduce costs and improve efficiency

¹ Murphy, K. M., Shleifer, A., & Vishny, R. W. (1989). Industrialization and the big push. *Journal of political economy*, 97(5), 1003–1026.

through growing economies of scale and technological innovation as they face pressure from rising commodity prices,² and further expand their market share in the raw material exporting countries.

Second, rising commodity prices exacerbate social inequality in raw material exporting countries.³ Rising commodity prices drives up resource rents, which encourages rent-seeking behaviors, and disincentivizes technological innovation and risk-taking, thus hindering economic growth. A country relying heavily on comparative advantage in natural resources can easily give rise to mechanisms that inhibit economic growth, resulting in slower economic growth in these countries than those with scarce resources. For example, Spain could be considered a resource-rich country in the seventeenth century due to the gold and silver resources from the New World, but its economic growth was slower than that of the resource-poor Netherlands. In the nineteenth and twentieth centuries, resource-poor countries such as Japan and Switzerland were ahead of resource-rich economies such as Russia in terms of economic growth.⁴

Third, the high volatility of the terms of trade has a negative impact on the economic structure and economic growth of raw material exporting countries. In general, commodity prices are more volatile than those of manufactured goods and services. The numerator of the formula for calculating raw material exporting countries' terms of trade is mainly the price of exported goods, which often features a high concentration ratio, making it difficult to diversify price risk. The denominator is the price of a wide variety of imported manufactured goods and services. As such, raw material exporters' terms of trade are inherently more volatile.

High volatility in terms of trade leads to lower investment in fixed assets, human capital, and technological R&D. Meanwhile, in economies with high price volatility, economic actors tend to commit to low-risk, low-return investments, thus adversely affecting economic growth and improvement in economic structure. From households' perspective, faced with high uncertainty over income, they typically seek lower-risk, lower-return economic activities to support their families, and increase savings and reduce investment. Reductions in investment in health and education ultimately affect the next generation and long-term human capital accumulation.⁵ From the government's perspective, raw material exporting countries usually rely heavily on import and export tariffs. For example, tariffs accounted for an average of 58% of total fiscal revenue in 11 Latin American countries over 1820–1890.⁶ The high volatility in terms of trade leads to high volatility in fiscal revenue, which also

² Venables, A. (2007). Trade, Location, and Development: an overview of theory. *Natural Resources Neither Curse nor Destiny*:259–287.

³ Engerman, S. L., & Sokoloff, K. L. (1994). Factor endowments, institutions, and differential paths of growth among new world economies: a view. *NBER Historical Working Papers*.

⁴ Sachs, J. D., & Warner, A. (1995). Natural resource abundance and economic growth.

⁵ Rosenzweig, M. R., & Wolpin, K. I. (1993). Credit market constraints, consumption smoothing, and the accumulation of durable production assets in low-income countries: Investments in bullocks in India. *Journal of political economy*, 101(2), 223–244.

⁶ Bates, R. H., Coatsworth, J. H., & Williamson, J. G. (2007). Lost decades: postindependence performance in Latin America and Africa. *The Journal of Economic History*, 67(4), 917–943.

makes it difficult for such countries to access international credit support. Therefore, raw material exporting countries find it difficult to ensure smooth public investment in infrastructure, education, etc.⁷

In summary, developing countries with rich natural resources are prone to the negative impact of the resource curse on their economic development. To address this negative impact, China and BRI countries can cooperate in areas such as commodity raw materials, achieving win–win results for both parties by leveraging their comparative advantages, and accelerate the process of industrialization, improve social welfare, reduce volatility in terms of trade, and thus break the resource curse in BRI countries.

9.1.2 Mutually Complementary Industrial Advantages to Break the Resource Curse

Do China and BRI countries have mutually complementary industrial advantages in commodity raw materials? Can BRI cooperation help developing countries break the resource curse and achieve win–win results? In order to answer the above questions, we selected 32 BRI countries with abundant resource endowments as samples in this section, and classified them into six regions (Southeast Asia, Central Asia, West Asia, Europe, Latin America, and Africa) based on the characteristics of commodity raw material endowments. At the same time, we divide commodity raw material-related industries into four major sectors, i.e., three primary raw material sectors—fuels, ores and metals, and agricultural raw materials—and the finished goods sector. We use the Revealed Comparative Advantage (RCA) index, a widely used index initially proposed by Hungarian-American economist Béla Balassa in 1965⁸ to analyze the industrial comparative advantages of related countries in the four sectors, and their evolution from the 1960s to the present.

For the fuel sector, West Asia and Central Asia have significant comparative advantages. The RCA of China’s fuel sector exceeded 1.0 (unity) only in the 1980s, implying a comparative advantage over the global average at that time. However, it has stayed below 0.5 since the 1990s amid a gradual downward trend. For the ores and metals sector, Africa, Latin America, and Central Asia exhibit notable comparative advantages, while the RCA of China’s ores and metals has stayed below 1.0 amid a gradual downward trend, implying it has a comparative disadvantage over the global average. For the agricultural raw materials sector, Central Asia and Southeast Asia

⁷ Williamson, J. G. (2006). Globalization, de-industrialization and underdevelopment in the third world before the modern era. *Revista de Historia Economica-Journal of Iberian and Latin American Economic History*, 24(1), 9–36.

⁸ Revealed comparative advantage (RCA) is equal to the proportion of a country’s exports of goods in a certain sector in its total merchandise exports, divided by the proportion of world exports that are of that class. It measures whether the country has a comparative advantage globally from the perspective of exports. A comparative advantage is “revealed” if $RCA > 1$. If RCA is less than unity, the country is said to have a comparative disadvantage in the commodity or industry.

show visible comparative advantages. China's RCA of agricultural raw materials exceeded 1.0 only in the 1980s, implying a comparative advantage over the global average. However, it fell below 1.0 in the 1990s and has been declining year by year ever since. For the finished goods sector, only China has a comparative advantage.

We note that the changes in the RCA of BRI countries and China in the raw materials and finished goods sectors exhibit some important characteristics. Due to the limited data available, we compared the current comparative advantages of these countries with those in the 1990s, and drew three main conclusions.

First, compared with the 1990s, the RCA of BRI countries and China in the raw materials sector have declined to different degrees. Central Asia and Europe recorded the sharpest declines, followed by Southeast Asia and China. The declines were more moderate in Africa, Latin America, and West Asia. RCA rose to some extent in the fuel sector in Latin America and the ores and metals sector in West Asia. Second, changes in the RCA of BRI countries and China in the finished goods sector were smaller than those in raw material sectors. Southeast Asia and China's RCA in the finished goods sector increased notably, followed by West Asia. RCA in the finished goods sector declined in Latin America, Africa, Europe, and Central Asia. Third, Southeast Asia saw the sharpest decline in RCA in raw material and increase in RCA in the finished goods sector, followed by China and West Asia. This is possibly because the economic transformation and upgrading in these countries and regions have achieved positive results. Africa, Latin America, Central Asia, and Europe saw their RCA in both raw material and finished goods sectors decline over the years.

In summary, the RCA of BRI countries in the three major raw material sectors—fuels, ores and metals, and agricultural raw materials—remain notable, despite the downward trend in recent years. In the finished goods sector, these countries generally do not have comparative advantages. BRI countries in regions such as Latin America, Africa, Central Asia, and Europe even saw their RCA in finished goods decline. While China has a stable comparative advantage in the finished goods sector, its RCA in raw material sectors has continued to fall.

Based on this analysis, we conclude that the industrial comparative advantages of China and of BRI countries in commodity raw materials are, to a large degree, mutually complementary, and they lay a solid foundation for mutually beneficial cooperation. By leveraging its own mature manufacturing sector and strong overseas engineering capabilities, China can help BRI countries that rely mainly on upstream raw material production to gradually expand to midstream and downstream industries such as smelting, processing, and manufacturing. We believe this will facilitate the industrialization process in such countries, reduce the volatility of terms of trade, and hopefully break the resource curse that has long plagued developing countries.

9.1.3 Security of China’s Raw Material Supply and Transfer of Production Capacity

BRI cooperation in the field of commodity raw materials provides not only a solution to the resource curse faced by BRI countries, but also a significant opportunity to ensure China’s commodity raw material supply. Furthermore, it will advance the transfer of smelting and deep processing capacity overseas amid changes in the international political and economic environment.

From the perspective of upstream raw materials, as China is a large manufacturing country, commodity raw materials are crucial for the national economy, people’s well-being, and social and economic stability. However, risks associated with ensuring the supply of key raw materials have become increasingly prominent in China in recent years, including high dependency on imports of raw materials, relatively weak bargaining power of domestic industries, and cost disadvantage in the local supply of key commodities.

From the perspective of midstream smelting and processing, China accounts for a high proportion of global production capacity, which is under increasing pressure to shift overseas. For traditional metals, China accounted for a high proportion of the world’s total midstream smelting capacity for bauxite, iron ore, zinc, and tin in 2022 (61%, 55%, 49%, and 48%). For metals used in new energy technologies, China accounted for a high proportion of the world’s total midstream smelting capacity for rare earths, lithium, antimony, and cobalt in 2022 (94%, 76%, 71%, and 63%). By contrast, China accounted for a relatively low proportion of global processing capacity for oil, gas, and agricultural products, with the ratio for oil, sorghum, palm oil, and barley at 20%, 13%, 9%, and 7%.

We believe the high proportion of China’s midstream smelting and processing capacity in the global total is related to the strong demand for raw materials from China’s primary manufacturing industries. However, such high proportions might lead to environmental problems and high raw material costs. We analyzed China’s net exports of key commodities as a percentage of domestic output, and noticed that industries with a high proportion of net exports in total output are under pressure to transfer production capacity to other countries.

For traditional metals, net exports of processed aluminum and iron ore products accounted for 8% and 6% of total domestic output in 2022. As for metals used in new energy technologies, net exports of processed and smelted metals products such as lithium, cobalt, and nickel accounted for a relatively high proportion of domestic output (15%, 35%, and 17%), implying that related companies face pressure and are incentivized to transfer production capacity to overseas markets. However, processed products such as oil, gas, and agricultural products recorded net imports.

BRI cooperation in the field of commodity raw materials presents an important opportunity to mitigate China’s commodity raw material supply risks and accelerate the transfer of smelting and deep processing capacity overseas.

First, BRI countries have abundant resources and could help address the demand for raw materials from China’s manufacturing industries. As of 2022, BRI countries

and China account for a combined 20–98% of the world's total reserves of commodity minerals, with the average level at 51%, or 36% with China excluded. In addition, BRI countries and China account for a combined 17–95% of the global output of commodity ores, with the average level at 58%, or 32% with China excluded.

Second, BRI countries have high-quality resource endowments and show significant cost advantages in energy and mineral products. Statistics show that Saudi Arabia, Iran, Kuwait, and the United Arab Emirates have the lowest oil extraction costs in the world, and Qatar has the lowest natural gas cost. The net direct cash cost (C1) of copper mine production in the Democratic Republic of the Congo (DRC) and Peru are in the 10th–15th and 15th–30th percentiles of the global cost curve, and the production cost (C2) of electrolytic aluminum in Indonesia is below the 50th percentile globally. In addition, Russia and Belarus, Russia and Indonesia, and the DRC and Indonesia enjoy a low production cost for their potash mines, nickel mines, and cobalt mines.⁹

Third, the transfer of China's commodity raw material smelting and processing capacity to overseas markets would not only reduce the supply risks that China faces in sourcing energy, but is also in line with the reasonable policy aspiration of BRI countries to accelerate industrialization. Thus, China transferring its smelting and processing capacity would improve the social welfare of both parties and achieve mutually beneficial results. According to data on foreign direct investment (FDI) inflows in BRI countries, FDI flows from China as a percentage of their total FDI inflows in the corresponding year have shown a steady upward trend, ranging from 3 to 6% and averaging about 4%. As China continues to enhance economic integration and improve diplomatic relations with BRI countries, we are optimistic about the depth and breadth of production capacity cooperation between China's commodity raw material industries and BRI countries.

9.1.4 A New Super Cycle is Slowly Unfolding

On the supply side, BRI cooperation in the commodity raw material sector would complement China's infrastructure strength, extensive production experience, and large market size with ASEAN countries' demographic dividend and the natural resources in the Middle East and Africa. At the same time, BRI cooperation would accelerate industrialization and economic growth in BRI countries by creating new economies of scale and synergies. It would thus initiate a super cycle from the demand side with industrialization in developing countries as the main engine, in our view.

First, we see significant room for industry chain restructuring within BRI countries, which could generate significant shocks to commodity demand. Compared with

⁹ Source United States Geological Survey, Wood Mackenzie.

developed countries, there is significant growth potential in commodity consumption in BRI countries.¹⁰ In 2019, the annual per capita consumption of fossil energy, metal, and non-metallic minerals in BRI countries was only equivalent to 18%, 21%, and 25% of that in developed countries. At the same time, the consumption volume in BRI countries in the past has largely stayed below the fitting line of the historical data of developed countries, indicating that there was still a large gap between BRI countries and developed countries. This conclusion holds even if we control for the level of GDP per capita. In fact, per capita consumption of fossil energy, metals, and non-metallic minerals in BRI countries in 2019 was only 25%, 37%, and 30% that in developed countries in the 1970s.

In order to seize the opportunities for development amid industry chain restructuring, BRI countries have introduced policies to promote industrialization. For example, according to its national industrial strategy, the Saudi Arabian government plans to invest SAR1 trn (about Rmb1.92 trn) to diversify its economy and double industrial output by 2030.¹¹ The Indonesian government has unveiled the National Industry Development Master Plan (RIPIN) 2015–2035, hoping to increase the industrial sector’s contribution to GDP to 30% by 2035.¹² Vietnam, Malaysia, Ethiopia, and some other BRI countries have also put forward similar documents.

Improving the quality of infrastructure construction is one of the preconditions for advancing industrial development. For BRI countries, there is room for improvement in both per-capita infrastructure investment and the quality of infrastructure construction. Infrastructure investment and the construction of new production facilities will play an important role in narrowing the global supply gap over the long term. As it will take some time to complete the infrastructure construction and begin production, we expect the demand for infrastructure investment to be sizable in the initial stage, which, coupled with the limited supply capacity of new production facilities, could make BRI countries “net consumers” of global physical assets. The resulting gap in the supply of and demand for physical assets will be an important factor driving the evolution of the new super cycle, in our view.

We made brief calculations on the supply gap of infrastructure facilities in the 10 largest BRI countries in terms of GDP in 2021.¹³ Infrastructure investment gaps in these countries averaged 4.55% of their 2021 GDP (equivalent to annual investment growth of US \$331 bn), with the power and transportation sectors seeing large gaps (1.47% and 1.81% of 2021 GDP). Within the transportation sector, the land transportation segment features a large infrastructure investment gap, especially road transportation, indicating room for improvement in cooperation among BRI countries. By country, the infrastructure investment gap-to-GDP ratio was the highest

¹⁰ BRI countries here refer to BRI countries among the 180 countries and regions included in the OECD database (<https://stats.oecd.org/>), which is different from the previous 151-country definition.

¹¹ <http://sa.mofcom.gov.cn/article/jmxw/202210/20221003363476.shtml>.

¹² http://unctad.org/system/files/official-document/BRI-Project_RP07_en.pdf.

¹³ The top 10 BRI countries in terms of GDP include Türkiye, Indonesia, Saudi Arabia, Iran, Thailand, Egypt, the Philippines, Malaysia, Pakistan, and Vietnam. Due to the lack of data on Iran, we replace it with Brazil, which is not a BRI country, but has a large economy and close ties with China.

in Pakistan (9.04%). In particular, the ratio was 3.14% in the country's electricity sector, the highest among all 10 countries,¹⁴ whereas the infrastructure investment gap is relatively low in more developed countries like Türkiye, Malaysia, and Saudi Arabia. These infrastructure investment gaps, especially in the power and transportation sectors of key countries, reveal weaknesses that need to be addressed amid the restructuring of the industry chains, and the demand for real assets generated during this process would be an important impetus for a new super cycle.

9.2 Development Process, Experience, and Lessons

9.2.1 *Development of BRI Cooperation in Commodity Raw Materials*

When we consider the history of BRI cooperation in commodity raw materials between China and BRI countries from the late 1980s to 2003, we see a stage of initial exploration. Cooperative activities were mainly government-to-government collaborations that focused on key SOE projects, and were conducted on the basis of prudent decision-making and gradual implementation.

From 2004 to 2013, against the backdrop of a sharp rise in commodity prices, the Chinese government called for endeavors to give full play to “domestic and foreign markets and resources” in the 2004 Government Work Report, and it introduced a slew of policies that encouraged companies to “go global”. Against such a backdrop, China's commodity raw material sector entered a period of accelerated growth driven by active participation of both SOEs and private-sector companies. Besides commodity raw material companies, companies in other industries such as manufacturing, trade, real estate, etc., also stepped up efforts to increase investment in overseas resources.

After 2012, as commodity prices trended downward, the “going global” boom gradually cooled. Amid cyclical fluctuations, China proposed building the Silk Road Economic Belt and a 21st Century Maritime Silk Road (i.e., the BRI), with policy coordination, connectivity of infrastructure, unimpeded trade, financial integration, and people-to-people exchanges being the “five pillars”. The proposal was well-received by China's commodity raw material companies and BRI countries. With the ramp-up of policy support, China and BRI countries embarked on a new journey of cooperation in raw materials focusing on high-quality development, which helped both parties to achieve win-win results.

(1) *Stage 1 (before 2003): Initial exploration*

¹⁴ In early 2023, Pakistan faced widespread power outages across the country. Reference: https://www.news.cn/photo/2023-01/24/c_1129310068.htm.

China’s mining industry started to go global in the late 1980s, when cooperative activities were mainly government-to-government collaborations. Among the companies taking the lead to go global, most were mining companies (90%) and SOEs (70%). The forms of cooperation mainly included acquisition of mineral rights (41%) and establishment of joint ventures (39%).¹⁵ In this stage, because of the prudent approach to investment adopted by related companies, projects in which they invested have reached 78% of their designed capacity.¹⁶ After three decades of development, most of these projects today continue to hold high-quality mining capacity in overseas countries, e.g., Shougang Group’s Marcona iron ore mine in Peru and MCC Group’s Saindak copper–gold mine in Pakistan and Ramu nickel–cobalt mine in Papua New Guinea.

Since 1993, China has been a net importer of crude oil, and Chinese oil and gas companies have started to go global ever since, driven by the supportive policies aiming to give full play to “domestic and foreign markets and resources”. In 1993, PetroChina won the tender to develop Block 7 of the Talara Oilfield in Peru, pioneering Chinese oil and gas companies’ efforts to go global, and the firm recovered its initial investment in just five years through rolling exploration and development. In 1994, CNOOC acquired a 32.59% stake in an oilfield in Indonesia’s Malacca Strat Contract Area. In 2000, Sinopec signed an exploration service contract with the National Iranian Oil Co. (NIOC) in Iran’s Zavareh-Kashan block.¹⁷

In the coal industry, at the end of the twentieth century, some companies faced issues such as aging mines and the inability to relocate coal miners due to the depletion of coal resources in some parts of China. By becoming contractors of local projects and “exporting” experienced workers to other countries, Chinese coal companies made initial progress in going global. They have successfully helped target regions develop and operate coal mines, achieving a win–win situation. For example, Xuzhou Coal Mining Group became the contractor of the two coal mine projects in the Philippines, and it helped two mines of the Indian firm South Eastern Coalfields reach full capacity.¹⁸

In the agriculture industry, China’s first Distant Water Fleet (DWF) left for the West African coast in March 1985,¹⁹ marking China’s first trial in distant water fisheries and opening a new chapter for the Chinese agricultural industry’s efforts to go global. China’s overseas agricultural investment in the 1980s was dominated by the establishment of joint ventures, which mainly involved cooperation in the development of fishery and forestry resources. In the 1990s, Chinese companies started making overseas investments in agriculture by undertaking agricultural assistance projects,

¹⁵ Wang, Q., Song, C., Li, W. et al. (2022). Analysis of development history and status of international cooperation in mining industry in China. *Geology and Exploration*, 58(01):229–238.

¹⁶ Wang, Q., Song, C., Li, W. et al. (2022). Analysis of development history and status of international cooperation in mining industry in China. *Geology and Exploration*, 58(01):229–238.

¹⁷ https://www.sohu.com/a/538775658_158724.

¹⁸ Shi, Z., Zhu, C., & Lu, J. (2017). Exploration of international cooperation in coal against the background of Belt and Road Initiative. *Coal Engineering*, 49(11):156–159.

¹⁹ <http://aoc.ouc.edu.cn/2019/0510/c9821a243815/page.psp>.

with SOEs playing a leading role. For example, China National Agricultural Development Group (CNADC) invested in a farm in Zambia in 1990,²⁰ accumulating valuable experience in overseas agricultural investment. After 1995, China further clarified its aid policy of mutually beneficial cooperation²¹ to encourage high-quality domestic companies to participate in aid projects, encourage the use of aid funds in productive projects that involve the use of local resources and or target the local markets, and encourage large agricultural companies to make resource development-oriented investments overseas. During this period, large SOEs such as China National Fisheries Group and CNADC played an important role. By 1998, the number of farms in Zambia in which CNADC invested increased to three,²² and involved planting, breeding, and agricultural and livestock product processing.

(B) *Stage 2 (2004–2013): Accelerating cooperation*

In the early 2000s, China's industrialization process began to drive a "super cycle" in commodities markets. In particular, the government called for endeavors to give full play to "domestic and foreign markets and resources" in the 2004 Government Work Report, and it introduced a slew of policies encouraging companies to expand overseas. Against such a backdrop, China's commodity raw material companies stepped up their efforts to go global.

A large number of companies spanning different segments ramped up global expansion. According to the China Geological Survey, non-SOEs (47%) overtook SOEs (46%) to become the main investors in overseas mining projects during this period, while geological exploration institutions also started to go global (accounting for about 6%). In addition, non-mining companies (24%) from trade, manufacturing, and real estate industries also moved to invest in overseas mining projects.

Chinese companies' coverage of global mineral resources essentially took shape at this stage, and many companies reached milestones in going global, e.g., China Nonferrous Metals Mining (Group)'s Chambishi copper-cobalt mine in Zambia, Chinalco's Toromocho copper mine in Peru, and Baowu Iron & Steel Group's acquisition of an iron ore mine in the Bong mine area in Liberia. However, overheated investment and the influx of some non-mining companies also led to irrational investment activities, e.g., the Simandu iron ore project and the Kasempa copper mine project in Zambia, which caused the project's capacity utilization rate to fall to 31% during this period.²³ The forms of investment became more diversified at this stage, including acquisitions of 100% stakes, gaining access to ore supply in the form of partial stake acquisition, acquiring stakes only at the strategic level, and establishing joint ventures with overseas companies to develop mines.

Oil and gas companies ramped up their efforts to go global. As China's rapid industrialization fueled swift growth in oil demand, it turned from a country for which

²⁰ <https://csfa.cnadc.com.cn/qydt/16173.jhtml>.

²¹ http://www.cidca.gov.cn/2018-08/06/c_129925064_2.htm.

²² <https://csfa.cnadc.com.cn/qydt/16173.jhtml>.

²³ Wang, Q., Song, C., Li, W. et al. (2022). Analysis of development history and status of international cooperation in mining industry in China. *Geology and Exploration*, 58(01):229–238.

crude oil imports were largely equivalent to exports into a net oil importer. Therefore, identifying stable sources of oil supply gradually became the focus of domestic companies. During this period, Chinese companies conducted a large number of M&As. In 2004–2007, as crude oil prices had just come out of a downturn and resource nationalization had not yet become prevalent, Chinese companies generally acquired resources from independent resource companies and injected a large amount of funds to help them upgrade and expand production capacity. Typical examples include PetroChina’s acquisition of PK, the third largest oil company in Kazakhstan in 2005, CNOOC’s acquisition of Unocal, and M&As carried out by Sinopec International Petroleum Exploration and Production Corporation (SIPC).

In 2008, as crude oil prices hit a high at US \$147, resource nationalization accelerated significantly, leading to fewer M&A opportunities from South America and Central Asia, which are rich in oil and gas resources. Chinese companies began to gradually enter the riskier African market. In the era of high oil prices over 2011–2014, unconventional oil and gas technologies such as shale oil and gas and deep-water exploration and development had advanced rapidly, and Chinese companies started to explore shale oil and gas projects.

The coal industry also stepped up the process of going global during this period. Apart from “exporting” labor services and related technologies into the coal industries overseas, Chinese firms started to invest in the development of overseas coal resources, helping the target regions expand from resource mining to coordinated development of the entire industry chain (from upstream to downstream). For example, Zhongding International invested in ABOK Coal Mine of Malaysia in 2003, and became the first Chinese company to invest in overseas coal resources. In 2009, China Shenhua cooperated with PT. Energi Musi Makmur of Indonesia to build a 2×150 MW coal-fired power project in South Sumatra province and a supporting 2.1 mtpa open-pit coal mine.

The strategy of going global was formally introduced to the agriculture industry during this period. Since China officially joined the World Trade Organization (WTO) in 2001, agricultural companies started to place equal emphasis on “bringing in” and going global. In 2006, China’s Ministry of Commerce, Ministry of Agriculture, and Ministry of Finance jointly issued opinions on accelerating the implementation of the going global strategy in the agricultural sector, while the Ministry of Agriculture also formulated the going global development plan for agriculture,²⁴ marking the formal establishment of the go global strategy for the industry. The “No. 1 Central Document” for 2007 proposed accelerating the implementation of the go global strategy for agriculture, emphasizing the importance of overseas agricultural investment. Meanwhile, China has faithfully fulfilled its commitments in the WTO, cutting tariffs on agricultural products from 23.2% in 2001 to 15.2% in 2010, among the lowest in the world. The opening-up of China’s agricultural industry has borne fruits, as evidenced by the expansion in the trade volume and increase in trade intensity of agricultural products.

(C) *Stage 3 (after 2013): High-quality development*

²⁴ http://www.agri.cn/zx/fjyps/201908/t20190809_6474407.htm.

FDI in China's commodity raw materials sector has gradually declined since 2013 as commodity prices have been on a downward trend, and Chinese companies have adopted a more rational approach to the going global strategy. After the official launch of the BRI in 2013, the efforts by Chinese commodities raw materials companies to go global became closely integrated with the BRI, entering a period of high-quality development.

At this stage, large Chinese non-ferrous metal mining companies seized opportunities from cyclical fluctuations in the international mining market and successfully acquired a number of high-quality overseas assets through counter-cyclical investment. Chinese mining companies made breakthroughs in overseas expansion, e.g., China Minmetals acquired Glencore's Las Bambas project in Peru; China Molybdenum acquired Freeport-McMoRan's (FCX) TFM project in the DRC, one of the world's largest and highest-grade copper and cobalt mines; Ganfeng Lithium acquired a 22.5% stake in the Sonora Lithium Project in Mexico; and Zijin Mining acquired Ivanhoe Mines' Kamo-a-Kakula project in the DRC, the fourth largest undeveloped high-grade copper mine in the world.²⁵

Meanwhile, Chinese companies became more rational towards investment in overseas iron ore markets. The global economic slowdown and low iron ore prices since 2013 have weighed on Chinese companies' confidence in overseas iron ore investment. At the same time, some overseas iron ore projects in which Chinese companies invested during the previous stage suffered losses upon the kick-off of mining operations due to management errors, outdated infrastructure, or complicated political environments. Against such a background, Chinese companies have adopted a more cautious approach to investing in overseas projects.²⁶ As a result, investment activities at this stage have mainly involved the restart and integration of existing projects, with only a few new projects added. After 2017, driven by the supply-side reforms of the domestic steel industry and the BRI, Chinese steelmakers reinforced preliminary feasibility studies on related projects, and paid more attention to the sustainability of the projects. This allowed them to successfully acquire many high-quality overseas assets.

Since 2014, overseas investment in the oil and gas industry has slowed across the board, with a focus on refined operation and capacity expansion. Oil and gas companies generally turned cautious about overseas investment as oil prices hovered at low levels and the high-cost projects acquired previously became a drag on their performance. However, China has strengthened the operations of the previously acquired assets. CNOOC's Guyana project is a successful case, which was only one of the potentially high-return projects among assets acquired via the acquisition of Nexen, but has delivered stronger-than-expected returns. At the same time, as the world's second largest primary energy consumer, China has stepped up trade cooperation with resource-rich countries.

²⁵ Wang, Q., Song, C., Li, W. et al. (2022). Analysis of development history and status of international cooperation in mining industry in China. *Geology and Exploration*, 58(01):229–238.

²⁶ https://m.mysteel.com/21/0309/11/134FFD342D213E46_abc.html.

As of June 2023, China’s overseas attributable oil and gas output had reached 185 mn tonnes, close to China’s domestic oil production in 2022,²⁷ mainly contributed by projects in BRI countries. Considering the long-term impact of the substitution effect from alternative energy, we believe Chinese companies that missed the opportunities for capacity expansion over 2014–2020, when oil prices lacked momentum, may also adopt a cautious approach to expansion in the oil and gas sector in the future. Meanwhile, China has nearly 300 oil and gas exploration and development projects in 46 countries, with a total annual attributable oil and gas output of 180 mn tonnes of oil equivalent (TOE).²⁸

Given China’s commitment to achieving peak carbon emissions and carbon neutrality, more factors need to be taken into account in BRI cooperation in the coal industry. In September 2020, China announced that it aims to have CO₂ emissions peak before 2030 and achieve carbon neutrality before 2060. In such a context, China’s coal companies may need to consider more factors when going global. That said, Chinese coal companies still have incentives to expand overseas amid the increasing importance of energy security and closer cooperation under the BRI framework. For example, the South Sumatra No. 1 2×350 MW coal-fired power project jointly built by China Shenhua and Indonesian coal producer PT. Lion Power Energy is slated for operation in 2024.²⁹ Looking ahead, coal companies will need to explore new cooperation models to achieve mutual benefits and win–win results with BRI countries in a “greener” and more environmentally friendly way.

The BRI has made remarkable achievements in facilitating agricultural cooperation under the BRI framework since 2013. As of June 2023, China had signed cooperation agreements on agriculture and fisheries with 86 countries, and established stable working mechanisms on agricultural cooperation with more than half of them.³⁰ Within the decade, BRI investment in agriculture has covered more than 820 projects, with a cumulative investment of over US \$17 bn. Total agricultural trade between China and BRI countries reached US \$95.79 bn in 2020 alone.³¹ China has reached extensive cooperation with BRI countries on exchange in agricultural products, technologies, and talent.

In addition, the implementation of a series of rules, such as tariff reductions and exemptions under the Regional Comprehensive Economic Partnership (RCEP), has significantly reduced intra-regional trade costs and improved trade facilitation, helping more ASEAN agricultural products enter the China market. Moreover, with the progress of major projects such as the New Western Land-Sea Corridor in China and the China-Laos Railway, supporting infrastructure such as cold chain and cold

²⁷ <http://www.sasac.gov.cn/n4470048/n13461446/n15390485/n15769618/c28016592/content.html>.

²⁸ https://www.mnr.gov.cn/dt/kc/201903/t20190326_2402970.html.

²⁹ https://mp.weixin.qq.com/s?__biz=MzAxMTUyNTA0OA==&mid=2649550241&idx=4&sn=e3225a548e81733e6377e188ff9980db&chksm=83a78376b4d00a601261d01a228aa32560e1e0f1593a643ad06daeab89b3300751a05062cb84&scene=27.

³⁰ <https://www.icc.org.cn/publications/policies/128.html>.

³¹ http://www.gov.cn/xinwen/2021-11/25/content_5653270.htm.

storage has been improving within the region, which makes it increasingly convenient for agricultural products from ASEAN countries to enter the China market.

It is noteworthy that with the boom of the new energy vehicle (NEV) market, prices of metals used in new energy technologies have risen sharply. Since 2016, China's investment in metals used in new energy technologies, such as lithium, cobalt, and nickel, in BRI countries has accelerated notably, and exhibited some new features.

First, private sector companies have taken a lead in going global, introducing a higher level of flexibility in decision-making. Second, they rely more on China's booming capital markets for financing, and the amount and efficiency of financing have improved rapidly. Companies improve their capital strength through private placements, issuance of convertible bonds, and rights issuance in the domestic capital market, and support their acquisition and development of overseas projects by leveraging the diversified financing channels in international capital markets such as Hong Kong SAR and Switzerland. Third, thanks to notable improvement in technologies and equipment, Chinese firms have the ability to "export" their industrial capabilities. For example, Ganfeng Lithium has developed strong lithium extraction technologies and established leading R&D and engineering teams, and is also able to design and implement lithium resource development plans in overseas countries catered to local conditions. Liqin Resources has world-leading nickel hydrometallurgy technology and construction capabilities, and is deeply engaged in Indonesia's nickel and cobalt resource markets. The firm "exports" production capacity, gains access to resources, and advances in-depth cooperation with local partners.

In summary, China's commodity raw material sector has made significant achievements in going global through three stages of development, from prudent exploration under the go global strategy, through ups and downs amid cyclical fluctuations, to the current stage of high-quality development leveraging cooperation under the BRI. Up to June 2023, projects related to BRI cooperation with Chinese companies accounted for 5% of the oil, 5% of the natural gas, 8% of the iron ore, 0.2% of the coal, 13% of the potash, 14% of the copper, 57% of the bauxite, 19% of the lithium, 21% of the cobalt, and 2% of the nickel resources in BRI countries. Looking ahead, we believe the share will hold ample upside potential amid ongoing BRI cooperation.

9.2.2 Experience in BRI Cooperation

After the aforementioned three stages of development, a number of successful cases for global expansion have emerged in China's commodity raw materials sector, providing valuable experience for future BRI cooperation. First, establishing a cooperation mechanism based on complementary industrial advantages and mutually beneficial cooperation. Second, empowering BRI cooperation and providing comprehensive solutions by leveraging China's sound manufacturing base, strong overseas engineering and technology capabilities, and capital advantages. Third, contributing China's wisdom and the country's role in ESG and poverty alleviation in BRI countries.

- (1) *Establishing a cooperation mechanism based on complementary industrial advantages and mutually beneficial cooperation to build a community with a shared future between China and its BRI partners*

Zijin Mining’s Kamo-a-Kakula copper mine project in the DRC is a typical example of the integration of Chinese and Canadian industrial capabilities and cooperation with the DRC government to build a mutually beneficial industrial ecosystem and achieve win–win results. Located in the DRC, the Kamo-a-Kakula copper mine ranks among the world’s top 10 copper projects in terms of resource reserves. Canadian mining company Ivanhoe Mines obtained the exploration rights (covering an area of 50,000 km²) in 1996, started early-stage exploration in 2001, discovered the high-grade Kamo-a deposit in 2008, and successfully put Phase I and Phase II of the project into operation in 2021 and April 2022.

During that period, the project faced many difficulties such as political changes and disruptions in project funding. However, thanks to the mutually complementary industrial advantages and mutually beneficial cooperation between the governments of China, Canada, and the DRC, Kamo-a-Kakula has become one of the world’s top five copper mines in operation as of end-2022. It is a benchmark project for BRI cooperation in the non-ferrous mining industry.

We attribute the project’s success to three reasons. First, the designing of a reasonable equity structure to establish a stable mechanism for mutually beneficial cooperation. As of June 2023, the Kamo-a-Kakula copper mine project is managed and operated by the joint venture Kamo-a Copper, whose major shareholders include Zijin Mining of China (39.6%), Ivanhoe Mines of Canada (39.6%), and the government of the DRC (20%). Ivanhoe Mines introduced Zijin Mining and CITIC Metal as strategic investors in 2015 and 2018, with the two companies holding 25.9% and 13.6% stakes in Ivanhoe Mines as the two largest shareholders. The third largest shareholder, Mr. Robert Friedland, is the founder and executive chairman of Ivanhoe Mines and holds a 13.4% stake. Under this ownership structure, Zijin Mining has become the largest shareholder at the project level through its dual shareholdings in Ivanhoe Mines and Kamo-a Copper, and the project has become one of the major growth drivers of total copper output of Zijin Mining as a listed company. Ivanhoe Mines has earned lucrative financial returns by introducing Chinese investors and leveraging China’s industrial capabilities. At the same time, the project has brought economic and social benefits to the government of the DRC.

Second, creation of synergies among shareholders and partners to achieve efficient project construction and operation. As a leading exploration company in a Western country, Ivanhoe Mines made important achievements in the preliminary exploration work for the Kamo-a-Kakula copper mine, but the project almost came to a halt later due to the firm’s weak financing and development capabilities. CITIC Metal and Zijin Mining injected funds and “exported” industrial capabilities to Ivanhoe Mines and the Kamo-a-Kakula copper mine project over 2015–2018 amid low commodity prices. Thanks to the efficient cooperation among China, Canada, and the DRC, since the start of construction in 2015, Ivanhoe Mines has contributed to the refined production scheduling design and ESG practices in line with Western norms in terms

of design and operation, Zijin Mining has demonstrated China's strength and efficiency in overseas project development and construction by keeping project costs under control and ensuring the timeliness of project delivery, and the DRC government has offered support to localized operations, especially in terms of utilities and community relations. The joint efforts of the three parties have enabled the project to be put into operation ahead of schedule in May 2021 and reach its design capacity in less than two years.

Third, building a community with a shared future between China and DRC's coal mining industries under the development philosophy of green and sustainable production. Kamoanga Copper implements Zijin Mining's development philosophy of pursuing "green and eco-friendly development" and attaches great importance to mutual benefit with the local community and residents. It has introduced a series of strategies such as the Sustainable Livelihoods Program. The mine supports farmers by establishing agricultural demonstration parks and handing the parks over to the farmers. In 2022, the total social contribution made by the mine was US \$2.35 bn, accounting for 4% of DRC's GDP.³² Looking ahead, Zijin Mining and Ivanhoe Mines are advancing plans for a 500,000 t smelting facility at the Kamoanga-Kakula copper mine.³³ After completion, we believe that the project could further increase the industrial value added contributed by Kamoanga Copper in the local economy, while creating more tax revenue, job opportunities, and extensive social benefits in the DRC.

(B) *Empowering BRI cooperation with China's established manufacturing sector, strong overseas engineering and technology capabilities, and capital strength*

It is well known that Western multinational companies have gained notable first-mover advantages in the exploration and development of high-quality resources, and in recent years, they have been optimizing their asset portfolios through M&As and strengthening control over high-quality resources. This also means that Chinese companies' cooperation with BRI countries will face greater challenges in terms of resource quality, development conditions, and operating difficulties, which will inevitably require Chinese companies to further enhance their ability to empower greenfield projects and less efficient assets in BRI countries. Fortunately, as Chinese commodity raw materials companies faced similar pressure and difficulties in the early stages of going global, they have gradually developed strong problem-solving capabilities in the practice of BRI cooperation in overseas markets.

For example, China ENFI Engineering Corporation, a subsidiary of China Minmetals Corporation, is a pioneering engineering consulting and design company. The firm has gradually gained growth momentum amid the acceleration of BRI cooperation in the commodity raw materials sector. China ENFI is one of the few comprehensive service providers in the world that can simultaneously undertake mining, smelting and processing, power, chemical, environmental protection, and

³² <https://ivanhoemines.com/news/2023/ivanhoe-mines-publishes-2022-sustainability-report/>.

³³ According to Zijin Mining's announcement (No. 2021-074).

infrastructure projects. It also provides technical support for Chinese companies pursuing a go global strategy and are developing overseas resources.

According to corporate filings, China ENFI has designed and built more than 4000 engineering projects for more than 30 countries and regions covering almost all types of metals.³⁴ In September 2016, the China ENFI Mining Going Global Alliance, led by China ENFI, was jointly established by renowned Chinese mine equipment companies to integrate key equipment and engineering technology suppliers in the non-coal mining industry for the entire process—from mining, through ore dressing and tailings, to smelting. It also aims to provide global mining customers with one-stop services backed by Chinese technologies, Chinese solutions, and Chinese equipment, as well as integrated solutions ranging from technology R&D, consulting, and design, to equipment integration and general contracting.

In April 2023, the nickel sulfate facility of Liqin Resources’ OBI nickel–cobalt project in Indonesia, for which China ENFI undertook the design work and supply of core equipment, successfully produced the first batch of battery-grade nickel sulfate products. For this project, China ENFI applied its core extraction technology, with the scope of design ranging from the pressing and filtering of nickel–cobalt hydroxide slurry to the production of battery-grade nickel sulfate and cobalt sulfate products, including filtration, acid dissolution, extraction and separation, evaporation and crystallization, and other auxiliary works. According to Liqin Resources, the project has nickel sulfate design capacity of 240,000 t, making it the largest monomer nickel sulfate project in the world. It is also the first project in Indonesia to achieve mass production of battery-grade nickel sulfate products, marking a milestone in Indonesia’s new energy industry.

(C) *Contributing Chinese wisdom and solutions to ESG and poverty eradication in BRI countries*

Eradicating poverty, improving people’s well-being, and facilitating economic development are important goals of BRI cooperation. Since the launch of the BRI, China has been increasing agricultural assistance to developing countries, making contributions to agricultural and rural development and poverty alleviation in related countries. To date, China has been one of the most generous developing countries in terms of amount of financial assistance offered, sending the biggest teams of experts and carrying out the largest number of projects under the South-South cooperation framework of the Food and Agriculture Organization of the United Nations (FAO).³⁵ China also works with African countries to help them alleviate poverty, which has always been the main theme of China-Africa relations.

Since 2011, China’s “Wanbao” rice farm project in Mozambique’s Gaza province has effectively alleviated the food shortage in Mozambique. More than 1500 farmers have been trained since the project commenced.³⁶ They have not only achieved food

³⁴ Lu Z. (2017). Thoughts on and practices of China ENFI’s implementation of the BRI. *China Nonferrous Metals*, No. 611(23):27–33.

³⁵ world.people.com.cn/n1/2022/0603/c1002-32437657.html.

³⁶ world.people.com.cn/n1/2022/0603/c1002-32437657.html.

self-sufficiency and gained access to planting technologies, but have also increased their incomes. Since 2007, Yuan's International Agriculture has sent agricultural technology experts to Madagascar to promote hybrid rice cultivation technology. After more than a decade of development, the country now boasts some of the largest hybrid rice planting areas and highest yields in Africa.³⁷ It became the first African country to develop a full industry chain for rice, covering links from hybrid rice breeding through seed production, planting, and processing, to sales.

9.2.3 *Lessons from BRI Cooperation*

The commodity raw materials sector is subject to cyclical fluctuations. The volatility of commodity prices determines the high level of cyclicality of related investment decisions. However, some Chinese companies do not have flexible decision-making mechanisms, and are prone to decision-making risks. In 2009, China's leading nickel mining company Jien Nickel acquired two large nickel mining companies in Canada and Australia when nickel prices were in a boom cycle, and it subsequently boasted more resources to devote to overseas markets. However, as nickel prices later tumbled, and as the firm was unfamiliar with local investment and operation environments, Jien Nickel had to increase capex on the projects, leading to high debt pressure and lower-than-expected profits, according to the firm. Jien Nickel was later delisted from the stock market.

BRI cooperation involves cross-border operations. Faced with geopolitical risks, cultural differences, and uncertainties in the local business environment, Chinese companies tend to face difficulties in adapting to the local markets, and their international operation and risk control capabilities still need improvement. Multinational companies not only need to deal with the relationships with local governments, management, and employees in BRI countries, and integrate themselves into the local business environment and culture, but also need to cope with the many differences in management philosophy, management structure, and specific business practices across both management and employee levels.

Lack of supporting institutions and service systems for overseas mining investment and lack of professionals proficient in investment, M&A, and operation and management in BRI countries are important factors restricting the smooth development of BRI cooperation. At present, Chinese mining companies mainly rely on foreign institutions for technical, legal, and financial consulting services in the process of overseas mining acquisitions, while mature supporting institutions and service systems for overseas mining investment have hardly been developed in China.³⁸ Meanwhile, as China's commodity raw materials companies have a short history of going global, they generally lack a team of professionals who are familiar

³⁷ <http://mg.mofcom.gov.cn/article/jmxw/202106/20210603070505.shtml>.

³⁸ Wang, Q., Song, C., Li, W. et al. (2022). Analysis of development history and status of international cooperation in mining industry in China. *Geology and Exploration*, 58(01):229–238.

with the rules of mineral resource exploration and development in overseas markets and have the ability to operate transnationally. This has also hindered the smooth development of BRI cooperation.

9.3 Reflections and Insights

To better promote cooperation in the raw materials sector between China and BRI countries, measures can be taken from the following three perspectives. First, overcoming multiple practical difficulties related to the business environment in BRI countries, and improving the public service system for cooperation. This includes:

- (1) Improving the information integration and sharing mechanism for BRI cooperation that provides support for investment decision-making and international operation of companies. Major industry associations can be encouraged to set up offices in BRI countries, improve communication and interaction with local industry associations in host countries, collect relevant industrial policy information in host countries, and provide consulting services to local firms. In addition, industry associations can help enhance communication and interaction among Chinese companies in the same industry, and try to achieve efficient competition between Chinese companies in BRI cooperation.³⁹ Intermediary service institutions can be encouraged to establish a presence in BRI countries, improve industry expertise and coordination with local governments in BRI countries, and cultivate a mutually beneficial and synergetic business ecosystem.
- (2) Establishing an overseas risk prevention and control mechanism for high-risk countries and regions, and improving the emergency response mechanism for overseas security incidents and various security issues in a timely manner.
- (3) Building a team of professionals for BRI cooperation. Companies can be encouraged to train and introduce managers and professionals who are well versed in international rules and situations in overseas markets; establish and improve incentive mechanisms for them; attach equal importance to higher education, vocational education, and social education; and facilitate interaction and organize training sessions for these professionals.

Second, advancing the use of RMB as the settlement and invoicing currency, and facilitating the internationalization of the RMB in the process of BRI cooperation in the commodity raw material sector. The financial systems of BRI countries have long been affected by sharp fluctuations in USD fund flows. With the deepening of cooperation under the BRI framework, it would be acceptable to both parties to settle in the local currency of the counterparty, boding well for the use of RMB as the settlement and invoicing currency. Such a move can not only reduce the

³⁹ Li, N., Chen X., & Chang X. et al. *“The Belt and Road” Industrial Civilization: Resource Integration*. Published by China Industry and Information Technology Publishing & Media Group and Publishing House of Electronics Industry.

impact of fluctuations in USD-denominated commodity prices on the terms of trade of BRI countries, but also reduce the vulnerability of their financial systems and exchange rate risks. It is also likely to enhance the convenience of cross-border investment flows among China and BRI countries, laying a solid foundation for RMB internationalization.

Third, attaching importance to the integration of ESG and cultural values to enhance mutual understanding among stakeholders. China can integrate itself into the mainstream international ESG framework and standards, and can build an ESG evaluation system featuring Chinese characteristics based on local conditions, effectively improve the ESG capability of BRI cooperation projects, and contribute to the improvement of social welfare in BRI countries. In addition, efforts can be made to attach importance to the integration of cultural values, enhance mutual understanding among stakeholders in BRI cooperation, and build a community with a shared future for mankind.

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Chapter 10

Heavy Chemical Industry to Embrace New Development Opportunities from BRI



Abstract This chapter summarizes the business presence of Chinese heavy chemical companies in BRI countries and the necessity for China's heavy chemical industry to go global. Then, we use a four-factor model of market, cost, governance, and support for the industry chain to analyze the investment potential of the industry in regions where BRI countries are located. Finally, we review three successful cases of Chinese heavy chemical firms going global, and list the challenges and measures to tackle the risks of investing in BRI countries.

We believe it is necessary for companies in the heavy chemical industry to participate in the development of the BRI and to expand their presence in BRI countries. In recent years, China's heavy chemical firms have invested overseas through M&A and self-constructed factories, which has paid off. We believe investing in BRI countries can help China's heavy chemical companies seize opportunities and guard against the risk of trade frictions. Meanwhile, Chinese investment may also promote local economic development, improve industrial competitiveness, and deliver mutual benefits.

The heavy chemical industry in BRI countries has large investment potential. Overall, the level of urbanization and industrialization in BRI countries is low, implying substantial growth potential for their heavy chemical industries. Based on an analysis of market, cost, governance, and industry chain support, we believe Southeast Asia and West and Central Asia are suitable investment destinations for China's heavy chemical industry. Some African countries with sound governance also have investment potential, in our view.

We review the successes of the heavy chemical industry's investment in BRI countries and summarize the key features of successful investments: (1) Advanced technologies and outstanding management capabilities; (2) strengthened localized operation and local employee training through different methods; and (3) the goal of mutually beneficial cooperation with governments and communities to pursue development.

When going global, the heavy chemical industry faces challenges from factors such as geopolitics, the regulatory environment, financing channels, cultural integration, as well as the construction and operation of factories. We believe governments

Author: QIU Xiaofeng, CHEN Yan, JIA Xiongwei, GONG Qing, XIA Siting, ZHANG Shuwei, LI Tangyi, HOU Yilin, YAO Xudong, LI Xiling.

and businesses can work together to address these challenges. This can be done by establishing a platform of information sharing among BRI countries, improving the investment insurance system, seeking to collaborate more closely with local companies or multinationals, encouraging companies in basic industries to take the lead, promoting the construction of large industrial parks, strengthening local employee training and localization, and enhancing the social responsibility awareness of companies that go global.

10.1 Current BRI Investments by Chinese Heavy Chemical Firms

M&A is the primary way that Chinese chemical companies invest in BRI countries, and such activities are mostly led by SOEs. For example, ChemChina acquired Pirelli, the world's fifth largest tire manufacturer, and Wanhua Chemical acquired BorsodChem, Europe's fifth largest producer of methylene diphenyl diisocyanate. Chemical SOEs have tended to acquire foreign assets whose businesses are struggling, and whose shareholders intend to sell the assets. After the acquisition, the business operations of the acquired assets are likely to improve notably. In recent years, some Chinese private enterprises have acquired assets such as South Korean new material companies to obtain advanced technologies.

Amid a backdrop of international trade frictions and domestic environmental restrictions, a growing number of Chinese chemical companies are building production facilities in Southeast Asia and elsewhere with the aim of delivering cost advantages and market expansion. For example, tire companies are increasingly building factories overseas. Hengyi Petrochemical's successful investment in an oil refinery in Brunei is a good example for Chinese companies seeking to build large refining projects in Southeast Asia.

Chemical companies take a prudent approach when going global, but BRI investments are likely to deliver satisfactory returns. When investing overseas, chemical companies take into account various factors such as local political stability, market potential, investment costs, and corporate management. Unlike building a factory in China, where conditions may be more accommodating, domestic chemical companies are more cautious about investing overseas. Their investment in BRI countries is thus limited at present, but the projects have tended to operate smoothly. Tire manufacturers, in particular, are seeing output and revenue growth at most of their factories overseas, and revenue and profit from Hengyi Petrochemical's Brunei project and Wanhua Chemical's subsidiary BorsodChem are improving (Fig. 10.1).

China's steel industry is expanding its global presence. In recent years, companies in the industry have integrated into the industry chains of BRI countries and seized market opportunities. Initially, companies in the industry promoted the overseas expansion of key advanced equipment, products, and technologies. They have since developed iron ore resources and built steel production bases in resource-rich regions

Sector	Company	Investment	Countries	Project
Refining	Sinopec	Factory construction	Saudi Arabia	Yanbu Refinery
	CNPC	Acquisition	Singapore	Singapore Petroleum Company
	CNPC	Factory construction	Kazakhstan	Chimkent Refinery
	CNPC	Factory construction	Sudan	Khartoum Refinery
	CNPC	Factory construction	Chad	N'Djamena Refinery
	CNPC	Factory construction	Nigeria	Jindell Refinery
	CNPC	Factory construction	Algeria	Adal Refinery
	Hengyi Shihua	Factory construction	Brunei	Refinery
Polyurethane	Wanhua Chemical	Acquired BorsodChem	Hungary	Polyurethane
Tires	Linglong, Sailun Group, Sentury, ZC Rubber, Guizhou Tyre etc.	Factory construction	Thailand, Vietnam, Cambodia, Serbia, etc.	Tire
	ChemChina	Acquired Pirelli	Italy	Tire
	Sinochem	Factory construction	Thailand	Rubber antioxidant
Electronics components	Jinhong Gas	Factory construction	Vietnam	Electronic gas
	Shanshan	Acquired LG polarizer business line	South Korea	Polarizer
	Yoke Technology	Acquired LG color photoresist business line	South Korea	Color photoresist
	Yoke Technology	Acquired UP Chemical	South Korea	Precursor

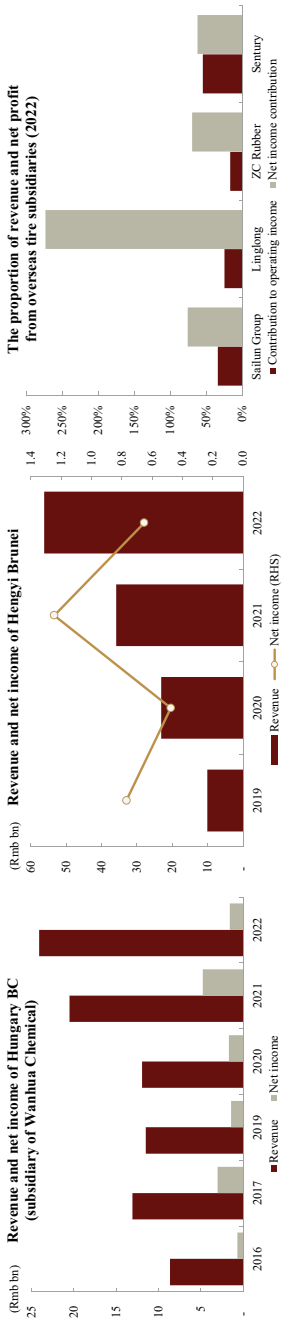


Fig. 10.1 Chinese chemical companies' investment in BRI countries. *Note* Data includes select projects as of 2022; financial data for ZC Rubber as of 1H22; the Chinese mainland operations of Linglong Tire booked losses in 2022 leading to its overseas net profit contribution exceeded 100%. *Source* Corporate filings, Wind, China Petroleum and Chemical Industry Federation (CPCIF), CICC Research

with access to infrastructure and in stable political environments. Multinational steel companies have been established through acquisitions, mergers, and alliances.

After the BRI was proposed in 2013, Chinese companies accelerated overseas expansion. Several cement production lines have been built overseas, utilizing different investment models. According to *shuini.biz*, as of end-2022, Chinese cement companies had built 44 production lines overseas, with total capacity of about 46.8 mnt of clinker, the equivalent of about 2.5% of domestic production capacity. Some of the leading companies involved include Anhui Conch Cement, Huaxin Cement, and Hongshi Group, while various privately owned SMEs have also built factories in Southeast Asia and Africa. Southeast Asia, Central Asia, and Africa have been the major destinations for overseas expansion, and a variety of models have been adopted, including M&A, self-construction, and joint ventures. According to corporate filings, the companies involved are developing steadily. For example, the gross margin of Conch Cement has stabilized after an early period of high growth in production and sales, and in recent years, Huaxin Cement's overseas revenue has grown.

10.2 Background of the Heavy Chemical Industry's Involvement in BRI Countries

Rising trade protectionism weakens China's competitiveness in exports of heavy chemical goods. Since 2015, the US has imposed high anti-dumping and countervailing duties on China's exports of passenger vehicle (PV) tires, cold-rolled steel sheets, hot-rolled steel plates, and high-carbon alloy steel rods, reducing the competitiveness of related exports. As the trend of trade protectionism develops, industry chains have become more concentrated in regional clusters. We believe that by investing overseas, the competitiveness of heavy chemical industry may improve.

Domestic energy consumption and carbon emissions policies limit the capacity expansion of some heavy chemical sectors. China's efforts to achieve carbon neutrality constrain the construction of high energy-consuming consumer goods projects. According to the *Action Plan for Carbon Dioxide Peaking Before 2030* released by the State Council in 2021, additional production capacity in oil refining and traditional coal-based chemicals industries will be strictly controlled in China, and targeted annual domestic capacity for primary refining of crude oil will be kept below 1 bn tonnes by 2025. In addition, the plan proposes a curb on inefficient development of energy-intensive and high-emissions projects. China has also emphasized a green transformation of heavy industry during the 14th Five-Year Plan (FYP) period (2021–2025), and there has been a marked reduction in the output of the steel industry. We believe China's industrial policy guidance can effectively incentivize the heavy chemical industry to expand overseas in regions with abundant production factors, i.e., land and energy, as well as large environmental carrying capacity.

Chinese heavy chemical companies are exploring new growth drivers, and overseas expansion can provide more market opportunities. Driven by economic development and rising urbanization rates in some overseas countries, demand for the heavy chemical goods is increasing. Along with the transfer of labor-intensive industries to overseas regions, we expect Chinese companies to increase investment and expand their presence in overseas markets. For example, as infrastructure and real estate construction peaked in China, domestic demand for the cement industry began to decline. The major overseas destinations for domestic cement companies' expansion, e.g., Southeast Asia, Central Asia, and Africa, are in the early or growth stages of infrastructure construction and urbanization, and they have relatively abundant mineral and land resources. In these markets, the development of the industry landscape is in the nascent stage, with ample room for market expansion, in our opinion.

Furthermore, investing in BRI countries may enable China's heavy chemical industry to leverage its technological, management, and engineering capabilities to meet local demand for basic materials and improve the supporting infrastructure along the industry chains in BRI countries. This could help enhance the competitiveness of industry chains and promote local economic development and employment, in our view, thus achieving mutual benefits.

10.3 A Quantitative System to Evaluate Investment Destinations

The heavy chemical industry's engagement in BRI investments can generate growth opportunities. However, generalizations are challenging due to the range of sectors in the heavy chemical industry and due to differences in resources and markets among BRI countries. Thus, we divide the heavy chemical industry into three subsectors, i.e., refining, cement, and steel, and evaluate the five major regions in which BRI countries are located, i.e., Southeast Asia, Central and Eastern Europe, Africa, West and Central Asia, and Central and South America, from the perspectives of market, cost, governance, and industry chain support.

In this section, we use a four-factor model (market, cost, governance, and industry chain support) to assign ratings to regions where BRI countries are located, and offer a blueprint for the future overseas expansion of China's heavy chemical companies. The choice of factors is largely based on the insights we have derived from our surveys and interviews with companies. Security is often the top consideration for companies when selecting investment destinations, which is closely related to governance. In addition, the economics and feasibility of overseas projects are influenced by local markets, costs, and industry chain support. We anticipate that the findings will provide some guidance to China's heavy chemical companies in selecting overseas destinations.

10.3.1 Market: Heavy Chemical Industries in Southeast Asia and Africa Have Large Growth Potential

We assign ratings to the five BRI regions by adopting the average rating of two aspects: Macro factors, including GDP and population, and the degree of self-sufficiency in sectors such as refining.

In Africa and Southeast Asia, GDP and population are growing rapidly, while per capita GDP and urbanization rates are lower than the global average. As growth in demand for heavy chemical products is highly correlated with economic growth, it is reasonable to use macroeconomic indicators such as CAGRs of GDP and population to represent the growth rate of overall market demand for heavy chemical products in various regions. Meanwhile, per capita GDP and urbanization rate are indicators of stage of regional economic development, and, to a certain extent, the growth potential of heavy chemical industries in different regions. In countries and regions that are in the middle or early stages of economic development, heavy chemical industries tend to have high capex. Judging from the overall stage of economic development and the growth in demand for heavy chemical products, we believe Southeast Asia and Africa are the top destinations for Chinese heavy chemical companies to go global (Fig. 10.2).

Southeast Asia and Africa lack oil refining capacity. We expect China to export refining capacity by leveraging mature technological design and engineering construction capabilities. Refined chemical products such as refined oil, ethylene, and p-Xylene (PX) are the basis for industrial development. However, most BRI countries lack a mature refining industry, adequate technology base, and sufficient capabilities to carry out R&D. China's refining companies can provide full-process services covering technology licensing, process package design, and trial operation for large-scale projects.

Based on statistics released by BP in 2021, we calculated the oil refining capacity gap in each region and found that Africa and Southeast Asia had the largest gaps. By country, the refining capacity gap was large in countries such as Indonesia and South Africa. As we can see from the projects listed in Fig. 10.1, the refining projects build by Chinese firms are mainly in Africa, Southeast Asia, and Central Asia. As refining projects require a large amount of supporting infrastructure, facilities, and

Region	CAGR of real GDP in 2016–2021 (%)	2021 population (mn)	CAGR of population in 2016–2021 (%)	2021 GDP per capita (US\$)	2021 urbanization rate (%)
Southeast Asia	2.9	675	1.0	4,962	50.6
West and Central Asia	0.6	473	1.5	7,126	64.4
Central and Eastern Europe	3.2	114	-0.3	17,157	61.8
Central and South America	0.6	162	0.7	7,685	83.1
Africa	2.3	1,389	2.5	1,943	44.0
Global	2.4	7,888	1.0	12,235	56.5

Fig. 10.2 Economic growth and population of the regions where BRI countries are located. *Note* Due to limited sample size, not all BRI countries are included in the five regions above. *Source* World Bank, Wind, CICC Research

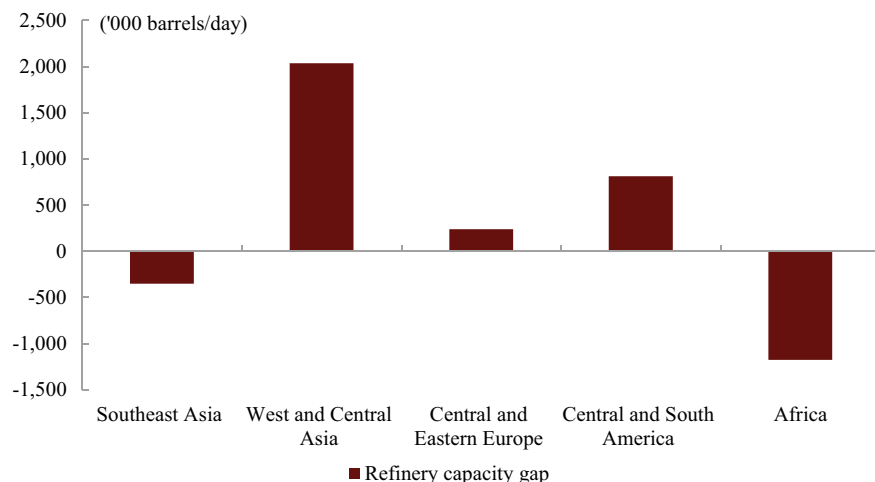


Fig. 10.3 The oil refining capacity gap in 2021 in regions where BRI countries were located. *Note* We calculate the gap in refining capacity by subtracting oil consumption from oil refining capacity, and the greater the negative number, the larger the gap; BP's data does not include all BRI countries, and data for each region is based on countries that disclose information. *Source* BP, CICC Research

technologies, the export of refining industries is essentially the export of industrialization capabilities. We believe that China's refining companies may continue to expand in overseas regions and countries with large supply-demand gaps and low levels of industrialization, but that are rich in resources and with favorable political environments (Fig. 10.3).

Southeast Asia has the highest net import volume of steel products, implying large unfulfilled domestic demand and thus great growth potential for the local steel industry. According to data released by the World Steel Association in 2021, net imports of finished steel were 26.07 mnt for major Southeast Asian countries, 19.13 mnt for major Central and Eastern European countries, 10.65 mnt for major countries in Central and South America, 8.95 mnt for major African countries, and 2.35 mnt for major countries in West and Central Asia.

Southeast Asia and Africa are likely to be where China's cement industry goes global. In our view, cement supply and demand are the decisive factors that determine the business climate of a cement market. A region cannot be considered a leading investment option if the supply landscape is largely fixed or is in oversupply, even when demand is strong. Likewise, if market demand is trending downward, it is unlikely that new market participants will enter the region. We believe regional markets with the following three features are suitable destinations for Chinese companies to expand their presence overseas. (1) A net gap in supply: Heavy reliance on imports of cement and clinker indicates a shortfall in domestic supply. To enhance self-sufficiency, it may be valuable to that country to attract capital to build capacity. (2) Strong market demand: Regional markets with booming demand are more attractive and offer higher visibility for investment. (3) Low level of market concentration

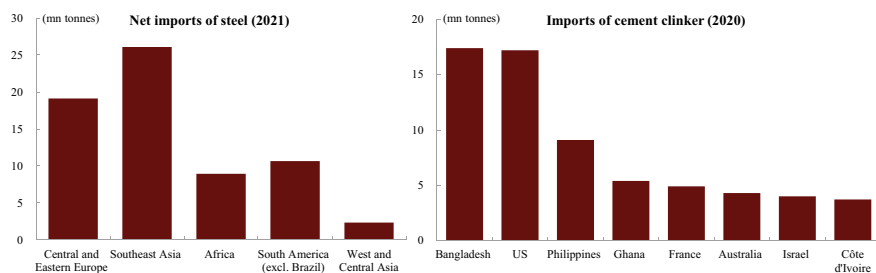


Fig. 10.4 Net imports of steel and cement by region. *Note* The sample data on imports of cement clinker is small, and we use countries with high global imports as representatives. *Source* World Steel Association, Pakistan Credit Rating Agency (PACRA), Statista, dcement.com, CICC Research

and less advanced technology: In a regional cement market with low concentration, where industry development is inadequate and where less advanced technologies generally correspond to an overall flat and high cost curve, Chinese companies may gain competitive advantages due to their more advanced technologies and cost control linked to high operating efficiency. Based on this analysis, Southeast Asia and Africa are suitable destinations for overseas expansion, in our view.

Cement factories built in Africa are highly profitable. Judging from prices in the market and corporate filings from some firms, the Africa market is at a relatively immature stage with strong construction demand. The market lacks production lines that can ensure stable supply of high-quality cement. Chinese companies operating in Africa are highly profitable. For example, ex-factory price of West China Cement's products from its production lines in the Democratic Republic of the Congo and Ethiopia reached US \$150/t and Rmb748/t as of 2022,¹ both much higher than in China. Given the potential incompleteness of statistics on clinker imports and the overall ratings based on market factors, we believe that investment in capacity construction in Africa is promising (Fig. 10.4).

Southeast Asia and Africa have high net imports of refined chemical products, steel, and cement, and we see large upside in their self-sufficiency ratios. The growth rates of GDP and population in Africa and Southeast Asia are relatively high, and their per capita GDP and urbanization rates are lower than the global average. Taking these macroeconomic indicators of each region and the net import volume of major heavy chemical products into consideration, we believe the heavy chemical industries in Southeast Asia and Africa have larger potential for growth compared with other regions.

¹ *Source* Pakistan Credit Rating Agency (PACRA), Statista, dcement.com.

10.3.2 Cost: Advantages in Investing in Heavy Chemical Industries in Southeast Asia and Africa

Cost is the main factor affecting competitiveness for heavy chemical products. When identifying investment destinations, cost should be an important consideration. In general, the major costs in producing heavy chemical products include raw materials, energy, depreciation, transportation, and labor. As crude oil and iron ore are priced globally, the difference in raw material costs mainly lies in other costs. In the following discussions, we mainly compare the remaining four types of costs in different regions.

Africa, Southeast Asia, and West and Central Asia enjoy an edge in refining costs. Cost is one of the core competitive factors in the refining industry. We estimate the refining costs for a 10 mnt/yr oil refining project in major BRI regions. Excluding the costs of raw materials, we found that Southeast Asia, Africa, and West and Central Asia have greater cost advantages, with processing costs at least Rmb100/t lower than in Central and Eastern Europe and Central and South America.

The steel industries in Southeast Asia and Africa also have advantages in costs. With high levels of product homogeneity, cost is an important competitive factor in the steel industry. Costs not only affect the operating results of steel mills, but also partially determine whether companies can operate in a healthy and sustainable way amid cyclical fluctuations. We estimate the steelmaking cost of a project with production capacity of 10 mnt/yr in major BRI regions. Most BRI countries would need to import the raw materials to build a steel mill, so the cost difference mainly lies in differences in transportation costs. Excluding raw material prices, we estimate that Southeast Asia and Africa have clear cost advantages, with processing costs about Rmb200/t lower than in West and Central Asia and Central and Eastern Europe.

Africa and West and Central Asia are competitive in terms of costs in the cement industry. Cost is one of the core factors in the cement industry as it directly affects the operating efficiency of production lines, with notable differences among individual projects. We estimate the cost per tonne of a 5000 t/day cement clinker production line (implying annual cement output of about 2 mnt) in major BRI regions. Energy consumption accounts for a dominant share of cement production costs, and as raw material costs of mines vary greatly given different locations and countries, we assume raw material prices are the same across regions. Based on our estimations, we believe Africa and West and Central Asia are relatively competitive in terms of costs (in fact, cement prices vary considerably among countries) (Fig. 10.5).

Industry	Processing cost (Rmb/t)	Southeast Asia	West and Central Asia	Central and Eastern Europe	Central and South America	Africa
Refining	Depreciation	187	217	273	347	181
	Energy consumption	34	24	57	51	42
	Freight costs	27	0	43	0	0
	Labor costs	15	30	27	22	16
	Total	263	270	399	420	239
	Rating	4	3	2	1	5
Steel	Depreciation	218	305	293	499	244
	Energy consumption	50	43	48	42	44
	Freight costs	60	90	120	30	30
	Labor costs	59	123	109	91	65
	Total	387	561	570	662	383
	Rating	4	3	2	1	5
Cement	Depreciation	51	42	34	39	33
	Energy consumption	126	106	165	116	103
	Freight costs	53	61	55	63	68
	Labor costs	67	64	120	78	53
	Total	297	273	374	297	257
	Rating	2	4	1	2	5

Fig. 10.5 Our rating of overseas destinations for expansion of the heavy chemical industry from the perspective of estimated costs. *Note* We use the costs of overseas factories in select countries and derive an average value according to our regional classification (latest available data up to June 2023); average costs may be affected by the sample size; the lower the total cost, the higher the rating (with 5 being the highest), and the greater the cost advantage the region enjoys. *Source* McCloskey, dcement.com, World Steel Association, Hengyi Petrochemical corporate announcements, China Petroleum and Chemical Industry Federation (CPCIF), China National Chemical Information Center, CICC Research

10.3.3 Governance: Central and Eastern Europe, Southeast Asia, and Central and South America Are Better Suited to Investment for the Heavy Chemical Industry

Development of the heavy chemical industry requires heavy investment, hence marking the importance of sound governance. For example, Hengyi Petrochemical's investment in its Phase I 8 mnt/yr oil refining project in Brunei was nearly US \$3.45 bn, with high technical standards for continuous operation of facilities. It would be difficult to quickly recover the investment in the event of deprivation of ownership or use rights, geopolitical conflicts, etc. Using the 2020 Worldwide Governance Indicators (WGI) to evaluate the quality of governance for each BRI region, we found that Central and Eastern Europe, Southeast Asia, and Central and South America may be more suited to large investments.

10.3.4 Industry Chain Support: Central and Eastern Europe and West and Central Asia Have Solid Industry Foundation

The heavy chemical industry needs support in raw materials, infrastructure, and skilled workers, and each aspect has high requirements. The production capacity of a single factory operating with economies of scale will typically exceed 1 mnt/yr, which generates demand for raw materials, as well as transport for raw materials and products. Refining and other related industry processes tend to require high-temperature and high-pressure conditions, as well as supporting infrastructure and waste treatment facilities. In addition, the around-the-clock operation of large-scale facilities requires a substantial staff of experienced operators. Therefore, the needs for industry chain support mainly consist of raw materials, infrastructure, and skilled workers.

For raw materials, crude oil and iron ore are the main raw materials in the refining and steel industries. We calculate the proportion of crude oil reserves and iron ore output in the representative countries of the five regions relative to the global total, to represent the level of raw materials in the refining and steel industries. We assign a rating of one to five for the five regions. Our analysis excludes limestone, which is common, and so is not considered.

For infrastructure, construction in the heavy chemical industry is inseparable from infrastructure such as environmental treatment and heating. We use World Economic Forum (WEF) scores released in 2019 to assess the level of infrastructure support for each region, and assign ratings of one to five for each of the five regions.²

For skilled workers and engineers, the heavy chemical industry has complex production processes and high technological barriers to entry, which requires large numbers of skilled workers and engineers. Based on the global secondary school enrollment data released by the World Bank in 2018, we select the four most populous countries in each region and calculate the average enrollment rate. We then rate the five regions from one to five based on the average enrollment rate. We are upbeat on the potential of Central and Eastern Europe and Southeast Asia to educate engineers on a large scale.

We derive an overall rating for supply chain support for each region by taking the average of the three ratings. Although support for the refining, cement, and steel industries varies among regions, we believe that West and Central Asia, Central and Eastern Europe, and Central and South America are good destinations for investment in the heavy chemical industry given their solid foundation for industry chains (Fig. 10.6).

² The scores mainly take into consideration transportation infrastructure, e.g., road quality, railway transport efficiency, and air transport efficiency, and utility infrastructure, e.g., quality of power supply, and reliability of water supply.

		Southeast Asia	West and Central Asia	Central and Eastern Europe	Central and South America	Africa
Raw materials support	Proportion of crude oil reserves (refining sector)	0.7%	62.2%	0.1%	27.9%	9.1%
	Proportion of iron ore output (steel sector)	1.1%	4.1%	0.1%	1.2%	4.0%
	Rating (refining sector)	2	5	1	4	3
	Rating (steel sector)	2	5	1	3	4
Infrastructure facilities	Scores based on WEF data	69	70	74	63	49
	Rating	3	4	5	2	1
Skilled workers and engineers	Rating	2	3	5	4	1
Rating by overall industry chain support	Average rating (refining) ²		5	4	3	1
	Average rating (cement) ²		4	5	3	1
	Average rating (steel) ²		5	4	3	1

Fig. 10.6 Ratings of support for industry chains of heavy chemical industry in overseas investment destinations. *Note* Limestone resources are common and are not considered in our analysis; only infrastructure, skilled workers, and engineers are considered in our ratings of cement industry chain support; data as of 2021 except for infrastructure, which is based on 2019 data; the higher the rating (with 5 being the highest), the better the industry chain support the region has. *Source* Wind, *The Global Competitiveness Report 2019* by the World Economic Forum, BP, CICC Research

10.3.5 Overall, Southeast Asia, West and Central Asia, and Some African Countries Are Attractive Investment Destinations for the Heavy Chemical Industry

We rank the five regions on the weightings of the four characteristics of market, cost, governance, and industry chain support. We believe Southeast Asia, and West and Central Asia are attractive investment destinations for the heavy chemical sectors. Some African countries with sound governance are also good choices for investments, in our view. In addition, Central and Eastern Europe are appealing destinations for the steel and petrochemical sectors.

Figure 10.7 compares the overall investment landscape in the five regions. It should be noted that there are large differences in cost and governance between countries in the same region. Therefore, due diligence and communication with government officials is necessary when identifying specific investment destinations—especially in Africa, where the governance scores of countries vary greatly. For example, Morocco has relatively high governance scores, while other African countries tend to score lower. We believe other select African countries with high governance scores may also become attractive investment destinations for the heavy chemical industry.

10.4 Successful Cases of Going Global

According to our rating of governance, market, cost, and industry chain support, Southeast Asia and West and Central Asia are the most attractive investment destinations for the heavy chemical industry. However, companies may encounter practical problems in the process of expanding in these regions. In this section, we summarize

Sector	BRI region	Market	Cost	Governance	Industry chain support	Weighted average rating without considering governance	Weighted average rating considering governance
Petrochemical	Southeast Asia	4	4	4	2	3.6	3.6
	West & Central Asia	2	3	2	5	2.9	2.8
	Africa	5	5	1	1	4.2	3.4
	Central & Eastern Europe	3	2	5	4	2.9	3.4
	Central & South America	1	1	3	3	1.4	1.8
Cement	Southeast Asia	4	3	4	2	3.3	3.4
	West & Central Asia	3	4	2	4	3.5	3.2
	Africa	5	5	1	1	4.2	3.4
	Central & Eastern Europe	1	2	5	5	2.1	2.8
	Central & South America	2	3	3	3	2.5	2.6
Steel	Southeast Asia	5	4	4	2	4.1	4.0
	West & Central Asia	2	3	2	5	2.9	2.8
	Africa	4	5	1	1	3.7	3.0
	Central & Eastern Europe	3	2	5	4	2.9	3.4
	Central & South America	1	1	3	3	1.4	1.8

Fig. 10.7 Quantitative evaluation of overseas investment destinations in the BRI for the heavy chemical industry. *Note* Ratings are subject to sample selection and calculation method; the formula for weighted average rating without considering governance = 50% * market + 30% * cost + 20% * industry chain support; the formula for weighted average rating including governance = 40% * market + 20% * cost + 20% * governance + 20% * industry chain support. *Source* CICC Research

the commonality of three successful cases of Chinese heavy chemical firms going global, namely Hengyi Petrochemical's Brunei project, the HBIS Group acquisition of the Smederevo Steel Plant in Serbia, and Huaxin Cement's overseas expansion. These heavy chemical companies have generated good returns from their successful investments and operations in BRI countries, which we attribute to three factors.

The first factor is advanced technologies and outstanding management capabilities. To go global, Chinese companies in the heavy chemical industry have established multiple advantages in technology R&D, engineering construction, and team management. In terms of technological capabilities, taking the petrochemical sector as an example, core output of facilities produced in China (e.g., 10 mt/yr oil refining and 1 mt/yr ethylene facilities) have largely reached the level of comparable plants elsewhere around the world. In terms of engineering capabilities, Chinese engineering construction and engineering technical services in the chemical, cement, and steel industries are considered advanced and compete at a global level, in our view. For example, China Huanqiu Contracting and Engineering (chemical industry) and Sinoma International Engineering (cement sector) have become world-leading heavy chemical engineering, procurement, and construction (EPC) companies. In terms of management capabilities, the number of people working in China's chemical, cement, and steel industries exceeded 10 mn in 2021, implying a large talent pool from which to export managerial knowledge to other countries. In addition, we believe Chinese management teams have rich experience in localized operations and in respecting local culture and customs.

The second factor is localized operation. The three expansion projects we have mentioned all involve investment of substantial amounts of time and resources to hire and train local employees. For example, HBIS Group established a platform for employee training and exchange between China and Serbia, with Serbian employees

assuming key leadership positions. In another example, Huaxin Cement has implemented a system that sees a senior Chinese employee instruct a local employee on the job.

The third factor is mutually beneficial cooperation. Brunei has abundant oil resources but lacks refining capacity. Hengyi Petrochemical's investment was in line with the government's need to expand refining capacity. The Smederevo steel mill in Serbia was loss-making for many years and on the verge of bankruptcy before being acquired by HBIS Group. It became profitable six months after the acquisition, ensuring the employment of more than 5000 Serbians, which promoted social stability and economic development for the country. We believe mutually beneficial cooperation between heavy chemical companies, local governments, and communities is critical to the success of these projects, and that common interests can facilitate greater development.

10.5 Reflections and Insights

10.5.1 Challenges Faced by Chinese Heavy Chemical Companies in Expanding Overseas

- (1) Unstable political environment. The international security landscape has evolved rapidly in recent years, and geopolitical events such as US-China trade frictions, Brexit, and the Russia-Ukraine conflict have altered the course of globalization. Instability in the global political environment may make it more difficult to achieve mutually beneficial results for overseas projects.
- (2) Varying legal systems in BRI countries. The legal systems of BRI countries differ from China's legal system, as do the rules protecting the assets of foreign investors.
- (3) Limited access to financing channels and forex fluctuations. Institutions that offer financial support in BRI countries are often characterized by high thresholds for granting loans, stringent credit requirements, and strict project reviews. In addition, the earnings of companies that go global are more susceptible to exchange rates fluctuations.
- (4) Cultural differences. China and BRI countries have different cultures, which may lead to greater obstacles to investment and operation, economic risk, and higher costs of coordination and governance for companies.
- (5) Long project cycles. Investment destinations are often in regions with abundant oil and gas resources but poor infrastructure, such as West Asia, Central Asia, and Africa. A lack of industrial infrastructure in such regions means refining and petrochemical projects with Chinese backing generally involve large investments and long construction periods.

- (6) Inadequate international operations and management capabilities. Chinese companies that go global need managers and key employees to be deployed abroad and to lead local employees. Difficulties in recruiting core staff and in managing staff are significant issues for the heavy chemical industry when considering an investment in BRI countries.
- (7) Different engineering standards. When building factories overseas, companies in the heavy chemical industry often face additional costs due to engineering standards that vary between countries.
- (8) Lack of supporting infrastructure along industry chains. Raw material transportation and equipment utilization in the heavy chemical industry necessitate related infrastructure and energy support. If infrastructure is not available, other Chinese companies may also need to go global to help build infrastructure, raising costs.

10.5.2 Possible Solutions to Mitigate Risk and Overcome Challenges

- (1) Establish a platform to share information among BRI countries, and conduct due diligence on local policies and the investment environment. For example, the Japan External Trade Organization was founded to provide Japanese companies with the most up-to-date overseas information and due diligence reports to help them expand overseas and reduce risks.
- (2) Improve the investment insurance system. The investment insurance system could be optimized to encourage and protect the investments of Chinese companies in BRI countries.
- (3) Seek collaboration with local companies or multinationals to share benefits and risks. Domestic companies may establish joint ventures with local firms or multinational companies operating in the local market. This can help domestic companies reduce their investment and risks, as well as make better use of the advantages from operating in the host country, which is conducive to Chinese firms' quick and effective integration into the local market.
- (4) Encourage companies in basic industries to take the lead, guide companies to expand their presence in downstream sectors, and promote the construction of large industrial parks. We believe that domestic companies in basic industries (e.g., energy sectors such as coal, oil, and electricity, as well as metallurgy, basic chemicals, and transportation) can be encouraged to take the lead in expanding overseas in countries with poor infrastructure or that require basic industry development, laying a foundation for the development of downstream sectors along the industry chain. In countries that have started to develop a basic industrial footprint, Chinese enterprises can be guided to build supporting facilities in the downstream of the industry chain.

- (5) Strengthen local employee training and localization. Experience shows that cultivating local employees can effectively reduce the impact of cultural differences, enhance corporate identity in host countries, reduce costs, and reduce staff turnover.
- (6) Strengthen awareness of social responsibility. Compared with large Western multinational firms, Chinese companies are less experienced in going global. It is thus necessary for Chinese companies to monitor their environmental, social, and corporate governance (ESG) performance to establish a strong foothold and grow steadily in overseas markets.
- (7) Enhance communication and promote the adoption of Chinese standards for new projects. If new projects adopt Chinese standards, the threshold and cost of technology exports can be greatly reduced, and the construction cycle will tend to shorten notably.
- (8) Improve international management capabilities of enterprises. This can be achieved in three main ways. First, learn from the experience of multinational companies. For example, Huaxin Cement has introduced a management model with foreign major shareholders, producing good results in terms of employee and customer loyalty, governance structure, and efficiency in decision making. Second, attract high-caliber employees with international management experience. Some top-tier domestic technology and engineering companies have accumulated experience in international operation and management, and staff can be introduced to companies seeking to expand overseas. Finally, strengthening the training of international employees can also be an aim.

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Chapter 11

Opportunities Arising from Infrastructure-Related Exports to BRI Countries



Abstract The equipment manufacturing sectors play a crucial role in industry. As the growth of China's economy enters a new stage, it is important for Chinese equipment manufacturing companies to increase their presence in overseas markets. Currently, some sectors in equipment manufacturing are making technological breakthroughs and enjoying cost advantages, but moves to increase Chinese companies' presence in BRI countries have encountered obstacles. High-speed railway, nuclear power, and other sectors in China that were thought to be very likely to expand overseas have not been as successful as expected over the past decade. Understanding the reasons behind their uneven progress in overseas expansion can help improve the direction of policies for the future expansion of China's equipment manufacturing sectors in BRI markets.

An overview of the equipment manufacturing sector in China reveals that the export of infrastructure construction equipment to BRI countries is playing an important role in the sector's global expansion. Equipment manufacturing sectors in China enjoy high output value and balanced positions on the supply and demand sides of the global market, but the exports of leading companies remain low. Chinese companies have built a more significant presence in developing countries than in developed countries, and the export of infrastructure construction equipment is proceeding more rapidly compared to that of manufacturing equipment. The presence of domestic sectors overseas is highly correlated to their domestic production rates. However, we note that overseas market shares remain low for several sectors that have recorded high domestic production rates.

An analysis of major sectors reveals that project-based industries encounter many challenges. We note that overseas market shares of China's product-based industries exceed those of its project-based industries, and overseas market shares of market-driven industries exceed those of government-driven industries. We believe that it will take time for Chinese companies to gain market share in developed countries due to limitations in their brands and distribution channels. Among China's project-based industries encountering challenges in developing countries are high-speed railways and nuclear power. First, project-based industries require substantial funding and may

Author: CHEN Xianfan, ZENG Tao, ZOU Jing, MIAO Yufei, QU Haoyuan, CHE Yunji, LIU Zhongyu, LIU Jing.

come under pressure on the demand side in BRI countries. Second, these industries are likely to be affected by geopolitical issues. Third, China does not have advantages in project management and financing. As a result, Chinese companies may encounter challenges in expanding their overseas presence, even if they have technologies that meet overseas standards and their product costs are low.

11.1 Overview of High-End Equipment Exports

Focusing on 15–20 high-end equipment subsectors, we analyze the position of China's high-end infrastructure equipment sector in the global market and its overseas market share. A global comparison reveals that China is playing an important role in the equipment manufacturing sectors (Fig. 11.1). We note that of the total output value of select product categories in the global equipment manufacturing industry in 2022, China recorded the highest value (37%), exceeding the US (20%), Europe (20%), and Japan (9%).

A cross-sector comparison demonstrates that China's traditional industries—such as the real estate and infrastructure construction, metal product, shipbuilding, and energy equipment industries—account for high proportions in global output. This is because the sizable market and mature industry systems in China have created conditions for the development of such industries. However, following China's late start in semiconductor equipment, large aircraft, and other industries that require more sophisticated technologies, the country lags behind in high-end equipment industries that requires cutting-edge technologies, with the share in global output in these industries remaining low.

11.1.1 Position of China in Global High-End Equipment Markets: Supply and Demand Balanced; Companies Benefit from Comprehensive Cost Advantages

Supply and demand in China's high-end equipment sector remain balanced in many domestic industries, but three categories of industries have seen supply exceeding demand (Fig. 11.2). The first category includes industries that rely on advantages in supply chains and costs. For example, the tool and container industries do not require sophisticated manufacturing techniques, while they utilize notable amounts of steel products. The metal processing industry in China enjoys a size advantage, making the downstream equipment manufacturing industries more competitive on the supply side, compared to other developing countries whose related supply chains are immature.

The second category includes industries that have developed good value-for-money driven by large domestic demand. For example, in the power equipment and

Category	Industry	China	US	Japan	Europe	World	Category	Industry	China	US	Japan	Europe
Real estate infrastructure equipment	Railway equipment	300	300	42	360	1,140	Real estate infrastructure equipment	Railway equipment	26%	26%	4%	32%
	Construction machinery	420	260	210	95	1,000		Construction machinery	42%	26%	21%	10%
	Agricultural machinery	300	250	60	300	1,000		Agricultural machinery	30%	25%	6%	30%
	Electrical equipment	1,000	100	100	100	2,000		Electrical equipment	50%	5%	5%	5%
	Total	2,020	910	412	855	5,140		Total	39%	18%	8%	17%
Metal products	Hardware tool	525	50	30	80	700	Metal products	Hardware tool	75%	7%	4%	11%
	Container	95	0	0	0	100		Container	95%	0%	0%	0%
Transportation equipment	Total	620	50	30	80	800	Transportation equipment	Total	78%	6%	4%	10%
	Shipbuilding	450	180	100	100	1,100		Shipbuilding	41%	16%	9%	9%
	Large aircraft	100	600	25	500	1,300		Large aircraft	8%	46%	2%	38%
General-purpose equipment	Total	550	780	125	600	2,400	General-purpose equipment	Total	23%	33%	5%	25%
	Machine tool	111	37	104	74	370		Machine tool	30%	10%	28%	20%
	Industrial robot	41	14	84	40	180		Industrial robot	23%	8%	47%	22%
	Laser equipment	84	35	9	32	160		Laser equipment	52%	22%	6%	20%
	Injection molding machine	40	16	8	16	80		Injection molding machine	50%	20%	10%	20%
Special-purpose equipment	Total	276	102	205	163	790	Special-purpose equipment	Total	35%	13%	26%	21%
	Coal equipment	140	20	0	10	300		Coal equipment	47%	7%	0%	3%
	Lithium battery equipment	100	3	20	3	126		Lithium battery equipment	79%	2%	16%	2%
	Photovoltaic equipment	89	9	3	11	110		Photovoltaic equipment	81%	8%	2%	10%
	Wind power equipment	160	60	1	100	360		Wind power equipment	44%	17%	0%	28%
	Nuclear power equipment	90	8	8	164	270		Nuclear power equipment	33%	3%	3%	61%
	Semiconductor equipment	20	280	210	190	700		Semiconductor equipment	3%	40%	30%	27%
	3D printing	25	35	10	20	100		3D printing	25%	35%	10%	20%
	Satellite internet	5	27	1	15	50		Satellite internet	10%	54%	2%	30%
	Total	629	441	253	512	2,016		Total	31%	22%	13%	25%
Total aggregate		4,095	2,284	1,025	2,210	11,146	Total aggregate		37%	20%	9%	20%

Fig. 11.1 Comparison of representative equipment manufacturing industries in China, the US, Japan, and Europe. *Note* We use data on output value in 2022 (unit: Rmb bn); % figures in columns to the right refer to output value as a percentage of global output value, and figures in red represent countries and regions with the highest percentages. *Source* China Construction Machinery Association; China Machine Tool & Tool Builders' Association; China Photovoltaic Industry Association; corporate filings and company websites of China International Marine Containers (CIMC), Hangzhou GreatStar Industrial, and China Railway; CICC Research

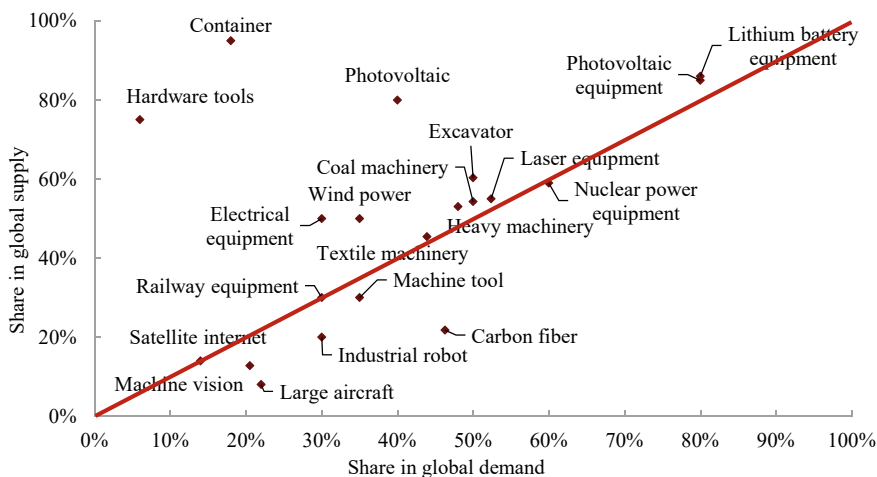


Fig. 11.2 Domestic industries' positions on supply and demand sides of the global markets. Note: We use 2022 data; share in global demand refers to demand in the domestic market as percentages of global demand; share in global supply refers to supply in the domestic market (supply from foreign companies included) as percentages of global supply. Source: China Construction Machinery Association; China Machine Tool & Tool Builders' Association; China Photovoltaic Industry Association; corporate filings and company websites of CIMC, Hangzhou GreatStar Industrial, and China Railway; CICC Research

excavator industries, substantial investment in real estate and infrastructure construction has created opportunities for these industries to develop. These industries are thus likely to expand their overseas presence by leveraging good value-for-money products after they mature in the domestic market.

The third category includes industries that have built leading positions in the world thanks to policy support and market-based cost reduction (such as the photovoltaic [PV] and lithium-ion battery [LiB] industries). For the machine tool, industrial robot, and large aircraft industries, domestic supply as a percentage of global supply remains lower than domestic demand as a percentage of global demand due to less advanced technologies in these industries.

11.1.2 Global Expansion of China's High-End Equipment Industries: Overseas Market Shares Remain Low; BRI Countries and Infrastructure Construction Equipment Play Important Roles in Exports

Global expansion of China's leading high-end equipment companies remains limited, as evidenced by low overseas revenue as a percentage of total revenue as well as low overseas market shares (Fig. 11.3). The PV industry enjoys higher overseas

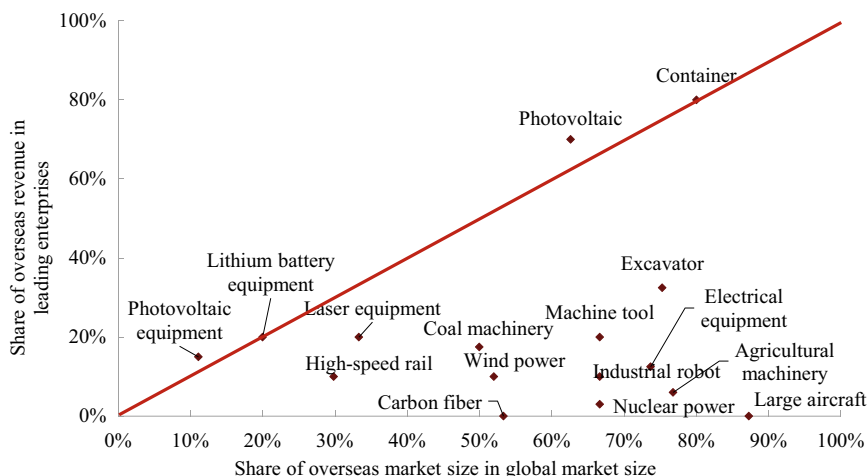


Fig. 11.3 High-end equipment exports. *Note* We use 2022 data on high-end equipment exports; the horizontal axis represents the market sizes of industries, and the vertical axis represents overseas revenue of leading companies as percentages of total revenue. *Source* China Construction Machinery Association; China Machine Tool & Tool Builders' Association; China Photovoltaic Industry Association; corporate filings and company websites of Sany Heavy Industry, Longi Green Energy Technology, and China Railway; CICC Research

market share compared to many other industries thanks to its notable cost advantages, sustained efforts to improve technologies, mature industry systems, and standardized products.

By region, the market share of China's high-end equipment companies in developing countries exceeds that in developed countries (Fig. 11.4). The following factors contributed to this pattern, in our view. First, customers in developing countries pay closer attention to value for money, while customers in developed countries are less sensitive to product prices but attach importance to product quality, brands, and distribution channels. Technologies utilized by Chinese companies remain less advanced than those used by overseas companies, and thus Chinese companies have less advantages in brands and distribution channels in developed countries. Second, local conditions in developing countries affect Chinese companies' exports. China's previous infrastructure construction in developing countries boosted product exports, and helped Chinese companies build distribution channels. As such, we are upbeat on China's equipment exports to BRI countries.

On the demand side, China has advantages in exporting infrastructure construction equipment, though exports of manufacturing equipment remain low. China, the US, Japan, and European countries account for high proportions of value-added output in the global manufacturing sector. As of 2021, the top 15 countries measured by the value-added output of their manufacturing sectors make up 79% of the value-added output in the global manufacturing sector. Of these top 15 countries, five are BRI countries that account for 10% of the value-added output of the global

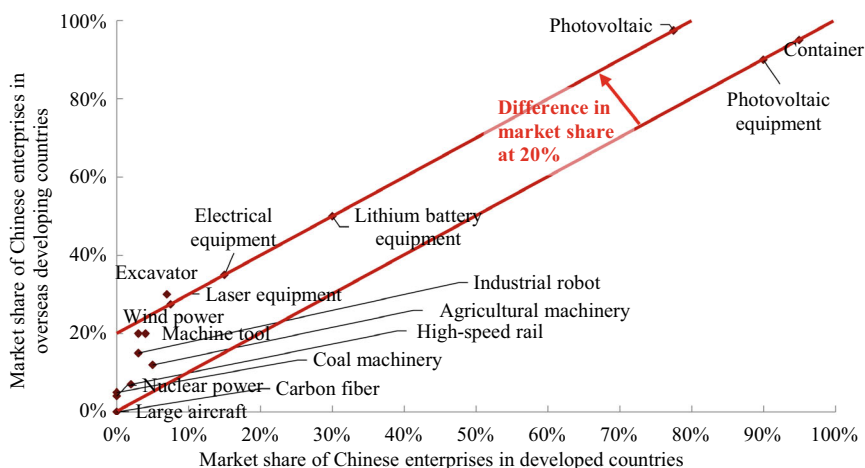


Fig. 11.4 Overseas presence of high-end equipment industries in developing countries and developed countries. *Note* We use 2022 data; the LiB equipment market is nearly non-existent in developing countries, and we assume Chinese companies' market share in the LiB equipment markets of developing countries is 50%. *Source* China Construction Machinery Association; China Machine Tool & Tool Builders' Association; China Photovoltaic Industry Association; corporate filings and company websites of Sany Heavy Industry, Longi Green Energy Technology, and China Railway; CICC Research

manufacturing sector. Of the five BRI countries, three are developing countries that account for merely 4% of the global manufacturing sector. Overseas market shares of Chinese manufacturing equipment companies are lower than those of infrastructure construction equipment companies, as: (1) Their technologies are less advanced than the technologies utilized by companies in developed countries; and (2) BRI countries and developing countries account for low proportions in the global manufacturing sector.

On the supply side, domestic production is a prerequisite for global expansion, in our opinion. The domestic production of complete machines is arguably a metric for how advanced technologies are. Limited domestic production in China suggests that the technologies are not sufficiently advanced and that Chinese companies offering such products are unlikely to have the ability to compete with overseas rivals. Limited domestic production also means that the domestic market share of Chinese companies remains low and that domestic entrepreneurs are not well poised to expand their overseas presence.

We note that global expansion remains limited for some industries with high domestic production rates, such as the nuclear power, coal mining machinery, wind power, and high-speed railway industries. For the underground coal mining machinery industry, China's global expansion is limited as overseas mines are mostly open pits. Global expansion of the wind power industry also remains limited as developed countries used to be the main overseas markets for wind power, while the markets in developing countries did not expand until recently. However, the

latter have grown rapidly, and the market share of Chinese companies in developing countries has increased swiftly. For the nuclear power and high-speed railway industries, China’s global expansion remains limited despite the country having developed advanced technologies. This may be due to multiple factors. In this report, we discuss why industries with cost advantages and technologies which meet overseas standards encounter obstacles in global expansion.

11.2 Major Industries: Analysis and Outlook

This section focuses on five industries. Among industries with low levels of global expansion, we focus on the high-speed railway and nuclear power industries due to their large size. In addition, we also concentrate on power equipment, engineering machinery, and PV industries as the markets for these industries are sizable and the export of these products is proceeding smoothly. We categorize representative industries based on the characteristics of their businesses from two perspectives: (1) Project-based and product-based industries; and (2) market-driven and government-driven industries (Fig. 11.5).

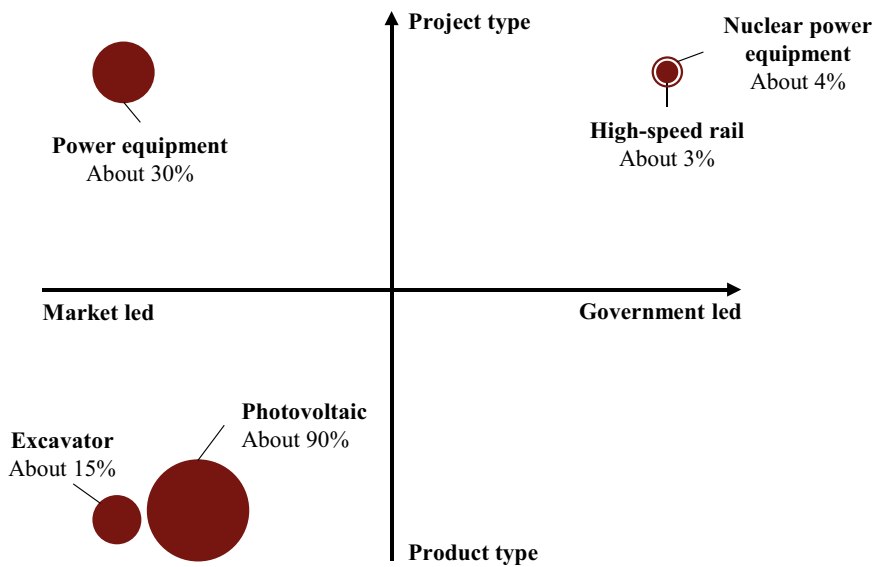


Fig. 11.5 China’s share of representative high-end equipment industries in overseas markets. *Note* We use 2022 data; government-driven describes participants in industries driven mostly by government departments, and market-driven describes participants in industries driven mostly by private entities. *Source* China Construction Machinery Association; China Machine Tool & Tool Builders’ Association; China Photovoltaic Industry Association; corporate filings and company websites of Sany Heavy Industry, Longi Green Energy Technology, and China Railway; CICC Research

Overall, China's PV exports to BRI countries have reached a high level. Efforts to sell power equipment and engineering machinery in BRI countries have paid off as Chinese companies create synergies along industry chains in sync with their moves to expand globally. However, global expansion of the nuclear power industry has proceeded slowly as Chinese companies do not have extensive experience in nuclear power projects. We think global expansion of the nuclear power industry will likely accelerate following the launch of nuclear power projects, while global expansion of the high-speed railway industry will take time due to weak overseas demand.

11.2.1 PV: Green Transformation and Energy Security

On the demand side, we are upbeat on the growth potential of PV markets in BRI countries as their demand for new PV facilities increases. Data from Bloomberg New Energy Finance (BNEF) shows that the installed capacity of new PV facilities in BRI countries as a percentage of total global installed capacity of new PV facilities reached approximately 20% in 2018–2020 (vs. 6–9% over 2011–2016). Total installed capacity of new PV facilities in BRI countries came in at 26.04 GW in 2021, representing 14.3% of total global installed capacity of new PV facilities. The proportion of BRI countries' total installed capacity of new PV facilities in global installed capacity declined in 2021 due to the end of a rush to install PV facilities.

On the supply side, Chinese companies are the main PV suppliers in BRI countries. We estimate that China's PV module exports to Central and Eastern Europe accounted for around 74% of the installed capacity of new PV facilities in this region over 2019–2021 given the value of exports and the average prices of exported products.¹ China plays a leading role in meeting the demand for PV modules from other BRI countries.

We attribute China's success in the global expansion of the domestic PV industry to two factors, one of which is cost reduction and efficiency enhancement. Cost advantages, coupled with sustained efforts to upgrade technologies, are accelerating the global expansion of the domestic PV industry, and Chinese companies are gaining economies of scale thanks to domestic PV demand and the large market in China.

First, costs play a crucial role in the PV industry. Labor, depreciation, electricity, and other non-raw material costs account for 5–27% of total costs in the PV industry. China has advantages in workforce, electricity supply, land, and equipment, enabling PV products to offer good value for money. Economies of scale also play an important role in helping companies reduce costs. As the production volume continues to increase, companies with economies of scale can gain advantages in supply chain costs and reduce production costs, thus cutting the costs along the PV industry chain.

Second, companies in the PV industry are continuing to improve technologies while manufacturing products. We think growing demand will not only help the PV industry gain economies of scale, but also create opportunities for companies to

¹ Our estimates on shipments might be different from the actual shipments, as average prices differ among regions.

improve technologies through real-world application. China has rolled out a series of policies to reduce costs for end-market customers in order to boost domestic demand for PV and promote the development of the domestic PV industry chain. On the demand side, the domestic market has laid a foundation for cost reduction, efficiency enhancement, and the upgrading of technologies at PV companies. Given the distribution of the production capacity of PV manufacturing equipment, we estimate that China has accounted for more than 80% of production capacity for the main materials and core auxiliary materials along the PV industry chain.

The second important factor to China's success in the global expansion of its PV industry is standardized products. Products of most PV subsectors are relatively standardized, and Chinese companies can sell them to international markets after obtaining the relevant overseas certifications, e.g., third-party product certificates. Despite originating in different markets, third-party product certificates share many common attributes. The Chinese PV industry has gained cost advantages, received product certificates, and built sales networks in many regions around the world.

The strategic value of China's PV industry has increased as the global carbon neutrality-based energy transformation is underway. China's PV industry has attracted attention in many countries due to its high market shares. We see two directions of development for the domestic PV industry. First, companies need to continue to upgrade technologies. Second, global expansion of production capacity will likely help Chinese companies increase their overseas presence, in our view. The global expansion of the domestic PV industry has proceeded more rapidly than that of many other manufacturing industries in China. We believe that seeking out stable regions and shifting the production capacity of midstream and downstream subsectors along the PV industry chain to such regions will create conditions for the sustained global expansion of the domestic PV industry.

11.2.2 Power Equipment: Strong Demand in BRI Countries; Chinese Companies' Global Expansion Accelerating

Global power grid investment is increasing steadily, reaching US \$273.8 bn in 2022, according to BNEF data, and it is likely to have increased by around 10% YoY to about US \$300 bn in 2023.

Demand for power equipment is strong in BRI countries. According to the World Bank, in 56 BRI countries (roughly a third of the total), more than 10% of the population did not have access to electricity in 2020. Moves to increase access to electricity in such countries have significantly boosted demand for power equipment. Green transition of the energy industry has also presented investment opportunities, in our view. Data from International Trade Administration (ITA) shows that to transmit renewable energy-based electricity, South Africa will likely increase the length of electric cables by 8000 km by 2030. Furthermore, the Philippines, Thailand, and

Qatar have made intelligence and automation the directions for upgrading their power grids.

On the supply side, China's power equipment technologies are more advanced than those of many other countries, and thus Chinese companies are competitive in overseas markets thanks to good value for money. China has taken the lead in building a complete ultra-high-voltage alternating current (AC) and direct current (DC) technology standard system and a smart power grid technology standard system. As of 2022, China had formulated more than 100 international standards. As of 2022, a total of 525 Chinese standards have been utilized in BRI countries. Chinese supply chains have advantages in raw material and labor costs. For example, the prices of plates (a main input in power equipment) of medium thickness are lower in China than in the EU, the US, and Japan.

China's power equipment exports are increasing rapidly. Data from China Electricity Council shows that as of end-2021, major Chinese power companies' cumulative overseas investment reached US \$102.7 bn. The value of China's transformer and inductor exports increased at a CAGR of around 14% over 2020–2022 despite the impact of the COVID-19 pandemic. The country's transformer and inductor exports over 2020–2022 exceeded those of many other countries.

While overseas businesses are mature for leading European and US electrical equipment companies, Chinese companies are still at the initial stage of global expansion. Siemens, Schneider, and other leading companies in the European and US electrical equipment industries have long histories of global expansion. Their brands are well recognized, and their global sales and service networks are mature. Chinese companies were late to start their global expansion. Overseas revenue as a percentage of total revenue is lower than 20% at Shanghai Electric Group, Sieyuan Electric, and other leading companies in the domestic electrical equipment industry. Overseas markets will be an important strategic direction for domestic companies, in our view.

The key to success for China's power equipment industry in overseas expansion is the building of a mutually beneficial, omni-industry chain model. This model is laying a foundation for global expansion, in our view. We believe that the global expansion of the power equipment industry will increase connectivity in power grid infrastructure facilities, promote clean and low-carbon energy transformation, and boost global economic growth and social progress, while improving local livelihoods. Mutually beneficial cooperation can help companies sell products and undertake projects overseas.

The omni-industry chain model that is composed of technological standards, planning and design, engineering and construction, and equipment manufacturing has helped advance the global expansion of the power equipment industry. The value of major Chinese power equipment companies' exports reached US \$2.5 bn in 2021, of which approximately 84% were equipment exports for overseas projects. For example, for the Pakistan Matiari-Lahore $\pm$ 660 kV HVDC transmission project, a major project in the China-Pakistan Economic Corridor (CPEC) program, nearly 80% of technology standards in the construction of this project were Chinese. More

than 5000 Chinese employees from 96 Chinese companies took part in the construction of this project. In addition, power equipment and technological service exports related to this project reached around Rmb6.7 bn.

Direct power equipment exports will likely increase thanks to stronger overseas demand. China's power equipment exports were mainly boosted by overseas projects conducted under the build-operate-transfer (BOT) model and the engineering, procurement, and construction (EPC) model at the initial stage of global expansion. Companies sold products in overseas markets thanks to these projects. However, overseas projects also face challenges. For example, payment collection is difficult and the risks of payment defaults are high in some countries. In our opinion, China's exports to BRI countries will reduce reliance on engineering projects. Chinese companies may compete directly for equipment orders and they are likely to gain market share by leveraging technologies and value for money as Chinese power equipment companies continue to deliver products overseas and their brands gain popularity among overseas customers.

11.2.3 Engineering Machinery: Chinese Companies Taking the Lead in Increasing Their Presence in Overseas Markets

BRI countries account for around 20% of total demand in the global engineering machinery market. Demand for engineering machinery is increasing more rapidly in BRI countries compared to other regions. In 2020, the sales volume of engineering machinery in BRI countries reached around 210,000 units, with the sales value coming in at about US \$20 bn, representing around 20% of global sales value of engineering machinery. Off-Highway Research estimates that the global engineering machinery market will increase at a CAGR of 0.6% over 2021–2025. Market research consultant Arizton expects demand for engineering machinery in Saudi Arabia and Southeast Asia to increase by more than 4% over 2021–2028, exceeding the global average.

In 2020, Chinese companies' market shares exceeded 30% in the engineering machinery markets of some BRI countries with larger markets than other BRI countries. Their market shares in this sector reached 65% in the United Arab Emirates (UAE), 80% in Russia, and 96% in Singapore.

On the supply side, Chinese engineering machinery companies are ready for global expansion as they have gained cost advantages thanks to domestic supply chains. Hydraulic parts, castings, and steel are the main raw materials in engineering machinery, according to corporate filings of Sany Heavy Industry and other companies. We estimate that these raw materials account for 88% of total costs of engineering machinery.

The domestic production rate of engineering machinery is increasing rapidly, and Chinese companies have the appropriate conditions for global expansion, in

our view. Domestic demand for excavators reached approximately 300,000 units in 2020, representing 44% of global demand. The sizable market in China has created opportunities for domestic companies to improve technologies. Domestic production rates of pump valves, cylinders, and engines for excavators reached 30%, 70%, and 15% in 2022. Leading hydraulic part companies sell products in China and other countries, with the domestic production rate for excavators exceeding 80% in 2022 (vs. 7.5% in 2006).

For Chinese companies that have just started to sell excavators in overseas markets, excavator exports, to a large degree, rely on infrastructure construction projects in these countries as most companies sell excavators under business-to-business (B2B) and business-to-customer (B2C) models. Companies are likely to build their own distribution channels as they increase their overseas presence. We note that engineering machinery markets are growing rapidly in developing countries. In addition, we think Chinese companies can pay attention to the engineering machinery markets in developed markets as the markets there remain sizable.

The major challenge to Chinese engineering machinery companies expanding overseas is that they mainly sell products in BRI countries, while their distribution channels and brands remain weak in non-BRI countries. For example, China has cooperated with Southeast Asian countries, investing in more than 22 large construction projects since 2013, but its infrastructure construction orders from India² are equivalent to only 15% of its orders from Southeast Asia. Engineering machinery offered by Chinese companies as a percentage of all engineering machinery in India came in at a mere 13% in 2020, lower than their shares in major BRI countries.

As for developed countries, Chinese companies account for low proportions in engineering machinery exports to them (including to those participating in the BRI). Off-Highway Research data shows that Chinese companies currently have 5–10% shares of the engineering machinery markets in North America, Germany, and the UK in 2022, as European and US companies impose standards that are not quite compatible with Chinese products, and Chinese companies do not have mature distribution channels in overseas markets. In addition, Chinese companies have low market shares in the engineering machinery markets of developed countries participating in the BRI.³

As Chinese companies continue to expand market share in the engineering machinery market in Southeast Asia, their sales in this region will likely increase alongside the expansion of local markets, in our view. We expect Chinese engineering machinery companies to increase efforts to expand their presence in BRI countries in South Asia, Central Asia, and the Middle East. Their efforts to sell products in developed countries participating in the BRI will likely pay off as they continue to improve brands and distribution channels.

² India is not a BRI country.

³ Chinese companies account for high market share in the engineering machinery market in Singapore.

11.2.4 Nuclear Power Equipment: Opportunities Exceed Challenges

We think the number of nuclear power stations in BRI countries will likely increase rapidly given their nuclear power station construction plans. Data from the World Nuclear Association shows that as of April 2023, the number of nuclear reactors in BRI countries (Russia and South Korea excluded)⁴ reached 51 units. The installed capacity of nuclear reactors in BRI countries came in at 26 mn kW, representing merely 8% of total installed capacity in overseas markets, and 7% of total installed capacity in the global market. If the nuclear power stations currently under construction are all completed and construction of nuclear power station projects being planned is carried out, the number of new nuclear power stations in BRI countries will reach 29 stations, and the installed capacity of these new nuclear power stations will reach 30 mn kW, representing 30% of the total installed capacity in overseas markets. Factoring in proposed nuclear power stations, we estimate that the number of new nuclear power stations will reach 100 and the installed capacity of these nuclear power stations will reach around 110 mn kW, representing 40% of the total installed capacity in overseas markets.

We estimate that the size of the nuclear power markets in BRI countries will exceed US \$200 bn, and suggest keeping an eye on markets in Saudi Arabia, South Africa, and Eastern Europe. Assuming the construction cost of nuclear power stations in BRI countries is US \$2000/kW, we estimate that the size of the markets for nuclear power stations that are currently planned or under construction in BRI countries will reach US \$60 bn in 5–8 years. Factoring in proposed nuclear power stations, we estimate that the size of the nuclear power station markets in BRI countries will reach US \$215 bn. Saudi Arabia, Türkiye, Ukraine, and South Africa will likely account for 16%, 13%, 10%, and 9% of the BRI countries nuclear power station market.

On the supply side, the number of nuclear power exporters is limited, leading to a high concentration ratio in the nuclear power export market. Countries that have the capabilities of exporting nuclear power include Russia, China, the US, France, Japan, and South Korea. Russia, China, France, and South Korea are currently nuclear power exporters. Japan and the US do not export nuclear power as weak demand for construction of nuclear power stations in the two countries has hindered development of domestic nuclear power companies. Based on the scale of overseas nuclear power stations constructed by companies from the other four countries, we estimate that Russia and China accounted for 68% and 4% of the global nuclear power export market in 2022. Companies in three countries—Russia, China, and South Korea—are constructing nuclear power stations in BRI countries. We estimate that Russia and China account for 76% and 7% of the nuclear power markets in BRI countries.

China accounts for low market share in the global nuclear power export market, which we attribute to three reasons. First, the late start to China's global expansion strategy for third-generation nuclear power units. The global expansion of nuclear

⁴ BRI countries in this chapter do not include Russia and South Korea, as the two countries are major nuclear power equipment exporters.

power companies requires the support of national strategies. The National Energy Administration (NEA) of China put forward the strategy for expanding the overseas presence of nuclear power companies for the first time on November 26, 2013, but Russia had already established the Rosatom State Atomic Energy Corporation in 2007. The second reason is that the nuclear power standards are not unified. For example, three technology standards (CAP1000, ACPR1000+, ACPR1000) coexisted until China launched Hualong One HPR1000 for overseas customers in 2015. The third is the lack of extensive experience in nuclear power projects. Construction of a nuclear power station that utilizes the third-generation Hualong One units independently developed by China was not completed in Pakistan until 2021, prior to which other countries may have been hesitant about the safety of nuclear power provided by China. After completing the construction of the nuclear power station in Pakistan, China has received nuclear power project orders from Argentina and the UK.⁵

We believe the global expansion of the nuclear power equipment industry will have more opportunities than challenges going forward. First, Chinese companies exporting nuclear power equipment have gained competitive advantages. They are likely to improve the capabilities of winning overseas bids, in our view. For example, Chinese companies have utilized third-generation Hualong One nuclear power technologies in six nuclear power units in Pakistan. They have amassed extensive experience in overseas nuclear power projects. Second, Chinese nuclear power projects require shorter construction periods and cost less than those constructed by foreign companies. Construction of Hualong One nuclear power units typically lasts 67 months, equivalent to a mere 60% of the construction period for nuclear power units offered by the companies of other countries. The construction and installation costs of Hualong One nuclear power units are on par with those offered by companies in Russia and South Korea, but lower than those offered by French, US, and Japanese companies.

We think the global expansion of China's nuclear power industry will continue to encounter some challenges. First, China is not competitive in offering advanced financing schemes. Construction costs of nuclear power stations and the interest costs of startup funding account for more than 60% of the total costs of nuclear power stations. Countries that own nuclear power stations typically pay attention to liabilities resulting from financing schemes, and they are not willing to utilize state credit to guarantee loans. China currently only offers common export loans, and nuclear power station owners are required to use sovereign credit as collateral.

Second, China's omni nuclear power equipment solutions and closed cycle treatment technologies for spent fuel disposal are not sufficiently mature. In addition, China does not offer nuclear waste recycling and treatment services.

Third, China's R&D projects on small modular reactors (SMRs) have yet to diversify. SMRs can help BRI countries with low investments to build nuclear power stations. China has taken the lead in developing light water reactors (LWRs) and high-temperature gas-cooled reactors (HTGRs). HTGRs require less water, and they

⁵ The UK is not a BRI country.

can meet the needs of countries with desert environments. However, China's R&D SMRs projects can be expanded to more areas. For example, fast-neutron reactors have advantages in the utilization rate of uranium, while molten salt reactors have advantages in water usage and fuel reserves.

11.2.5 High-Speed Railways: Weak Demand in BRI Countries, and Overseas Expansion Takes Time

On the demand side, the length of high-speed railway networks in BRI countries remains limited, and construction of high-speed railway networks remains uncertain in the long term. Union Internationale des Chemins de fer (International Union of Railways, or UIC) data shows that in 2021, the length of high-speed railways that had commenced operation and were under construction in BRI countries reached 4034 km and 3748 km, respectively. The corresponding data for China in the same year was over 40,000 km and 13,000 km, respectively. A total of 22 countries have released plans to build high-speed railways. The length of high-speed railways planned for construction in these countries has reached around 21,000 km (vs. 18,000 km for high-speed railways planned for construction in China), with 11,755 km planned for construction in the short and medium term, and 9159 km in the long term. Construction of high-speed railway projects has been disrupted due to various factors, and the execution of such projects remains uncertain in the long term.

Demand for high-speed railways is currently weak in some less economically developed BRI countries. High-speed railways require capital investment, population density, and power supply, as well as the appropriate economic conditions. Many less economically developed BRI countries cannot afford to build high-speed railways. Investment returns remain uncertain. Construction of high-speed railways in countries that have released plans to build high-speed railways is subject to changes in the macroeconomy and financial conditions of these countries.

On the supply side, China Railway High-Speed (CRH) is one of the most advanced high-speed train technologies in the world. The China Railway Rolling Stock Corporation (CRRC) exports electric multiple units (EMUs of 100 km/h and 160 km/h), urban rail transit, locomotives, subways, and freight wagons, while high-speed EMU exports remain low. The Jakarta-Bandung High-Speed Railway was the first overseas project to utilize 350 km/h high-speed trains offered by China. China has also exported 200 km/h EMUs to Austria. UIC data shows that Alstom (France) and Siemens (Germany) account for 38% and 11% of the high-speed train markets in BRI countries (measured by the number of carriages that have been put into operation). The two companies have higher market shares and larger customer bases. Hyundai accounts for 34% of the high-speed train market in South Korea due to its competitive advantages in the local market. It accounts for approximately 11% of the high-speed train market in Italy.

However, China's high-speed train exports remain low as foreign companies have more extensive experience in improving technologies, and operate businesses in many regions around the world. Alstom, Siemens, Kawasaki (Japan), and Bombardier (Canada) have operated high-speed train businesses for nearly a century, and have exported high-speed trains to many countries. Data from the Union of European Railway Industries (UNIFE) shows that Siemens, Alstom, and Bombardier each account for approximately 10% of the global rail transit market (China excluded), while CRRC's market share is only 3% in 2022. Leading overseas companies enjoy higher market shares in the global high-speed train market.

The domestic production rate of high-speed trains exceeds 90% in China. China has gained notable advantages in technologies and costs. Data from the World Bank shows that the construction costs of high-speed railways in China is Rmb129 mn/km, lower than those of high-speed railway systems in other countries. Domestic production rates of traction, braking, network control, and bogies for high-speed trains in China have exceeded 90% as companies continue to improve technologies. High domestic production rates help reduce manufacturing and operating costs.

Looking ahead, we believe that China can improve its financing support for overseas high-speed rail systems. Project owners typically pay attention to financing programs due to the high construction costs and long construction periods of high-speed rail systems. For example, Japan has offered zero interest rate and even negative interest rate financing since the beginning of the 1990s. It has also launched a specialized official development assistance (ODA) program, offering loan interest rates of 0.1%. China has advantages in the construction periods and construction costs of high-speed rail systems, but it still needs to improve financing schemes so as to better meet the needs of project owners. For example, high-speed rail systems constructed under the BOT model can help lower the sovereign credit-based collateral requirements on project owners.

Construction of high-speed rail systems takes time, and it is subject to external factors. Unlike market-based products and projects, execution of high-speed rail projects is, to a large degree, determined by factors at the state level. Chinese companies do not have notable advantages in developed countries and regions as rail transit equipment suppliers are mature there. In addition, unstable social conditions will likely have adverse impacts on high-speed rail projects.

Chinese companies are likely to export high-speed rail systems to the Middle East and Southeast Asia. Demand for infrastructure construction is strong in the Middle East due to sound economic conditions, high population density, and technologically underdeveloped infrastructure in this region. We think the Middle East is a potential market for Chinese high-speed railway companies. Chinese companies may also have opportunities in Thailand, Malaysia, and other Southeast Asian countries due to high population density and the sound economic conditions of these countries. Advanced economies like Europe and the US already have advanced high-speed railway technologies, and Chinese companies are less likely to sell products there due to fierce competition from local companies such as Siemens and Alstom.

11.3 Factors Influencing Expansion in BRI Countries

Previously, we analyzed the current state and key factors in the global expansion of China's high-end equipment industries. We note that some high-end equipment industries have advanced technologies, while global expansion within these industries is not proceeding smoothly. In this section, we summarize factors influencing expansion in BRI countries from two perspectives—demand and supply—so as to analyze factors that have hindered the global expansion of high-end equipment industries and find potential directions for improving global expansion.

11.3.1 Demand: Large Overseas Markets and Stable Regional Circumstances

While large overseas markets are a prerequisite for the global expansion of Chinese companies, BRI countries typically have medium-sized markets, with large populations but relatively underdeveloped economies. Purchasing power and consumer demand are stronger in developed countries, and the demand for infrastructure construction equipment in these countries is significant due to the presence of large infrastructure construction projects. Therefore, developed countries and regions represent major overseas markets for many high-end equipment industries. Manufacturing equipment industries are more reliant on markets in developed countries and regions than infrastructure construction equipment industries.

BRI countries account for a combined 20–30% of the global market for high-end equipment industries, while major overseas markets are mostly in developed countries in recent years. For example, Indonesia has a larger population and greater demand for infrastructure construction than many other BRI countries, but its engineering machinery industry is still at the initial stage of development. Off-Highway Research data shows that demand for excavators in Indonesia is about 10,000 units/year, compared to around 50,000 units/year in Japan and around 100,000 units/year in the US.⁶

Companies in the energy industry typically build basic power facilities to meet household demand for electricity before considering green transition and the replacement of traditional fossil fuel energy with clean energy. BRI countries account for high market shares in the global power equipment market as their demand for power equipment is relatively inelastic due to their large populations. In contrast, the sizes of their nuclear power, wind power, and solar power markets are small. China's shares in overseas power equipment markets are higher than its shares in overseas wind power and nuclear power markets.

Furthermore, the stability of a region also influences whether a Chinese firm will attempt to increase its overseas presence. General project-based industries are

⁶ Japan and the US are not BRI countries.

more influenced by regional circumstances. High-speed railway and nuclear power industries are project-based industries, and their development is mostly government-led. For example, China has extensive experience in high-speed railway projects and mature technologies, and the construction costs of its projects are lower than those of other countries. However, project owners in developed countries are more likely to hire well-established suppliers in their own countries than Chinese suppliers.

Overseas expansion of project-based industries in developing countries requires regional stability. For example, China's share in the excavator market in Southeast Asia (a relatively stable region) exceeded its shares in the excavator markets of many other BRI regions in 2020. China's excavator exports to BRI countries are closely correlated to the amounts of its local infrastructure construction investments.

China's PV industry has marked cost advantages. Its market size as well as its global market share exceed those of many other countries. While green transition has become global consensus, restrictions on China's PV exports have increased in recent years partly due to protectionism. For example, India and Türkiye have imposed restrictions on imports of Chinese PV products.

11.3.2 Supply: Technology, Cost Advantage, Brands, and Distribution Channels

Factors on the supply side also influence the expansion of Chinese high-end equipment industries in BRI countries. First, technological reliability is a prerequisite for overseas expansion, and experience in projects plays a key role. We note that for domestic industries in China that have steadily expanded their overseas presence, localization rates have reached high levels. The localization rates are low for the machine tool industry, the robotics industry, and other domestic industries that are at the preliminary stage of global expansion. Chinese companies in such industries usually account for low proportions in the domestic market. Their potential for gaining market share in the domestic market is significant, and their moves to build overseas distribution channels require substantial investments, in our view.

We believe that the lack of experience in projects is a challenge to the global expansion of firms in some project-based industries, even if they have advanced technologies. For example, although the domestic production rate of third-generation Hualong One nuclear reactors has reached nearly 90%, the lack of experience in construction projects in the early years of "going global" has weighed on the global expansion of China's nuclear power industry as project owners attach great importance to contractor experience in such projects.

Global expansion of China's PV industry is proceeding more smoothly than that of its wind power industry. The PV industry is a product-based industry, while the wind power industry is a project-based industry as wind power projects require assembly and installation. China's wind turbine industry enjoys cost and price advantages in the

long term. However, the global expansion of the wind turbine industry has proceeded slowly as customers purchasing wind turbines usually require follow-up maintenance services. They impose stringent requirements on the local maintenance service teams of wind turbine companies. Chinese wind turbine companies do not have competitive advantages in developed countries and regions. However, as demand from developing countries continues to grow, China's wind turbine exports to BRI countries have increased in recent years.

Second, domestic manufacturing industries have cost advantages, and we think moves can be made to improve financing schemes. Chinese manufacturing industries have clear cost advantages thanks to the large domestic market, demographic dividend, mature industrial system, and the infrastructure in China. Companies in Southeast Asia have benefited from lower labor and land costs in the past two years compared with Chinese companies. However, most industries in Southeast Asia do not have comprehensive cost advantages due to less mature industrial systems. We believe that almost all domestic firms that sell products or have overseas projects have cost advantages in manufacturing.

Chinese firms also have cost disadvantages in global expansion. The high-speed railway industry, the nuclear power industry, and other project-based industries require long construction periods and substantial capital investments, and they are sensitive to interest rates. China does not have an advantage in interest rate costs vs. developed countries. As such, we think Chinese companies can improve investment and financing schemes for overseas construction projects, and attract project owners by making investment plans more appealing.

Third, brands and distribution channels play important roles in helping domestic companies gain market share in developed countries. Chinese companies have made significant breakthroughs in expanding to developing countries in the BRI, and we believe they will soon be able to turn their attention to the sizable markets in developed countries where they do not currently have much of a foothold. We believe that markets in these countries are of significance for the initiatives of Chinese industries that plan to go global over the long term.

For example, Chinese companies sell excavators in Southeast Asia and other overseas markets where Chinese contractors undertake infrastructure construction projects. Chinese companies have improved marketing channels, service centers, and component factories in these overseas markets. However, their efforts to sell products in developed countries via infrastructure construction projects have yet to pay off. This is largely because they do not have distribution channels in developed countries.

Overseas supply faced headwinds following the onset of the COVID-19 pandemic. Production efficiency remains low in developed countries due to high inflation and low labor force participation rates, even if the direct impacts on the supply sides of overseas markets have eased. Chinese companies have gained opportunities to increase their share in overseas markets thanks to macroeconomic stimulus in those markets. For example, sales volumes of high-end equipment at Sany Heavy Industry have doubled in Europe and the US. Tight supply during the COVID-19 pandemic

presented opportunities for Sany Heavy Industry and other leading Chinese companies to export excavators. We think Chinese companies will be able to improve their brand power and the reputation of their products if they can improve overseas marketing channels, service systems, and financing schemes.

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Chapter 12

AFV Industry Expanding Overseas Along the Belt and Road



Abstract BRI countries and China have ample opportunities for mutual cooperation in the automobile industry, grounded in shared resources, coordinated development, and environmental protection. While auto demand in BRI countries is rising rapidly, the industrial foundation of their auto sectors remains weak. China can provide such countries with high-quality auto products and technologies that can boost local consumption and the popularity of automobiles. This has the potential to bolster local economic growth and employment and elevate living standards. China has the capacity to assist BRI countries in their green transformation and sustainable development. Such countries can also leverage their resource advantages to expand and upgrade their alternative fuel vehicle (AFV) industry chains.

According to the China Association of Automobile Manufacturers (CAAM) and MarkLines, China has held the top position globally in terms of auto production and sales volume since 2009. It became the world's largest AFV market in 2015, and surpassed Germany to become the world's second largest auto exporter in 2022. We believe China's auto industry is able to export high-quality products and technologies. We expect the expansion into overseas markets to not only foster the development of the auto sector in BRI countries, but also reinforce the strength of China's auto industry.

In examining Toyota's overseas expansion since the 1970s, we see an example of mutually beneficial development in a number of Asian countries through various measures such as developing full-value-chain clusters, building factories for localization, and balancing greenfield investment and joint-venture cooperation. The similarities in background and development needs between the Chinese and Japanese auto industry chains make Toyota's experience a valuable reference for China's cooperation with BRI countries.

In recent years, Chinese automakers have accelerated their expansion in products, production capacity, technologies, brands, and human resources in BRI countries. Despite this acceleration, policy support for automakers' overseas expansion still needs improvement, and the formation of industry clusters have yet to take shape. As such, we believe that China should strengthen collaboration with BRI

Author: DENG Xue, ZENG Tao, QI Ding, CHANG Jing, WANG Yingdong, ZHANG Jiaming, SUI Shihua, SI Ying, CHEN Yating, DU Yizhen.

countries in various aspects. We think that automakers should cultivate comprehensive and systematic capabilities to avoid disorderly investment and facilitate healthy competition.

In the realm of automotive batteries, we believe China could encourage the overseas expansion of segments along the value chain to address potential resource constraints and mitigate geopolitical risks. Moreover, establishing closer ties with BRI countries in battery metals leveraging their resource advantages can enrich upstream supply sources. We believe that China's auto industry—especially the AFV sector—will play an important role in the BRI. As the industry ventures into the global arena, China's auto industry has the potential to generate a cluster effect for the industry chain. By leveraging the industry's scale advantage and technological strengths, China's auto sector can facilitate overseas expansion of products, brands, technologies, and talent. We suggest that Chinese auto companies formulate and implement strategies for overseas expansion tailored to the local conditions of BRI countries, considering their economic growth stages, development needs, and resource endowments.

12.1 Enhancing Auto Industry Competitiveness for Mutual Benefits in BRI Countries

12.1.1 China's Auto Industry Likely to Enhance Economic Growth in BRI Countries; Prospects Promising

China and BRI countries possess the foundation for establishing mutually beneficial cooperation in the automobile industry. In China's auto market, domestic auto demand has plateaued, resulting in oversupply. However, auto exports can alleviate such pressure. China's automobile industry has adopted two models for overseas expansion: Product exports and overseas industry chain expansion. China's auto exports have increased significantly since 2021. As part of their global outreach, Chinese auto parts companies are shifting their focus from product exports and M&As to building overseas production capacity and R&D centers. Some domestic automakers have strengthened their international presence in production, manufacturing, and marketing services. China's auto exports deliver high-quality products at affordable prices to BRI countries, which is conducive to improving local living standards.

Furthermore, overseas industry chain expansion involves actions taken by automakers and upstream segments of the industry chain to invest in and build production capacity overseas. This may also support the development of the automobile industry in BRI countries and boost local employment and economic growth. In particular, China's exports of AFV products and technologies have the potential to expedite the transformation BRI countries toward green economies.

Many BRI countries are experiencing rapid growth in auto demand, yet the industrial foundation of their auto sectors remains weak. A high proportion of BRI countries are low- and middle-income countries with low levels of car ownership. Except for some countries in Southeast Asia, Central & Eastern Europe, and South America, most BRI countries have weak industrial foundations for the auto sector and lack competitive local auto brands. Data from MarkLines indicates that 2022 auto production and sales volume in BRI countries or regions were 16.07 mn units and 11.91 mn units, accounting for 20% and 15% of the global total (Fig. 12.1). Auto demand has strong growth potential amid economic development in BRI countries. For example, sales volume of passenger vehicles (PVs) in Southeast Asia, South America, South Asia, and Oceania grew at double-digit CAGRs over 2020–2022. This is in sharp contrast to sluggish demand globally and in developed regions.

China's auto products are primarily exported to BRI countries and regions, and the country's auto industry chain is expanding its presence overseas. Data from China Customs shows that over 2017–2022, China's PV exports to BRI countries rose to 1.15 mn units from about 532,000 units, a CAGR of 24%. With the increase in China's total exports and structural adjustment of export markets in recent years, the proportion of exports to BRI countries has declined. That said, BRI countries have remained the major markets for China's auto exports, accounting for more than 50% in recent years.

Chinese auto brands have gained global competitiveness and are moving away from a brand image of selling low-priced and low-quality products. After establishing leading advantages in technologies in electric and intelligent vehicles, Chinese automakers are gaining an edge in the value for money of their products and building a high-tech brand image. Amid scale expansion and brand upgrading, China's auto industry is seizing the opportunity to shift from product exports to overseas industry chain expansion. We believe that the investment and capacity construction of Chinese firms in overseas regions will promote development of the automobile industry in BRI countries from aspects such as infrastructure improvement, training talent, financial support, and sharing experiences. In addition, many countries are developing AFVs as part of the measures to achieve carbon neutrality. China's AFV value chain boasts world-leading technologies and products, and we expect the overseas expansion of Chinese AFV firms to prompt BRI countries to pick up the pace towards carbon neutrality.

In the upstream segments of the AFV industry, China can leverage the resource endowments of BRI countries to facilitate local industrial upgrading and promote green transformation. Lithium, cobalt, nickel, and rare earths are major battery metals in the upstream sectors of the AFV industry. While China accounts for a large proportion of global rare earth resources, it lacks lithium, cobalt, and nickel resources. Bolivia, Argentina, and Chile all have rich lithium reserves, and Zimbabwe and the Democratic Republic of the Congo (DRC) also have potential to develop lithium resources. In 2022, the United States Geological Survey (USGS) reported that the DRC was home to 46% of global cobalt reserves and 71% of global cobalt output, and that Chinese firms were operating several cobalt mines in the country. Most of global nickel ore resources are in Australia and Indonesia. Since Indonesia banned the

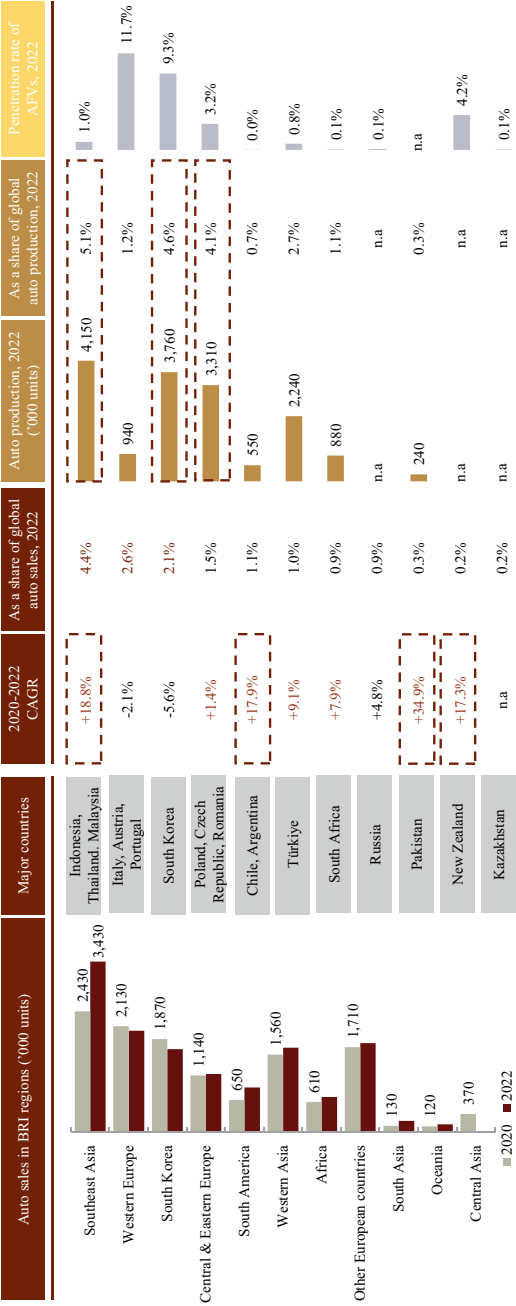


Fig. 12.1 Auto sales volume in BRI countries or regions demonstrates robust growth momentum. *Note* The MarkLines database does not cover all BRI countries; the 2022 auto output, sales volume, and AFV penetration data of some countries under the categories of “Other European countries” and “Western Asia” are missing, and are replaced by 2021 data; data for the auto output, sales volume, and AFV penetration of “Central Asia” is replaced by 2020 data. *Source* MarkLines, CICC Research

export of unprocessed nickel ore in 2020,¹ Chinese companies have been expanding their presence in Indonesia's nickel smelters and downstream sectors along the value chain.

We believe China can deepen cooperation with BRI countries in resource development and localized deep processing, improve its upstream and midstream presence along the value chain, and overcome its weakness in upstream energy metal resources. We think that BRI countries can introduce advanced technologies and production capacity in the AFV sector by leveraging their resource advantages, as well as conducting industrial upgrading and green transformation. This should help them achieve high-quality economic and social development. However, amid the green transition, we also suggest paying attention to the potential risk of rising production costs in technology, energy, capital, and land.

12.1.2 China's Auto Industry Holds a Competitive Edge on the Global Stage Benefitting from Its Substantial Market Size and Advanced Technologies

China has ranked No. 1 globally in auto production and sales volume since 2009. It became the world's largest AFV market in 2015, surpassing Germany to become the second largest auto exporter globally in 2022. Each milestone achieved testifies to China's improving auto manufacturing capabilities, as well as the country's strengths in product exports and overseas influence. China's auto industry is now in a new stage of industrial upgrading to overseas industry chain expansion from product exports, and we expect China's auto sector to play an important role in the BRI.

Previously, the competitive landscape of China's PV market was dominated by joint-venture (JV) automakers or foreign brands. Due to the limited introduction of technologies and domestic production under the JV model, it took a long time for China's automakers to accumulate core technologies and manufacturing capabilities independently, and they thus lagged behind competitors. However, China is now transforming from a major auto producer to an auto powerhouse after going through three stages: (1) Expanding the mini-car market at low prices (1949–2009); (2) developing SUVs with good value for money (2009–2015); and (3) building advantages in electric and intelligent vehicles (from 2015 to present). We expect the transformation to accelerate, driven by overseas expansion of the auto industry in countries that have signed BRI cooperation agreements.

The shift to the rise of domestic auto companies from a market dominated by JVs and foreign companies occurred amid a backdrop of the development of the global auto industry and China's auto sector, as well as the upgrading of auto technologies. However, we should not ignore the notable long-term competitive advantages established by China's auto industry in an era of electric and intelligent vehicles.

¹ <https://www.reuters.com/markets/commodities/investments-indonesias-nickel-industry-2023-02-06/>.

According to 2022 data from the International Organization of Motor Vehicle Manufacturers (OICA), China has become the largest global automobile market with top-ranked economies of scale (Fig. 12.2) thanks to its advantages in flexible policies, substantial market demand, and an efficient supply chain.

The advancement of electric and intelligent technologies has changed the core technological capabilities of automobiles, resulting in major changes in product form and the core value chain. China has caught up with or surpassed international peers in terms of auto technologies, gaining a competitive advantage in the industry chain. Domestic automakers are seizing opportunities from the rise of electric and intelligent vehicles, and their product and brand competitiveness has notably improved. Automakers are leading China toward becoming an automotive powerhouse while enacting measures to promote high-quality manufacturing in other countries.

Leveraging its industrial advantages, China's auto industry boasts world-leading economies of scale, manufacturing capabilities, and supply chains. The automobile industry is a pillar industry underpinning China's national economic development, and automobiles are an important consumer good. Driven by the macro economy and household income growth, the penetration rate of cars in household consumption has gradually increased. Data from the National Bureau of Statistics (NBS) shows that the average car ownership per 100 households in China increased to 43.5 units in 2022 from 16.9 units in 2013. After 28 consecutive years of growth, China's auto sales volume peaked and fell in 2018, suggesting that the country's auto market has entered a mature stage following the growth stage. Consumption upgrading has been an important growth driver for the existing auto market, which continuously promotes technological innovation and product quality improvement to ensure high-quality growth of China's auto market.

The auto industry also makes full use of China's strong supply chain capabilities, as evidenced by clear cost advantages, high-caliber engineers, and efficient management. In an era of electric and intelligent vehicles, such advantages have become more notable due to significant changes in vehicle powertrains. China's advanced AFV batteries, motors, and control systems account for as much as 40% of the bill of materials (BOM) costs. China is able to respond to the needs of automakers in a timely manner as it has a well-established domestic automotive battery industry chain cluster with wide coverage in various segments, in-depth cooperation, and strong value chain support. We believe that this lays a solid foundation for scale expansion and continued cost reduction.

China excels in technological innovation, particularly in the advancement of electric and intelligent technologies. Under the growing trend toward electric and intelligent vehicles, the product form and core value of vehicles have changed significantly. AFV batteries, motors, and control systems are replacing traditional powertrains, and intelligent functions are being upgraded to provide a better intelligent cockpit experience as well as a higher level of autonomous driving. We note that electric and intelligent components account for more than 70% of BOM costs of smart electric vehicles as such vehicles do not use the high-value engine and gearbox powertrain



Fig. 12.2 Competitiveness of China's PV industry. Source CAAM, MarkLines, CICC Research

system that traditional fossil-fuel-powered vehicles use.² Technological barriers that existed with fossil-fuel-powered vehicles have been broken, and China's position in the electric and intelligent vehicle value chain as well as its competitive advantages have significantly improved, making it possible for domestic automakers to upgrade their brands.

Domestic automakers emphasize designing new products, optimizing the brand mix, and upgrading their brands. As a result, the competitiveness of their products and brands has significantly improved. Backed by China's large auto market and educated workforce, the R&D cycle for new vehicles has been reduced to 12–18 months from 28 to 36 months. We see a notable increase in the number of new models released each year as the time to launch models has been shortened. Leading domestic automakers leverage the scale advantage of modularized platforms to broaden product categories and optimize portfolios, meeting the diverse needs of users across various market segments. In addition, in order to overcome the previous low-end brand image, domestic automakers have established distinct high-end electric and smart car brands, which distinguishes these products from their existing mid-range and low-end models. We believe that Chinese automakers are rapidly advancing their journey towards electrification, intelligent upgrading, brand premiumization, and global expansion.

The competitive landscape of China's auto market that was previously dominated by JV brands has changed. Compulsory auto insurance data shows that Chinese brands were experiencing significant YoY sales volume growth and securing prominent market shares across all price ranges of alternative-fuel PVs in 2022 (Fig. 12.3). Furthermore, the persistent efforts of top-tier domestic automakers to expand overseas are yielding positive results in international markets. China's auto exports rose 55% YoY in 2022 to 3.11 mn units, meaning that the country surpassed Germany to become the world's second largest auto exporter, with the proportion of AFV exports also continuing to increase. China's exports of alternative-fuel PVs soared 126% YoY in 2022 to 650,000 units, and the penetration rate of AFVs in exported vehicles rose to 26% from 8% in 2020 (Fig. 12.4).

China introduces advanced AFV technologies to BRI countries for mutual benefits. With domestic automakers having enhanced their manufacturing capabilities and product competitiveness, benefiting from economies of scale and technological advantages, China's AFV industry has become globally competitive. Therefore, China's auto industry is now capable of globally exporting high-quality products and cutting-edge technologies, with the AFV industry's overseas expansion under the BRI framework implying that China's high-end and advanced technologies, high-quality products and brands, and green and environmentally friendly sectors are going global. We think this is a reflection of the transformation and upgrading of China's manufacturing industry, and highlights potential benefits for BRI countries. More importantly, China has the capability to introduce cutting-edge AFV technologies

² Source Autohome, CICC Research.

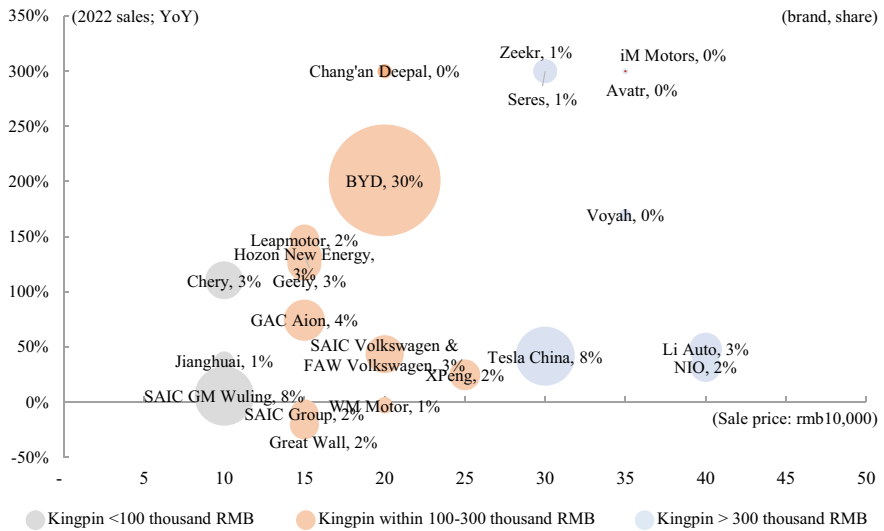


Fig. 12.3 Chinese brands are experiencing significant sales growth and capturing prominent market shares across all price ranges of alternative-fuel PVs. *Source* Compulsory auto insurance data, CICC Research

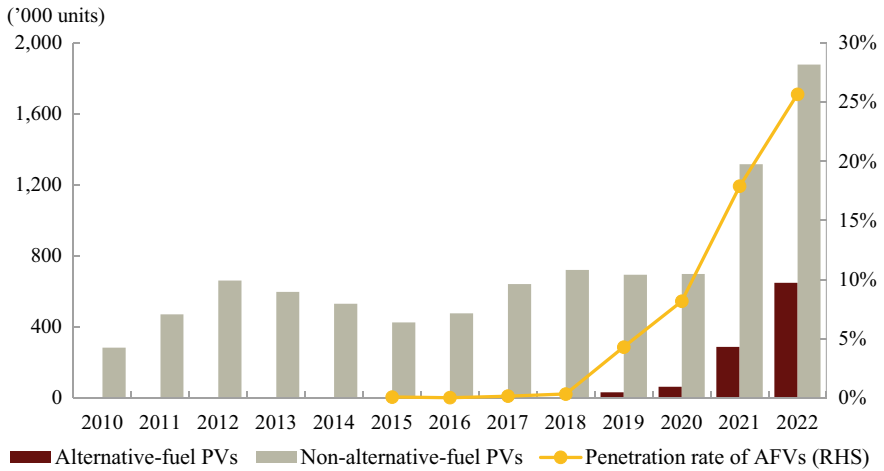


Fig. 12.4 China's exports of PVs have soared since 2021. *Note* Includes AFVs. *Source* CAAM, CICC Research

to BRI countries, elevate production capacity from low value-added to high value-added, redistribute profits across different segments in the auto value chain, and foster substantial collaboration in the AFV industry. We view this as an innovative approach that generates mutually beneficial outcomes for China and BRI countries.

12.2 Harnessing the Industry Cluster Effect and Intensifying Comprehensive Collaboration for Overseas Expansion

As mentioned above, over the past two decades, China's automobile industry has seen persistent enhancements in its manufacturing capabilities, enabling the export of products globally and a notable increase in brand awareness overseas. Overall, the auto markets in BRI countries have visible growth potential given their low car ownership and weak auto industry foundations. As China's auto industry expands globally through the BRI, it can offer good-value-for-money products to BRI countries. This facilitates the widespread adoption of automobiles and contributes to the improvement of people's livelihoods, employment rates, and the overall economy and taxation in these regions. Moreover, the international expansion of AFVs has the potential to support the green transformation in BRI countries. BRI countries can leverage their resource endowments and venture into the midstream and downstream sectors of the value chain. This strategic approach allows for mutually beneficial and fruitful collaboration with China's auto industry.

Several companies in China's auto industry chain are expediting business development in BRI countries across various aspects, including products, production capacity, brands, channels, technologies, and human resources. We interpret this as indicative of the irreversible trend towards overseas expansion of the auto industry. Nevertheless, we assert that Chinese auto companies' overseas expansion under the BRI framework is still marked by weak policy support and the absence of robust industry clusters. Additionally, there is a lack of connection and cooperation with host countries in terms of systematic capabilities, consumer markets, automotive batteries, and battery metals.

12.2.1 Increased Policy Support Has the Potential to Strengthen the Industry Cluster Effect of China's Auto Value Chain in BRI Countries

Given the current domestic and international macro environments, we believe it is imperative for China's auto industry chain to broaden its presence overseas through the BRI. At present, China is grappling with a diminishing demographic dividend, geopolitical tensions, and trade frictions. However, amidst the evolution of electric and intelligent vehicles, new opportunities for technologies, products, and brands are unfolding. The global competitiveness of China's AFV industry is rising with growing demand for PV in Southeast Asia, particularly in the emerging AFV market. Expecting the overseas expansion of China's auto industry to align with local market demand in BRI countries and regions, we believe that the BRI will stimulate the growth of local AFV industries and facilitate the export of high-quality products and advanced technologies.

Looking back, China's policy support for the automobile industry under the BRI framework can be summarized as follows: (1) Encouraging domestic firms to invest in the local auto industry in BRI countries and regions; and (2) facilitating smooth export channels and implementing preferential export trade policies. While the policy guidance has encouraged outbound investment and exports, there has been a notable absence of concrete and practical measures such as comprehensive laws and regulations, fiscal and tax incentives, and financial support. As an illustration, the number of China's overseas industrial parks experienced gradual growth starting from 2000, with a significant increase observed after 2010. The majority of these parks are located in BRI countries. However, they often exhibit unclear industrial positioning and park planning, coupled with limited capabilities in marketing, investment attraction, property management, and production and operational services. Consequently, these parks have limited appeal to Chinese companies, indicating a need for improvement in the cluster effect of China's automobile industry chain.³

The global expansion of China's auto value chain has emerged as a prevailing trend. Greenfield investment stands out as the primary method of investment, with Chinese firms establishing numerous production facilities in BRI countries. Chinese domestic automakers have cultivated solid sales and brand recognition in overseas markets over the years, and have established factories in BRI countries such as Thailand, Indonesia, Malaysia, Pakistan, and Russia. Furthermore, since the beginning of the twenty-first century, Chinese auto parts manufacturers have built production bases in Eastern Europe and Southeast Asia while concurrently serving international automakers. Thanks to their advantages in labor cost, geographical location, and transportation, the majority of BRI countries and regions have evolved into host locations for the capacity expansion of China's auto industry. This expansion has, to some extent, contributed to the development of their automobile industries and improved people's livelihoods.

Presently, while direct greenfield investment is the primary method of investment for China's auto industry's overseas expansion under the BRI framework, other forms of investment such as equity investment in joint ventures and M&As are less prevalent. Additionally, the lack of extensive cooperation between China and BRI countries has resulted in a focus on localization primarily in production and manufacturing, with limited efforts in upstream and downstream processes such as resource processing, R&D, design, and marketing services. Nevertheless, we believe that China has the potential to broaden its auto value chain overseas through various avenues, including greenfield investment, cross-border acquisitions, and investment in joint ventures. This expansion strategy may help deepen resource integration with BRI countries, fostering comprehensive cooperation across the upstream, midstream and downstream segments of the value chain. We believe such measures will stimulate the transformation and upgrading of the AFV industry in BRI countries (Fig. 12.5).

The overseas footprint of China's auto industry chain in BRI countries is now fragmented, with a lack of extensive resource sharing and support among Chinese

³ Zhan, X., & Li, J. (2021). Models of Overseas Industrial Zones and Development Strategy for China's New-Generation Overseas Industrial Zones. *International Economic Review*, No. 1.

Year	Automakers	Presence overseas	Year	Auto parts manufacturers and main businesses	Presence overseas
2014	SAIC	Thailand	2008	SONAVOX Electronics: Car speakers, power amplifiers, and AVAS	Czech Republic
2017		Indonesia	2011	Fuyao Glass: Automotive glass	Russia
2019		India	Since 2012	Tuopu Group: Automotive NVH, aluminum alloy die casting, thermal management, chassis systems	Malaysia, Poland
2021		Pakistan	Since 2016	Huayu Automotive Systems: Metal forming and molds, interiors and exteriors, electronics and electrical components, functional parts, hot working, and AFV businesses	Multiple countries and regions
2019	Great Wall Motor	Russia	2016	Lingyun Industrial: Automotive metal and plastic parts	Indonesia
2020		Thailand	2019	Loncin Motor: Engines and generators	Vietnam
2023		Brazil	2021	Xinquan Automotive Trim: Automotive interior and exterior systems	Malaysia
/		Malaysia	2021	Yinlun Machinery: Heat exchangers and aftertreatment of exhaust emissions	Poland
/	BYD	Pakistan	2022	Baolong Automotive: Tire-pressure monitoring, sensors and air suspension	Hungary
/		Ecuador	2022	Suzhou Cheersson Precision: Precision metal components and related molds	Hungary
2024		Thailand	2023	Pacific Precision Forging: Automotive forging gears	Thailand
2024		Brazil	2023	Ningbo Hengshuai: Automotive cleaning systems and micro motors	Thailand

Fig. 12.5 Expansion of production capacity by Chinese automakers and auto parts manufacturers in BRI countries (as of April 2023). *Source* Company websites, corporate filings, CICC Research

companies; the formation of industry clusters has yet to materialize. The overseas factories established by Chinese automakers such as Great Wall Motor and Chery in BRI countries primarily adopt the knocked-down (KD) manufacturing model. In the KD process, a substantial number of components are transported to overseas regions for local assembly. However, this approach offers only a limited enhancement to upstream supply chain segments and the local auto industry. Chinese auto parts companies have built local factories in BRI regions, including Eastern Europe and Southeast Asia, primarily to meet the demands of international automakers such as Tesla, Ford, and Volkswagen. However, such measures have not generated synergies with Chinese automakers expanding overseas. Furthermore, China's overseas industrial parks, mostly owned and developed by various local provincial governments and municipalities in China, tend to emphasize infrastructure construction while lacking front-end and back-end service capabilities. We believe that the Chinese government and the development of overseas industrial parks could provide more support to realize the desired industry cluster effect.

The overseas expansion of China's auto industry under the BRI framework encounters operational challenges such as cross-border transaction costs. Our discussions with Chinese automakers reveal that while they acknowledge the need for international expansion, they are concerned about short-term earnings and operational risks associated with it. As most BRI countries are developing countries, their legal systems, state governance, and educational levels lag those of developed countries. Chinese companies operating in BRI countries might lack experience in communicating with host governments, particularly at the local level, and may encounter specific issues such as unfavorable political and business environments, difficulties in team integration, and inefficient capacity. Overseas factories of some Chinese auto companies have struggled to achieve profitability even after an extended period. We believe that safeguarding the rights and interests of Chinese firms with an overseas presence while simultaneously cutting overseas operating costs poses a long-term challenge for China's auto industry.

We expect the Chinese government to encourage the overseas expansion of industry chains and the establishment of industrial clusters in BRI countries and regions. This involves developing overseas industrial parks and harnessing the industrial cluster effect to create robust and stable economic benefits over the medium-to-long term. First, to facilitate this, we think that companies can collaborate within China's overseas industrial parks, sharing comprehensive value chain services such as infrastructure, hydropower and other energy facilities, property management, and production and operation. In this way, Chinese firms can streamline their overseas business operations and integrate their connections with local governments, relevant authorities, energy suppliers, property management companies, and other entities in the host country. This collaborative model enables Chinese firms to conduct overseas business operations with Chinese capital, technologies, and services, ultimately reducing the costs of cross-border transactions and overseas factory construction.

Second, Chinese auto companies have the opportunity to enhance synergies within the manufacturing and financial aspects along the supply chain, fostering a strong ecosystem to expand businesses into international markets. For example,

large automakers can establish close horizontal cooperation in financial matters, and secure a stable supply from Chinese auto parts companies. This collaboration can involve standardizing auto parts production through deep integration and connection in the manufacturing process. Such collaboration across the supply chain can lead to a more efficient and competitive auto industry chain, which may ultimately generate greater economic returns.

We now turn to opportunities and challenges facing China's auto industry in its overseas expansion under the BRI framework across three key perspectives: Complete vehicles, automotive batteries, and AFV metal resources.

12.2.2 Improving Systematic Capabilities at Automakers to Deter Disorderly Investments and Foster Healthy Competition

As China's auto industry expands globally, it encounters distinct challenges and opportunities. In Southeast Asia, the fossil fuel-powered vehicle market is fiercely competitive, and is dominated by Japanese and South Korean automakers. Moreover, European and North American brands hold dominant positions in the auto markets in Africa and the Americas. Chinese automakers are confronted with challenges stemming from established brands and intense price competition in these regions. However, with the increasing adoption of AFVs in BRI countries, we believe that Chinese automakers should cultivate AFV consumption habits in overseas markets, leveraging their technological strengths in electric and intelligent vehicles to build comprehensive and systematic capabilities.

(1) Systematic capabilities of Chinese automakers still in the process of improving as they expand globally

As cars are high-priced durable consumer goods, they come with strong consumer demand for services such as personalized configuration, financial support, after-sales maintenance, and the sale of used cars. This means that when exporting products and production capacity to BRI countries, automakers need to possess systematic capabilities across various domains. This includes R&D centers, sales and service outlets, after-sales services, financial services, and charging and battery swapping infrastructure.

According to some Chinese auto companies, despite their products having solid advantages in value for money, local consumers in some BRI countries may opt for Japanese and South Korean brands which can be purchased with local bank loans due to financial policy considerations. Thus, we believe it is crucial for Chinese automakers to receive guidance and support from the Chinese government in securing resources and obtaining bank credit in overseas regions. Especially for AFVs, consumer concerns about driving range, charging, and after-sales services

create a unique set of challenges. Beyond improving the competitiveness and value-for-money of products, the development of comprehensive and systematic capabilities is a significant challenge for domestic automakers seeking to go global, and a key determinant of their success.

For example, we believe that SAIC Motor (SAIC) has become China's largest auto group by export volume (2022 data from CAAM) due to more than just its overseas expansion of production capacity. SAIC has strategically bolstered its global presence by establishing local R&D centers, expanding marketing service networks, improving after-sales service and charging facilities, and implementing differentiated strategies in local markets. This approach underscores SAIC's capabilities in global expansion, encompassing both products and services. SAIC Motor has concentrated its overseas production capacity in Southeast Asia and South Asia, operating four production bases or KD factories in Thailand, Indonesia, India, and Pakistan. The company has also established three innovation R&D centers and three design centers in Europe, the US, and Japan.

SAIC has established more than 1800 regional marketing service centers. These centers are in Europe, South America, West Asia, North Africa, Australia, New Zealand, and ASEAN countries, allowing the firm to provide localized after-sales services such as maintenance, loans, and charging infrastructure. In addition, supported by its own logistics arm, Anji Logistics, the company has opened seven self-operated international flight routes to support supply chain management, spanning regions such as Southeast Asia, Mexico, western South America, and Europe. Moreover, SAIC is promoting talent localization by recruiting a large number of local talents in West Asia, India, and Thailand to develop products and services that meet local demand and improve the overall consumer experience.

(2) *Promote robust competition and mitigate risks associated with disorderly investment and overcapacity*

Confronted with competition from well-established brands in BRI countries, Chinese automakers should steer clear of engaging in price wars and disorderly investments. European and North American brands dominate the auto markets in Africa and the Americas. In BRI regions such as Southeast Asia, competition is intense, and Japanese and South Korean brands offer good value-for-money and align with local consumer habits, thus holding leading positions in such markets. Data from MarkLines shows that the market share of Japanese and South Korean automakers in Asia (excl. China, Japan and South Korea) had at one point exceeded 40%, and maintained a level of around 20% from 2006 to 2022. Over the past two decades, Japanese and South Korean automakers have dominated Asian markets, which we attribute to the low fuel consumption and the high quality of their models. They have built cost advantages and established sound supply chain networks in these markets.

In 2022, fossil fuel-powered vehicles accounted for 70% of China's PV sales volume overseas. Currently, China's exports of fossil fuel-powered vehicle maintain competitiveness primarily through their good value-for-money. The targeted export countries exhibit fragmentation with limited sales volume and market share within individual countries. In our view, with the potential for domestic brands to expand market shares in various countries amid sales growth, it is necessary for them to

carefully consider how to avoid vicious competition, or worse, price wars, with existing market participants in overseas regions.

Looking ahead, we believe China's AFVs exported to overseas regions are characterized by advanced electric and intelligent features, and mature product design. This is a result of the advantages derived from well-established industry chains, manufacturing capabilities, and a skilled workforce of high-caliber engineers. We expect China's AFV industry to excel in exporting high-quality products, expanding overseas capacity, and exporting technology, as well as making breakthroughs in BRI countries. However, we think that achieving breakthroughs in overseas AFV markets will take time, and that AFV companies need to be cautious about avoiding disorderly investment and overcapacity. We note that some international automakers are optimizing their global presence and divesting excess production capacity as part of their strategic plans. This presents opportunities for Chinese automakers to acquire and consolidate high-quality assets, alleviate pressure on capex, reduce operational risks, and to benefit employees at factories and upstream and downstream partners.

For example, Thailand has the largest annual output of automobiles in Southeast Asia (2022 MarkLines data), and has attracted international automakers such as Toyota, Nissan, and General Motors, which have established mature auto production facilities in this market. Great Wall Motor in November 2020 took full ownership of General Motors' manufacturing plant in Rayong, Thailand.

12.2.3 Encouraging Global Expansion of Automotive Battery Production Under the BRI Framework to Mitigate Against Risks Associated with International Competition

The transition towards electric and intelligent vehicles has triggered changes in core component systems and technologies, resulting in changes to the auto industry supply chain. The powertrain of fossil fuel vehicles encompassing components such as the engine and the gearbox is a mechanical product mainly manufactured by subsidiaries of automakers and a limited number of component integrators with close affiliations to automakers. In contrast, the core power system of AFVs, including components such as the battery and the electric drive system, spans a more expansive value chain. This involves various upstream chemical and metal materials, and products are mainly manufactured and sold by third-party independent suppliers.

Thus in the global expansion process, fossil fuel automakers can encourage their engine and gearbox subsidiaries to establish localized factories overseas for auto parts production. In contrast, AFV manufacturers must cooperate with external automotive battery suppliers to ensure local supply chains in overseas regions. In particular, numerous BRI countries possess abundant resources in lithium, nickel, and cobalt—the core raw materials for automotive batteries. We believe this will generate robust synergies with overseas expansion of China's AFV and automotive battery sectors, fostering the development of industry chains in BRI countries.

Anticipating a robust collaboration, we expect China's automotive battery industry to extensively engage in partnerships in BRI countries, leveraging local resources to diversify value chain presence. Until June 2023, the 151 BRI countries did not have policies that directly restrict the midstream lithium-ion battery (LiB) production segment. Except for Indonesia, which has banned the export of unprocessed nickel ores since 2020, and Chile, which planned to nationalize its lithium industry and take more control of natural resources,⁴ other BRI countries have not devised or implemented any restrictive policies or draft plans related to such resources.

We believe that China's automotive battery industry can establish mutually beneficial cooperation with BRI countries, leveraging local resources to expand its presence into the midstream and downstream segments of the AFV value chain. This strategy has the potential not to only broaden market demand outside Europe and the US and diversify production capacity, but to also drive the transformation and upgrading of the AFV industry in BRI countries towards cutting-edge technologies and high-end production capacity.

12.2.4 Strengthening Collaboration to Diversify Upstream Supply Sources by Leveraging the Resource Endowments of BRI Countries

Lithium resources play a crucial role as a primary raw material for AFVs, and fluctuations in lithium prices significantly influence the cost of automotive batteries. Amid supply shortage, rising lithium salt prices would lead to a sharp increase in LiB costs. Over 2020–2022, during the shortage of lithium supply due to the rapid expansion in AFV demand, the prices of battery-grade lithium carbonate and lithium hydroxide soared more than tenfold from their lowest point. As cathode materials constitute the largest proportion of LiB costs, their production costs are predominantly affected by lithium salt prices. Consequently, the sharp rise in lithium salt prices translated into higher LiB costs, exerting upstream cost pressure that was passed on to the downstream sectors of the value chain. The resulting spike in battery costs has thus weakened the profitability of AFV manufacturers, limiting the potential for price cuts in the Chinese AFV market.

We think this underscores the necessity for China to cooperate with BRI countries in securing supplies of lithium resources. Given China's weak cost competitiveness in lithium and heavy dependence on foreign lithium resources, we think the upward trend in lithium prices will lead to higher battery costs, restricting the potential for price cuts in the Chinese AFV market. Overseas lithium mining companies equipped with their own high-quality resources hold a cost advantage, and their long-term agreements with non-Chinese AFV companies enhance their competitive positions.

⁴ <https://www.reuters.com/world/americas/chile-lithium-move-latest-global-resource-nationalism-trend-2023-04-21/>.

12.3 Reflections and Insights

We expect China's auto industry to play a crucial role in the BRI, achieving comprehensive expansion in BRI countries across various dimensions, including product exports, production capacity, brands, technologies, and human resources.

12.3.1 *Promoting International Expansion Through Various Means*

Chinese AFV makers can broaden their global presence through various methods, including direct exports, investment in joint ventures, cross-border acquisitions, and greenfield investment. Investing in joint ventures and pursuing cross-border acquisitions offer a strategy to mitigate policy risks in host countries as foreign enterprises could leverage local resources and export technologies to gain market share. Greenfield investment can help companies sustain their technological and management advantages. Given the diverse characteristics of BRI countries, we believe that Chinese companies in the auto industry can adopt various global expansion approaches. This includes direct exports, joint ventures, cross-border acquisitions, and greenfield investment. Through such methods, Chinese auto companies would strike a balance between leveraging local resources, reducing political risks, and preserving their competitive edge. For example, they can opt to export products directly to smaller markets or form joint ventures with local companies, while investing in upstream and downstream sectors, establishing local industry chains, or exporting key technologies to acquire core resources in large markets.

Especially in regions characterized by political risks, we believe Chinese firms can pursue expansion through technology licensing and operational cooperation. For example, CATL and Ford have announced plans to build a battery factory in North America.⁵ Under the arrangement, Ford will have full ownership of the production facility, while CATL will license its technology and oversee factory operations. This approach helps mitigate risks associated with international competition. We believe that in BRI countries and regions characterized by elevated policy risks and challenges related to international competition, Chinese companies could pursue overseas expansion by adopting novel cooperation models, e.g., technology licensing, and offering operation services and support.

We advocate for efforts to generate an industry cluster effect in the overseas expansion of China's auto industry. Currently, various segments along China's auto value chain lack full cooperation, mutual support, and resource sharing in their global expansion efforts. Individual companies face high costs associated with cross-border transactions and policy risks. Chinese companies can enhance collaboration by forging stronger ties among themselves, fostering industrial clusters through methods

⁵ <https://www.bloomberg.com/news/articles/2023-02-10/ford-set-to-pick-michigan-for-battery-plant-with-chinese-partner>.

such as equity cooperation, establishing supporting factories, and allocating additional resources, thereby improving operational efficiency and competitiveness in the global market.

12.3.2 Emphasizing the Importance of Cooperation and Building Partnerships for Resource Development Under the BRI Framework

The lithium brine project in Argentina of Ganfeng Lithium, a leading Chinese lithium company, serves as a successful example of resource cooperation between Chinese companies and BRI countries. Ganfeng Lithium's technological and financial advantages complement Argentina's resource endowments. The company has expanded its presence along the lithium extraction value chain and fostered strong relationships with the local lake-salt industry. By signing a memorandum of understanding with the provincial government of Jujuy and the Ministry of Productive Development of Argentina, Ganfeng Lithium has been exploring the possibility of establishing a battery assembly plant in Jujuy, Argentina. Moreover, Ganfeng Lithium's lithium extraction project from salt lakes in Argentina has not only created additional job opportunities for local residents, but has also helped the company integrate into local communities. By establishing a welfare foundation and implementing a donation program for communities where it operates, Ganfeng Lithium has garnered support from these communities. The company has also invested in building essential facilities to foster a harmonious relationship between industrial production and the local communities.

Ganfeng Lithium's operations in Argentina offer valuable insights and experience in resource cooperation between China and BRI countries. First, we think Chinese enterprises should carefully consider the complementarity between their unique strengths and the requirements of local economic development. By offering funds and technologies for investment in BRI countries' resources, they can foster mutually beneficial cooperation. Second, China could strengthen collaboration among companies in all segments of the AFV industry chain as they expand overseas. Extending the industry chain should align with the long-term development needs of local industries. Third, Chinese enterprises should be encouraged to embrace social responsibility, emphasizing environmental protection and fostering community relations throughout the resource development process. We believe this approach is conducive to fostering sustainable and enduring partnerships.

12.3.3 Developing and Executing Plans for Overseas Expansion Under the BRI Framework Tailored to Local Conditions to Foster Mutually Beneficial Cooperation

For China's auto industry to expand globally under the BRI framework, it is crucial to consider various factors in host countries, including local demand, industry and policy environment, and production factor endowments. Measures should be tailored and implemented based on the specific conditions of each locality. We use the Porter Diamond Model to assess the competitive advantages of BRI countries. From a macro perspective, we recognize that different countries exhibit variations in demand conditions, economic environments, industrial policies, and production factor endowments, as well as the development needs of their automobile industries. Given such factors, we believe companies in China's auto industry should craft and implement plans for overseas expansion tailored to the specific local conditions in BRI countries.

The auto industry as a whole is characterized by its capital and technology intensity, involving substantial upfront investment, high fixed costs, and significant economies of scale. We believe that companies should prioritize markets with substantial potential demand and favorable competitive landscapes. Meanwhile, these firms should decide on which products to introduce overseas and determine the method of introduction. This process requires consideration of supporting infrastructure along the industry chain, resources, costs, and policies.

Western Europe and South Korea have large AFV markets and high AFV penetration rates, but Chinese companies may face intense competition and policy risks due to the dominance of local automakers and supporting segments of the AFV industry chain in these markets. We believe that while breaking through in fossil fuel-powered vehicles might be difficult for Chinese automakers, opportunities still exist for competitive AFV models to make inroads in these markets, as exemplified by the MG brand's significant share in the AFV market in Western Europe in 2022. Given the relatively high labor and land costs in these markets, it may be more cost effective for Chinese automakers to build production capacity in neighboring regions. However, Europe has clear policy guidance on the localization of the AFV industry chain. Automotive battery manufacturers may carefully consider building factories in local regions to mitigate policy risks and align with the regulatory framework in place.

In contrast to Western Europe and South Korea, the Southeast Asian market has greater growth potential, with extensive industry chain support for fossil fuel-powered vehicles and a continuing increase in AFV penetration. The market landscape in Southeast Asia is characterized by the dominance of Japanese firms and the emergence of local brands. We believe that companies can enter both the fossil fuel-powered vehicle and the AFV segments, and that products with economic efficiency or a high level of intelligence may be more appealing. Either way, we think Chinese firms stand to benefit from the rising penetration rate of AFVs in Southeast Asia. To expand in this region, companies could establish localized production facilities,

leveraging the advantage of lower labor costs and comprehensive supply of auto parts. Notably, firms like SAIC, GWM, BYD, and Neta have already established factories in Thailand. The Thai government's strong support for AFV consumption through subsidies and tax incentives such as income tax reduction, customs duties exemptions, and investment incentive funds, further encourages investment from automakers and auto parts companies.

Indonesia also supports the development of the AFV industry but has imposed specific requirements on local production or procurement of vehicles and parts. With Indonesia's abundant nickel resources and favorable policies, we foresee Thailand and Indonesia becoming major destinations for expansion of China's auto industry chain in Southeast Asia through investment and capacity expansion. Apart from meeting local demand, we believe that developing businesses in Thailand and Indonesia would facilitate Chinese auto firms' expansion further into Southeast Asia, as well as into Australia and New Zealand. We believe that Thailand and Indonesia will become important interchange hubs for the overseas expansion of Chinese automakers under the BRI framework.

Furthermore, West Asia, Russia, and South America also have substantial auto markets. However, we see limited immediate growth drivers for the penetration rate of AFVs in these regions. We suggest entering these three markets by introducing fossil fuel-powered vehicle products and establishing relevant production facilities. Notably, South America has abundant upstream resources, which companies can leverage by incorporating technologies. In this region, we think firms should prioritize their environmental, social, and governance (ESG) performance while also focusing on expanding their industry chain expansion.

Central and Eastern Europe is a relatively small market, but it is located in the middle of the Eurasian continent and has supporting infrastructure for the automobile industry. We expect this region to become an important base for China's overseas construction of automobile production capacity. In regions with smaller auto markets, we believe it may be more efficient in the near term to rely on exports and capacity expansion in neighboring regions.

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Chapter 13

Consumer Industry Boosts the BRI Economy



Abstract The consumer industry is an important part of the Belt and Road Initiative (BRI). The BRI focuses on policy coordination and the connectivity of infrastructure. It aims to foster unimpeded trade, financial integration, and people-to-people exchanges. Household consumption and savings are key variables in macroeconomic growth and economic policy formulation, in our view. We think that connectivity of infrastructure will help reduce the transaction costs of consumer services, and unimpeded trade is key to meeting consumer demand through international trade. We expect financial integration to facilitate the conversion of savings into investments, and we think that people-to-people exchanges are essential to fostering cultural consumption and consumer culture. In addition, we expect consumer industry cooperation between China and BRI countries to facilitate the integration of national economic development strategies, accelerate household consumption and income growth, and enhance people-to-people and cultural communication and exchanges.

Consumer industry cooperation between China and BRI countries covers the full range of business processes, including production, sales, and procurement. Accordingly, we look at such cooperation from the perspective of optimizing global industry chains, facilitating brands' global expansion, and capitalizing on demand from large economies (including global procurement and tourism). First, rising unit labor cost is prompting China's consumer industry to optimize global industry chain distribution in BRI countries. This helps export China's expertise to BRI countries, improve local labor production efficiency, and foster local economic growth. Second, we think engineering expertise has become the main driver for the growth of China's consumer industry. The global influence of Chinese brands is improving rapidly on the back of incremental innovations in products and innovations in distribution channels (such as cross-border e-commerce). Third, as a large economy, China enjoys economies of scale and has the potential to become a major market for BRI countries. Fourth, consumption and culture are closely intertwined, in our view. We expect consumption to facilitate cultural exchanges between China and BRI countries, and familiarize people with each other's culture.

Author: HE Wei, FAN Junhao, ZHU Yiping, LIN Sijie, LIN Jichuan, GUO Haiyan, WANG Wendan, CHEN Wenbo, HOU Liwei, WEI Yifei, HUANG Jiayuan, WANG Jiayu, HUI Pu, CHEN Yudong, WANG Jierui, CHEN Jie, SUN Yuxin, LAI Shengwei, SHUI Jiachen.

13.1 The Consumer Industry is an Important Part of the BRI

The Belt and Road Initiative (BRI) aims to facilitate common development, shared prosperity, and mutually beneficial cooperation among the participating countries. We think improvement in people's living standards, often measured by the level of household consumption, represents an important sign of economic development.

The BRI focuses on policy coordination and connectivity of infrastructure. It aims to foster unimpeded trade, financial integration, and people-to-people exchanges. Household consumption and savings are key variables in short- and long-term macroeconomic growth and economic policy formulation, in our view. We think that connectivity of infrastructure will help reduce the transaction costs of consumer services, and unimpeded trade is key to meeting consumer demand through international trade. We expect financial integration to facilitate the conversion of savings into investments, and we think that people-to-people exchanges are essential to fostering cultural consumption and consumer culture.

We believe the consumer industry is an important part of the BRI. We expect consumer industry cooperation between China and BRI countries to facilitate the integration of national economic development strategies, boost regional market potential, accelerate household consumption growth, satisfy differentiated consumer needs, improve local employment, foster trade balance, and enhance people-to-people and cultural communication and exchanges.

This chapter focuses on the consumer industry, and discusses production, sales, procurement, and cultural exchanges, as well as possible challenges and opportunities in the context of the BRI. We also put forward relevant policy suggestions for optimizing global industry chains, facilitating brands' global expansion, capitalizing on demand from large economies (including global procurement and tourism), and fostering cultural exchanges.

13.1.1 Optimizing Global Distribution of Industry Chains to Boost Endogenous Growth in BRI Countries

China has become a global production center for textiles & apparel, light industry, and home appliances. Driven by an aging population and rising labor cost in China, as well as regional tariff barriers, the country's consumer industry is increasingly optimizing the geopolitical distribution of industry chains in BRI countries. We think the global distribution of production capacity for China's consumer industry can help export China's expertise to BRI countries, facilitate industrialization in these countries, and boost local employment. This would bring opportunities for BRI countries to overcome the bottlenecks in their development, in our view.

Through building global industry chains, China's consumer industry may improve labor productivity in BRI countries and foster endogenous growth of local economies.

To expand production capacity globally, Chinese consumer companies need to tailor their globalization strategies based on local conditions. While labor cost is an important consideration, we believe labor productivity should also be taken into account when developing such strategies. For example, the growth of labor productivity in Indonesia and Thailand over the past decade was largely on a par with that in Central and Eastern European countries (e.g., Bulgaria and the Czech Republic). However, growth in labor income in these countries was relatively slow during this period, indicating that some ASEAN countries still enjoyed advantages in unit labor costs. We think direct corporate investment in BRI countries with relatively low labor productivity may not only create synergies between capital and labor, but also help improve labor productivity in these countries through localization of factors of production such as technologies and management. This may foster endogenous economic growth in these countries, in our view.

13.1.2 Facilitating Global Expansion of Brands to Tap into Diversified Market Demand in BRI Countries

China and BRI countries vary in resource endowments and demand. We believe China and BRI countries are complementary to each other, which is conducive to driving high-quality development of these countries. Most BRI countries are rich in natural resources, while China boasts comparative advantages in manufacturing consumer goods, making the two parties complementary to each other in resource endowments and comparative advantages. For example, China could import goods and services such as commodities and agricultural products from BRI countries, while increasing its exports of consumer goods to these countries to meet growing local demand.

The consumer goods market is characterized by a diverse variety of consumption needs, fierce competition, high demand for innovation, and intergenerational differences in consumption. BRI countries are experiencing rapid population growth, and boast a relatively young demographic structure. While their total population is 2.6 times that of China, their population of people aged 15–40 is three times that of China.¹ We think China's consumer goods industry has strength in innovation in an incremental fashion, and offers fast-evolving, high-quality, and low-price products. We thus think the industry is well positioned to benefit from the fast-growing, young, and diverse consumer markets in BRI countries.

We think a larger market can help improve the manufacturing efficiency of Chinese consumer goods, boost technological advances and product innovation, and allow Chinese firms in the consumer industry to benefit from economies of scale. We think Chinese companies can provide job opportunities for the young workforces in BRI countries, improving the synergies between China and these countries in funding,

¹ Source The United Nations.

technologies, and labor force. We expect the synergies to facilitate the development of manufacturing industries and technological innovation in BRI countries, boost economic development and social welfare, and improve local people's living standards.

We think the main driver of the growth of China's consumer industry has transitioned from favorable demographics to engineering expertise. We are upbeat on the global expansion of Chinese brands on the back of incremental innovations in products and innovations in distribution channels (such as cross-border e-commerce). Notably, a number of Chinese brands have gained influence in BRI countries, such as Chinese TV (e.g., Hisense) and handset (e.g., Transsion) brands in Africa, as well as Chinese consumer electronics (e.g., Honor, Xiaomi, OPPO, VIVO, and Transsion), major appliances (e.g., Haier and Midea), restaurants (e.g., Haidilao), and film & TV (e.g., iQIYI and Tencent) brands in Southeast Asia.

Growing household income in BRI countries may create market potential for Chinese consumer brands to go global. Consumption is a function of household disposable income, but the two do not always move in lockstep. In 1957, Milton Friedman² published *A Theory of the Consumption Function* and Franco Modigliani³ propounded the life cycle hypothesis of savings and consumption. Essentially, they saw the significant intertemporal nature of household consumption, and believed that income growth tends to be largely consistent with consumption growth over a longer period of time.

13.1.3 Leveraging Large Domestic Demand and Economies of Scale to Make China One of the Major Markets for BRI Countries

The China market enjoys economies of scale, and the growth in China's imports of goods and services from BRI countries can help to boost economic growth in these countries. Economies of scale have played an important role in China's growth into a global manufacturing center over the past three decades. In addition to demand for industrial goods, there is also substantial demand for consumer goods in China. For example, China's demand for agricultural products such as tropical fruits and services such as overseas travel has been trending upwards.

BRI countries vary markedly in geographical location and climate conditions, and each has its unique advantages in natural resources. Consumer industries such as agriculture and tourism are critical to economic development in a large number of BRI countries. However, restrictions relating to transportation, funding, and technologies have long prevented these countries from benefiting from international trade.

² Friedman, M. (2018). Theory of the consumption function. In *Theory of the Consumption Function*. Princeton University Press.

³ Modigliani, F., & Ando, A. K. (1957). Tests of the life cycle hypothesis of savings: Comments and suggestions 1. *Bulletin of the Oxford University Institute of Economics & Statistics*, 19(2), 99–124.

The BRI calls for interconnectivity among participating countries. We think measures such as promoting the connectivity of infrastructure and financial integration can pave the way for enhancing trade, economic development, and cooperation between China and BRI countries. We expect high-quality agricultural products, tourism, and other goods and services from BRI countries to meet growing demand in the China market.

Moreover, we believe China can leverage its large domestic demand to enhance the flow of trade, funds, goods, and data between China and BRI countries, and boost the development of these economies. We also think improved infrastructure such as transportation and logistics infrastructure in BRI countries may promote their imports of goods and services from China, and also facilitate the growth of their local economies and household income.

13.1.4 Strengthening Cultural Exchanges Through Consumption

Consumption and culture are closely intertwined, in our view. We expect consumption to facilitate cultural exchanges between China and BRI countries, and familiarize people in those countries with Chinese culture. Experience from developed countries shows that the globalization of consumer goods can enhance the global influence of certain cultures, and turn such goods into cultural symbols. European countries, the US, Japan, and South Korea have leveraged consumer goods to facilitate their cultural exports and enhance their soft power across the globe.

We think the global expansion of China's consumer industry is conducive to exporting Chinese culture and improving the image of China in BRI countries. In the past, China's consumer and cultural industries focused their marketing more on Europe and the US and less on BRI countries. We think Chinese consumer companies could emphasize the appeal of Chinese culture and go beyond being just the suppliers of value-for-money products and services.

For example, we think Kweichow Moutai could enhance its influence in international liquor culture, and MINISO could highlight Chinese cultural elements in its products. In addition, we think technology companies such as Xiaomi, Roborock, and Ecovacs could showcase China's innovations in consumer goods. Moreover, we note that some Chinese cultural works have become influential internationally, including LI Ziqi's short videos, online novels such as *Battle through the Heavens*, science fictions such as *The Three-Body Problem*, and games such as *Genshin Impact*. Chinese TV series have gained increasing popularity in Southeast Asia as well.

In the rest of the chapter, we will elaborate on global industry chain distribution, global expansion of Chinese brands, and demand in China as a large economy.

13.2 Labor Cost and Tariffs Drive Global Industry Chain Distribution

13.2.1 Labor Cost and Tariff Barriers Are Key Drivers of Global Industry Chain Distribution

The textiles & apparel and furniture manufacturing industries are sensitive to changes in labor cost. Garment manufacturing involves processes such as cutting, sewing, ironing, and packaging. The industry relies mainly on manual work for sewing, and labor cost accounts for a high proportion of total cost due to the soft texture of apparel and the low level of automation in the production process. The upholstered furniture manufacturing industry is also labor-intensive, and so was the home appliance industry before its transition to automated production. These industries are relatively sensitive to changes in labor cost, and are thus incentivized to build production facilities in regions with lower labor costs to improve profit margins.

Labor resources abound in South Asian and Southeast Asian countries, and labor cost in some BRI countries is much lower than that in China. According to the International Monetary Fund, people aged 15–64 accounted for 69% and 65% of the population in Vietnam and Cambodia in 2021, rising 6ppt and 8ppt from 2000.

Differences in tariffs among countries and regions also play a part in the relocation of production capacity for China's consumer industry. Due to trade frictions in recent years, it has become more costly to export to certain countries from China than from BRI countries such as Vietnam and Cambodia. Exports from regions with low tariff rates tend to enjoy more competitive pricing, prompting China's consumer industry to relocate production capacity to overseas markets.

13.2.2 Southeast Asia Has Been the Main Destination for the Capacity Relocation of China's Consumer Industry

Chinese consumer goods manufacturers are expanding industry chains to distribute production capacity globally. China's textiles industry has invested in over 100 countries and regions,⁴ including key markets such as Southeast Asia and Africa for expanding production capacity, as well as Europe, the US, and Australia for reaching consumers and improving design and technologies. We therefore think China's textiles industry can adapt to changes in the industry chain in the long term.

In addition, large home appliance companies such as Midea and Haier have built factories around the world to facilitate product delivery, while also improving their overseas businesses through M&A. Such companies have completed large-scale

⁴ <http://chinawto.mofcom.gov.cn/article/ap/p/202201/20220103236583.shtml>.

Company	Main business	Production distribution
Light industry		
CCGRASS Green Innovation	Artificial turf	49% in Vietnam and 51% in China
Loetek Ergonomic Technology	Ergonomic office equipment and furniture	30% in Vietnam and 70% in Zhejiang and Guangxi, China (2021)
Xiamen Intretech	Intelligent control components and consumer electronics	In 2021, the production capacity of Malaysia's intelligent manufacturing base has reached over 30%; 1H22 Malaysia's intelligent manufacturing base production capacity has decreased YoY.
Home furnishing		
KUKA Home	Finished furniture	Vietnam and Mexico
Man Wah Holdings	Sofas	Vietnam and Mexico
Household light industry		
Chervon Holdings	Electric tools and outdoor equipment	10% in Vietnam and Europe
Joy Kie Corporation	Bicycles and electric scooters	European electric scooter production capacity accounts for approximately 20% in 2022.
Shenzhen Yuto Packaging Technology	Printing and packaging	10% in Southeast Asia and India
Personal care		
Hangzhou Haoyue Personal Care	Diapers	Thailand

Fig. 13.1 Relocation of light-industry manufacturing capacity. *Source* Corporate filings, CICC Research

construction of production facilities in Europe, the Americas, Southeast Asia, South Asia, East Asia, and Africa, and thus enjoy significant network effects.

Southeast Asia has been the main destination for the capacity relocation of China's consumer industry. China is the world's biggest apparel exporter, with the Chinese mainland accounting for 32.1% of global apparel exports in 2021, down 7.1ppt from the level in 2013. Bangladesh and Vietnam have captured some of the market share that China lost, accounting for 7% and 6% of global apparel exports in 2021. Light-industry companies, including suppliers of home furnishings (such as sofas and mattresses), personal care products (such as diapers), and pedelec bikes and power tools, have also opted to build factories in BRI countries such as Vietnam and Laos. In addition, China accounts for about 90% of the world's total net exports of consumer appliances. In the audio & visual industry, about 52% of net exports come from China, 24% from Central and Eastern Europe and Türkiye, and 19% from Latin America. Southeast Asia has also become a net exporter of audio & visual products in recent years (Fig. 13.1).

13.2.3 Insights from History on Capacity Relocation

Leading Chinese consumer companies have gained insights from their years of experience in overseas capacity expansion. There is a learning cycle involved in improving international business operations, in our view. While large companies tend to be more experienced, we think many small companies lack a full understanding of local policies and culture in their target markets. A learning process is thus essential to gaining such an understanding.

For example, stringent policies on environmental protection are in place in some countries and regions. Chinese companies that have successfully expanded production capacity overseas need to strictly abide by local environmental requirements and attach importance to green production. In addition, some countries and regions

differ significantly from China in religion, culture, and customs. We think companies should thoroughly survey local conditions before building factories overseas, and facilitate adaption to local business environments by sending staff abroad and integrating with the local culture.

13.3 Chinese Brands Are Expanding Overseas and Tapping Market Potential in BRI Countries

13.3.1 Chinese Brands' Global Influence is Improving Rapidly

Following China's accession to the World Trade Organization in 2001, the country has gradually grown to become one of the world's most important production bases for the majority of consumer goods on the back of its advantages in cost and efficiency. Along with the improvement in industry chains, China is transitioning from an original equipment manufacturing (OEM) model to an original design manufacturing (ODM) model. In recent years, China has significantly strengthened its ability to innovate in consumer goods thanks to a large workforce of skilled engineers. The global influence of Chinese internet companies has improved as well. As e-commerce begins to reshape offline distribution channels globally, Chinese consumer goods brands are rapidly gaining market share across the world by leveraging their first-mover advantages in e-commerce.

Chinese consumer brands from various industries have made inroads in their global development. Consumer electronics brands such as Xiaomi, and Transsion have moved fast to build their competitiveness in overseas markets on the back of rapid product innovations. While Chinese consumer appliance brands moved early in going global, their advancement in this regard has been relatively slow. That said, Chinese companies such as Haier and Midea have expanded their global footprint rapidly in recent years by acquiring overseas brands and developing their own brands. Meanwhile, light-industry brands have expanded overseas by leveraging the new retail model,⁵ and many cross-border e-commerce companies such as Shein and MINISO market their light-industry products online.

In the past few years, Chinese consumer brands focused their overseas expansion on developed countries in Europe and the US due to the strong spending power and standardized markets in these countries, especially the large, unified US market. However, many Chinese consumer companies have started to see rapid growth in their branded businesses in BRI countries. We think China's consumer industry could pay more attention to the growth potential of consumption in BRI countries and regions.

Meanwhile, Chinese brands have encountered many difficulties and setbacks in their global forays. For example, after capturing a large share of the Vietnamese

⁵ The new retail model refers to the integration of online and offline shopping experiences.

motorcycle market in the early 2000s with competitive pricing, Chinese motorcycle brands saw their market shares fall rapidly due to disappointing product quality. In addition, TCL acquired the French TV company Thomson in 2003, only to see its value plunge as flat-screen TVs rapidly replaced cathode ray tube TVs.

Furthermore, Chinese internet companies have faced numerous regulatory challenges overseas. Some companies expanded into industries with which they were not familiar or misjudged industry trends, while some faced the challenge of industry chain disruptions. That said, we expect Chinese companies to learn from such setbacks and forge ahead.

In the remaining part of this section, we look at consumer electronics, consumer appliances, and daily necessities, and some representative companies in these industries. We also analyze how Chinese internet companies leverage their global influence to facilitate the global expansion of Chinese brands.

13.3.2 Chinese Consumer Electronics Brands Are Engaging in Global Expansion

Chinese consumer electronics brands have been gaining global market share in recent years. A number of leading global brands such as Honor, Xiaomi, Oppo, Vivo, Transsion, TCL, Hisense, Anker Innovations, and XGIMI Technology have emerged in consumer electronics segments such as handsets, TVs, and smart accessories. For example, Chinese smartphone brands have made their name in overseas markets and showed robust growth momentum thanks to their good-value-for-money products and services, rapid product upgrades, superior distribution channels, and effective localization strategies.

We have seen strong growth of Chinese brands in both developed regions with relatively saturated markets and emerging markets with large potential. According to Counterpoint, three of the top five smartphone brands in Europe by market share in 2021 were Chinese companies, namely, Xiaomi (with a market share of 20%), Oppo (5%), and Realme (3%). In addition, their market share is steadily trending upwards. Among the top five players in Latin America by handset market share in 2021, Xiaomi ranked third and booked the fastest market share expansion to 10.5% from 6.5% in 2020. ZTE ranked fourth, booking YoY growth of 74% and market share of 4.5%. Meanwhile, the Chinese brand Transsion outperformed in Africa. According to IDC and the CICC Research technology hardware team, Transsion's smartphone shipments in Africa totaled 11.14 mn units in 4Q21, giving it a market share of 47.9%, well ahead of Samsung, which ranked second with a market share of 19.6%.

Transsion has stood out for its overseas expansion in BRI countries, and exemplified success in BRI markets despite its lack of advantages in technologies. The firm is a leading handset supplier in Africa. According to IDC, Transsion has maintained a

share of more than 40% of the African handset market for several consecutive years.⁶ In the Africa market, the firm attaches importance to its localization strategy. First, it has worked diligently to localize products. In addition to low prices, Transsion has calibrated the cameras of its handsets for darker skin tones. Some of its handsets support the concurrent use of four SIM cards since local consumers usually have several SIM cards due to the high cost of cross-carrier calls. The firm has also integrated subwoofer features into its handsets to cater to the entertainment needs of local consumers. Second, the firm pays attention to localizing distribution channels and marketing. For example, it has recruited a large number of distributors and built an extensive offline sales network, considering the offline-dominated markets in Africa and the complex offline distribution channels there. The firm has also customized its marketing strategies. For example, it has hired local singers as brand ambassadors, and focused on marketing in rural areas at first and painted its marketing murals on the exterior walls of major buildings there. We believe the success of Transsion in Africa has delivered value-for-money and better customized products to local consumers. Its success also highlights the importance of localizing product functions, distribution channels, and marketing in addition to offering value-for-money products and services for Chinese consumer brands going global, in our view.

Transsion has also developed rapidly in Southeast Asia. The region accounted for 11.2% of the firm's handset shipments in 4Q22, up from 2.7% in 4Q19. In particular, Transsion's market share in the Philippine jumped from 8% in 2020 to 16% in 2022, and the firm ranked among the top five brands by sales value during Lazada promotional campaigns in 2022. We think a number of factors have contributed to its success. First, by leveraging its acute insights into local consumer preferences and market trends, Transsion focused on the mass consumer markets in countries with relatively low income levels and spending power such as the Philippines⁷ when it first entered the Southeast Asia market, and launched a series of affordable handsets with stable performance and practical functions. Second, it has adopted a localized operation strategy, and established local R&D centers, marketing teams, and after-sales service centers to cater to the needs and habits of local consumers. The firm has also strengthened cooperation with local telecom operators and electronics retailers, and built stable distribution channels and sales networks.

Apart from Transsion, the market share of other Chinese smartphone brands has also been trending upwards in major Southeast Asian countries since 2013. According to Euromonitor, there were at least three Chinese brands among the top five smartphone brands by market share in the six major Southeast Asian countries in 2022. Notably, Xiaomi had the highest market share in Malaysia at 31%, while Oppo has built market shares exceeding 20% in Thailand, Indonesia, and Vietnam. While the

⁶ IDC. (2023). Africa's Smartphone Market Declines Amid Inflationary Pressures and Weaker Demand.

⁷ Gross national income per capita was about US \$3419 in the Philippines in 2021, relatively low among the six major Southeast Asian countries (Indonesia, Malaysia, Singapore, Thailand, the Philippines, and Vietnam).

market share of Chinese brands is still below that of Apple and Samsung in Singapore, their combined market share increased to about 20% in 2022 from less than 3% in 2013. We note that Chinese brands are gradually expanding to the premium handset market, and they appear determined to continue this effort.

13.3.3 Chinese Consumer Appliance Brands Are also Going Global

Global expansion of Chinese home appliance brands started to gain momentum after 2020. Leading Chinese home appliance companies attempted to expand their overseas presence in the 2010s, but such efforts were premature back then. The global expansion of these brands started to gain momentum after 2020 as the COVID-19 pandemic led to a significant increase in demand for home appliances in Europe and the US. By that time, China had become a frontrunner in incremental innovations for a large variety of home appliances, and e-commerce had started to reshape traditional offline sales channels in Europe and the US. These developments contributed to significant growth in China's home appliance exports in 2020 and 2021.

Consumer appliances trail markedly behind consumer electronics in product upgrades, making it more difficult for new consumer appliance brands to crack markets with a relatively stable competitive landscape. Chinese consumer appliance brands are therefore inclined to expand globally via M&A. The consumer appliance markets in BRI countries are growing rapidly, boding well for Chinese companies to develop their own brands. Meanwhile, Chinese companies have preferred expanding in developed countries and regions via M&A, and examples include Haier's acquisition of the home appliance businesses of GE and Sanyo, Midea's acquisition of the home appliance business of Toshiba, Hisense's acquisition of Gorenje, and JS Global Lifestyle's acquisition of the small appliance business of SharkNinja.

Haier has been expanding its brands globally since 2006. Since the 2000s, Haier has started marketing its own brand globally, and building factories in the US, Thailand, Nigeria, Jordan, and Pakistan to produce and market major appliances. In the 2010s, Haier began to acquire and integrate foreign home appliance brands in developed markets to facilitate its global expansion. For example, the firm has acquired Sanyo's major appliance business, Fisher & Paykel in Australia, the home appliance business of GE, and Candy in Europe, among others. These acquisitions have helped Haier secure some factories owned by target firms around the world, which has been conducive to furthering its globalization. In 2015, Haier Group started to designate Haier Smart Home as its global platform for home appliance businesses, and has since gradually consolidated various overseas home appliance businesses into this entity, whose spending on M&A totaled more than Rmb55 bn over 2015–2020. Haier's M&A strategy has paid off handsomely thanks to the relatively slow changes in major home appliances and their distribution channels, and the high recognition

of local brands in some developed markets. As of end-2022, Haier had 122 manufacturing centers and 30 industrial parks around the world, covering nearly 230,000 points of sale and 1 bn users and households.

In BRI countries and other developing economies, Haier attaches importance to multi-brand and localized business operation. First, the firm maintains localized business operation integrating R&D, manufacturing, and marketing, and seeks to build local product R&D laboratories, manufacturing facilities, and complete marketing networks. For example, it launched the SAP system at its manufacturing facilities in Vietnam and Indonesia in 2017. The firm held a groundbreaking ceremony for its industrial park in northern India in 2019, which reached full production capacity in 2021. Second, the firm gives full play to the advantages of acquired brands. In addition to the Haier brand, the firm markets the Japanese brand AQUA in Southeast Asia, and completed product planning for Candy in Indonesia in 2022. It has also introduced Casarte to Thailand to target different market segments and expand new markets. Third, Haier continues to build local experience stores in addition to improving its distribution system. For example, it opened its 001 store in the Philippines in 2021, put the Casarte premium smart experience center in Thailand into operation in August 2022, and debuted AQUA's branded store in Makassar, Indonesia in February 2023.

13.3.4 Chinese Light Industry Brands Leverage Branded Retailers to Tap Global Markets

It has proven economically viable for Chinese light industry companies to go global through branded retailers. Due to the large variety of light industry products and the relatively small market for some categories of such products, we do not think it is cost effective for light industry brands to directly expand into the global market. Instead, it has proven economically viable for them to go global on the back of branded retailers such as branded chain stores (e.g., Muji of Japan). A Chinese brand, MINISO, has emerged as a global chain retailer for such products. Founded in 2013, MINISO initially benchmarked itself against Muji, but has gradually taken its own path and expanded globally. With a simple and natural design style, MINISO has grown into a branded chain retailer with more than 8800 key stock keeping units (SKUs) in a variety of product categories, including fashionable home furnishings, consumer electronics, cosmetics and personal care products, stationery, and gifts. According to Frost & Sullivan, MINISO is the world's largest retail brand for private-label lifestyle products, with a market share of 6.7% globally and 11.4% in China measured by GMV in 2021.

MINISO began its global expansion in 2015, and has expanded to both BRI and non-BRI countries. As of June 2023, it has expanded to more than 105 countries and regions, including developed countries such as the US, the UK, Australia, France, and Singapore, as well as emerging markets such as Latin America and Southeast Asia. The number of its overseas stores has been rising steadily in recent years, with a

net addition of 672 stores over 2019–2022. The number of its overseas stores reached 2027 in 2022, accounting for about 38% of its total number of stores. The share of its overseas revenue rose from 22% in 4Q20 to 40% in 4Q22. In February 2023, MINISO's chairman and CEO Mr. YE Guofu announced the firm's strategic focus on localizing and refining business operations in overseas markets, and developing MINISO into a super brand across countries.⁸

We think MINISO has succeeded by appealing to consumers and facilitating repeat purchases with attractive, affordable, and high-quality products and frequent innovations. In addition, its groundbreaking retail partner model has fostered rapid and standard distribution channel expansion and contributed to economies of scale. Moreover, large-scale procurement and digital tools have helped reduce cost and ensure stable and efficient supply chains. Apart from advantages in prices, MINISO has also worked diligently to differentiate its positioning and product portfolio based on local competitive landscapes and the purchasing power and preferences of local consumers.

MINISO has become successful in Southeast Asia. With the rapid rise of the middle class and changing consumer attitudes, we see large growth potential for variety stores in the retail store market in Southeast Asia. As a well-known variety store, MINISO has gained popularity among young consumers in the region thanks to its fashionable design, affordable prices, and quality services. The firm's "high-quality and low-price" strategy aligns with local spending power, and its fashionable and practical designs appeal to young consumers. Furthermore, the firm has leveraged its innovative retail partner model to expand to major commercial districts and shopping malls, thus rapidly expanding its distribution channels and market share. In Vietnam, for example, MINISO has worked diligently on marketing, and improved its brand influence and popularity on the back of endorsement by famous singers, strategic cooperation with Vincom (shopping malls of Vietnam's largest real estate group), simple store decoration, and convenient shopping experience. The rise of MINISO has ended the long-term dominance of Daiso (a Japanese brand) in the market, making the former a new leader in the retail market for light industry products in Southeast Asia. Notably, MINISO's market share gains in the two major markets of Indonesia and Vietnam have been the most significant. According to Euromonitor, MINISO's market share in these two markets jumped to 87% and 39% in 2022 from 16 and 17% in 2016.

13.3.5 Globalization of China's Internet Industry Fosters Overseas Expansion of Chinese Consumer Goods Brands

China's globally competitive internet industry has facilitated the global development of Chinese consumer goods brands. China's internet industry—which includes

⁸ <https://www.miniso.cn/News/Details?id=100000318628685>.

the e-commerce, long video, short video, and online game segments—is globally competitive and growing. The development of e-commerce has reshaped the structure of distribution channels of overseas consumer goods markets and brought advantages to e-commerce-savvy Chinese companies. Moreover, Chinese companies' deep understanding of the value of internet branding gives them an edge in marketing their products and brands.

The global e-commerce and cross-border e-commerce markets have grown substantially after the COVID-19 pandemic. While the US and Western Europe represent the most important markets for cross-border e-commerce, other regions are also growing rapidly. This major cycle of development has seen the rise of signature companies such as Shein and Anker Innovations.

The market potential of BRI countries and regions should not be overlooked, in our view. Despite relatively low internet penetration, e-commerce is growing rapidly in these countries and regions. In particular, Southeast Asia is characterized by its enormous population, swift economic development, and close geographical proximity to China. As a result, the Southeast Asia market has become a focus of business development for most leading Chinese internet companies, and these companies are playing an active role in the internet industry in the region. For example, Chinese leaders in long videos such as iQIYI and Tencent Video are growing rapidly in Southeast Asia, and rivaling European and US peers such as Netflix, HBO, and Disney. In addition to releasing Chinese TV series in Southeast Asia, iQIYI and Tencent Video have also started local production of TV series and invested in local TV series.

While Southeast Asia's e-commerce industry trails behind that of China, it is growing rapidly at a similar pace to that of China's e-commerce industry back in the 2010s. In 2022, excluding food and beverages, the e-commerce penetration rate averaged about 20% in Southeast Asia as a whole, and approached about 30% in frontrunners such as Indonesia and Singapore, followed by the Philippines, Thailand, and Vietnam, with e-commerce penetration rates of about 15%.⁹ However, they still lagged behind the penetration rate of 47% in China. Shopee, the largest e-commerce platform in Southeast Asia, has received strategic investment from Tencent, and is learning from China's successful e-commerce expansion through cross-regional experience exchanges. Meanwhile, Alibaba has a controlling stake in Lazada, the second largest regional e-commerce company in Southeast Asia. The company has integrated Lazada into its global e-commerce ecosystem. Through Lazada, Southeast Asian consumers can access popular products on Taobao and Xiaohongshu, and directly contact Chinese online merchants to purchase Chinese products.

⁹ <https://www.mckinsey.com/industries/travel-logistics-and-infrastructure/our-insights/e-commerce-is-entering-A-new-phase-in-southeast-asia-are-logistics-players-prepared>.

13.4 China's Large Demand Can Create a Win-Win Situation Between China and BRI Countries

13.4.1 *Non-staple Agricultural Products*

China has seen steady growth in consumption of agricultural products and growth in demand for imports of such products. The country is the world's most dynamic market for food and agricultural products, and the largest importer of agricultural products. Despite self-sufficiency in staple grain, China still needs to import a large volume of non-staple agricultural products amid consumption upgrading. The consumption of agricultural products in China has been rising steadily since 2015 and reached 2.2 bnt in 2022, with a CAGR of 3.1% over 2015–2022.¹⁰ In addition, China's imports of agricultural products have been expanding since 2015, and the import value of agricultural product reached US \$224 bn in 2022 with a CAGR of 11.4% over 2015–2022.¹¹

China's overall imports of agricultural products have been growing faster than its consumption volume, which we attribute to changes in the consumption structure of agricultural products, driven by strong demand for and rapid growth in the consumption of non-staple agricultural products. Moreover, due to differences in resource endowments, China relies mainly on imports to meet its demand for some non-staple agricultural products, and this may have fueled the rapid expansion of the country's overall imports of agricultural products.

Imports of non-staple agricultural products play an important role in meeting the growing needs of domestic households amid consumption upgrading in China. Along with the changing diets of Chinese households, demand for traditional staple food is stabilizing, while demand for non-staple agricultural products is increasing. We note the growth in China's per-capita consumption of meat, poultry, eggs, dairy, aquatic products, and dried and fresh fruits has outpaced that of overall agricultural products. Data from the National Bureau of Statistics shows the proportion of per capita consumption of meat, poultry, eggs, dairy, aquatic products, and dried and fresh fruits rose to 7.9%, 3.0%, 3.2%, 3.5%, 3.4%, and 14.7% in 2021 from 7.0%, 2.0%, 2.3%, 3.2%, 2.9%, and 11.2% in 2013.

Imports of these non-staple agricultural products have also grown faster than those of overall agricultural products. Data from the General Administration of Customs shows the proportion of imported agricultural products such as meat and edible offal, aquatic products, edible fruits and nuts, dairy & eggs, and coffee, tea & spices rose to 13.8%, 8.4%, 7.4%, 4.3%, and 0.7% in 2022 from 6.5%, 6.0%, 5.7%, 3.1%, and 0.4% in 2015, effectively mitigating the pressure on domestic agricultural resources. On the other hand, China's per-capita supply of non-staple agricultural products remains relatively low. Data from the Food and Agriculture Organization of the United Nations shows China's per capita supply of beef, poultry, and coffee and

¹⁰ Ministry of Agriculture and Rural Affairs of China. (2022). China Agricultural Outlook Report.

¹¹ Source General Administration of Customs.

related products was 6.75, 15.63, and 0.13 kg in 2020. According to Euromonitor, per-capita consumption of dairy products in China was US \$70.4 in 2022.

BRI countries are important suppliers for China's imports of non-staple agricultural products. Data from the General Administration of Customs shows BRI countries supplied 33% of China's livestock and poultry meat imports in 2022, mainly frozen beef from Argentina and New Zealand. BRI countries also accounted for 64% of China's import value of aquatic products; the top three suppliers were Ecuador (mainly prawns), Russia (mainly cod), and Vietnam (mainly balsa), taking up a share of 19%, 15%, and 9%, respectively. At the same time, about 68% of China's egg and milk imports came from BRI countries. Raw milk for dairy foods processing in China is in short supply, and we expect a shortfall of 21 mnt, or 33.6% of total demand for raw milk in 2025. We see substantial demand for importing milk powder and dry cheese to produce dairy products such as dairy drinks and ice cream. In addition, BRI countries supplied about 91% of China's fruit and nut imports, including durian, coconut, and fresh longan from Thailand; cherries from Chile; dragon fruits from Vietnam; and bananas from the Philippines. They also accounted for about 50% of China's coffee, tea, and spice imports, such as coffee from Ethiopia and Vietnam and cardamom from Indonesia.

China's imports of fruits have also bolstered the economy in BRI countries. For example, Thailand is a major supplier of imported fruits for China, especially durians. Along with rising domestic demand for fruits, China's fruit imports from Thailand are increasing rapidly. According to the Ministry of Commerce of Thailand, Thai fruit exports to China totaled THB133.7 bn in 2022, or 88% of the country's total fruit exports. Notably, Thailand's durian exports to China amounted to THB106 bn, or 96% of its total durian exports.

China's imports of non-staple agricultural products from BRI countries have helped improve supply chains in these markets and contribute to their sustainable development through technology exports. For example, China's fisheries industry has organized more than 148 multilateral and bilateral foreign aid and training projects, and has trained over 4000 senior fishery management officials and technicians for 137 countries and regions (mostly BRI countries and regions) since 1981. Following years of output growth, the aquaculture industry in some countries such as Vietnam is suffering from overfishing, insufficient resources, and environmental pollution, while China has comprehensive research achievements in breeding high-quality varieties, preventing and controlling diseases of aquatic animals, and improving the quality of aquatic products. Since the launch of the BRI in 2013, China and Vietnam have jointly carried out five fish stocking exercises in the Beibu Gulf (including 226 mn aquatic seeds from China) to effectively enhance fishery resources in Beibu Gulf and benefit fishermen of the two countries (Figs. 13.2 and 13.3).¹²

¹² http://m.news.cn/gx/2023-05/08/c_1129596768.htm.

Overview of China's imports					
	Meat	Aquatic products	Dairy and egg products	Fruits and nuts	Coffee, tea, and spices
China's total import value in 2022	US\$30.9bn	US\$18.8bn	US\$9.5bn	US\$16.6bn	US\$1.6bn
Import share of major BRI countries in 2022	About 10% from Argentina and 9% from New Zealand	About 19% from Ecuador, 15% from Russia, and 9% from Vietnam	54% from New Zealand	About 38% from Thailand, 20% from Chile, 9% from Vietnam, and 4% from the Philippines	About 12% from Ethiopia, 11% from Indonesia, and 5% from Vietnam
Total import share of BRI countries in 2022	33%	64%	68%	91%	50%
Implications	Along with the adjustment of the dietary structure of Chinese residents, domestic demand for agricultural products is rising. The import of agricultural products has effectively alleviated the pressure on agricultural resources and met consumer demand, and we see large upside potential in such imports.				

Fig. 13.2 BRI countries are important suppliers of China's imports of non-staple agricultural products. *Source* General Administration of Customs, CICC Research

Overview of BRI countries' exports			
	Thailand		Vietnam
	Fruits	Durian	Cashew
Total exports in 2022	THB151.6bn	THB110.1bn	About 520,000t
Export share	About 88% to the Chinese mainland, 6% to 9 countries of ASEAN, 3% to Hong Kong SAR, and 1% to 27 countries of European Union	96% to China	About 28% to the US, 15% to China, 10% to the Netherlands, and 3% to Germany
Share of exports from BRI countries to China in 2022	91%	96%	15%

Fig. 13.3 A high proportion of BRI countries' exports are destined for China, with China's demand for imports bolstering their economies. *Source* General Administration of Customs, Ministry of Commerce of Thailand, CICC Research

13.4.2 Tourism

We see large market potential in China's outbound tourism compared with developed countries. The rapid development of China's economy has boosted the spending power of outbound Chinese tourists. According to the United Nations World Tourism Organization (UNWTO), per-capita spending of outbound Chinese tourists was US \$1954 in 2015, higher than that of outbound tourists from the US, France, South Korea, and India. It fell mildly to US \$1647 in 2019, but was still higher than the US \$1326 for outbound tourists from the US and US \$1328 for outbound tourists from Canada. The penetration rate of outbound travel in China rose from 4.3% in 2010 to 11% in 2019, implying sizable market potential compared with penetration rates of 30% in the US and 72% in Canada.

More importantly, there is substantial market potential in tourism consumption by Chinese tourists in BRI countries. Overall, Chinese tourists prefer to visit developed countries and regions such as Europe, the US, and Japan as their choice of destination for outbound tourism, and their tourism related spending in BRI countries and regions is relatively low, implying large potential for growth. The number of Chinese tourist arrivals in BRI countries has been rising year by year. According to CEIC, the number of Chinese tourist arrivals in major BRI countries such as Thailand, Cambodia, Indonesia, Malaysia, the Philippines, Singapore, Vietnam, South Korea, and Russia grew to 37.63 mn in 2019 from 16.63 mn in 2013, and their proportion in China's total outbound trips rose to 22.2% from 16.9%. In addition, the China National Tourism Administration forecasted in May 2017 that Chinese tourist arrivals in BRI

countries may total about 150 mn during the 13th Five-Year Plan period (2016–2020), and their tourism related spending may approach US \$200 bn. We estimate per-capita spending by Chinese tourists in BRI countries at about US \$1333 in 2019, implying high growth potential compared with the per-capita spending of US \$1972 by Chinese tourists in Japan and US \$12,000 in the US. In 1H19, Chinese tourists' overseas spending totaled US \$127.5 bn, including US \$14.9 bn or just 11.7% of the total in BRI countries.

Chinese tourists have facilitated economic development in BRI countries. According to the China Tourism Academy, broadly-defined international tourism revenue of BRI countries reached US \$385.1 bn in 2017, with 30.8% attributed to Chinese tourists.¹³ Data from World Travel and Tourism Council (WTTC) shows tourism contributed to 14.1% of overall employment and 14.9% of overall GDP on average in BRI countries in 2018. In order to meet the growing needs of Chinese tourists for outbound travel, BRI countries have improved their service industries to provide better services and travel experience, and to ultimately attract more Chinese tourists. For example, some countries have introduced electronic visas for Chinese tourists to facilitate their entries and exits (such as Thailand), enhanced road transportation and infrastructure, and optimized digital payment methods such as mobile payment and digital wallets.

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¹³ The data includes short-term overseas studies, work and healthcare services.