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ADB Working Paper Series

**EVOLUTION OF THE CHINA RAILWAY
EXPRESS IN THE CONTEXT OF POLICY
SUPPORT, TRADE TRENDS, AND
INFRASTRUCTURE SUPPLY**

Manuel Benard, Runze Yu, and Wenjing Pu

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Abstract

This paper delves into the developmental trajectory and future prospects of China Railway (CR) Express, a containerized railway freight service between the People's Republic of China (the PRC) and Europe, and examines the associated infrastructure investment needs for enhancing Eurasian freight transport. Since its establishment in 2011, CR Express has demonstrated remarkable growth, resilient even in the face of challenges such as the COVID-19 pandemic and the onset of the Russian invasion of Ukraine.

The substantial expansion of CR Express over the past decade can be partially attributed to generous subsidies and favorable policies. While it is anticipated that government subsidies will gradually be phased out, the ongoing role of favorable policies will remain pivotal in shaping the trajectory of CR Express's future growth.

Despite the dynamic evolution of the global trade landscape, the robust and steadily growing trade relationship between the PRC and Europe provides a solid foundation for CR Express to sustain its growth momentum. CR Express is also poised to capitalize on the growing demand for high-value products, including electronics, auto parts, high-end apparel, machinery, and premium furniture, as well as time-sensitive goods such as fresh produce, everyday clothing, and seasonal toys.

However, the growth potential of CR Express faces impediments in the form of infrastructure limitations and operational challenges. Bottlenecks at ports, railways, and logistics hubs, coupled with issues like insufficient standardization, technical constraints, and service-related challenges, exert a negative impact on the overall efficiency and attractiveness of CR Express. In response to these constraints, concerted efforts are underway encompassing infrastructure construction and modernization initiatives, as well as the digitalization of logistics services. Investment opportunities emerge in the form of infrastructure construction and upgrades, along with the adoption of proven new technologies and digital solutions to enhance the efficiency and competitiveness of railway services.

Keywords: China Railway Express, PRC–Europe trade, Eurasian freight transport, ports, railways, logistics

JEL Classification: L92, F1, P45, R41, O24

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1. INTRODUCTION TO CR EXPRESS AND ITS RAPID GROWTH

1.1 CR Express's Political Significance, Economic Impact, and Environmental Benefits

Since its establishment in 2011, China Railway (CR) Express has rapidly evolved into a dynamic cross-border containerized railway freight service linking the People's Republic of China (hereafter referred to as "the PRC") with Central Asia and Europe. This logistics service spans a substantial portion of the Eurasian continent, establishing itself as a globally acknowledged public logistics product. CR Express revitalized the historical Eurasia intercontinental railways and enhanced cross-border connectivity, demonstrating significant political, economic, and environmental benefits.

Politically, the inception of CR Express was spearheaded by China Railway, the nation's leading passenger and freight railroad corporation. This initiative holds significant stature as a flagship project within the PRC's Belt and Road Initiative (BRI). CR Express serves as a pivotal platform aligned with the PRC's strategic goal of expediting the accessibility of its inland cities. The overarching objectives include the promotion of trade facilitation, fostering cooperation, embracing openness and inclusivity, encouraging mutual learning, and fostering mutual benefit. Notably, this endeavor mirrors the PRC's escalating commitment to engaging in international governance.

Given the collaborative nature of CR Express operations across multiple countries, its development emerges as an invaluable opportunity for the PRC to play a constructive role in optimizing the global supply chain. The COVID-19 pandemic further underscored the vital role played by CR Express in stabilizing international supply chains. In particular, during a period when air and maritime transport faced substantial disruptions, CR Express proved instrumental in ensuring the timely delivery of critical protective supplies (National Development and Reform Commission (NDRC), China Railway Express Development Report 2021).

Economically, CR Express is a catalyst for advancing mutual economic interests by fostering enhanced infrastructure connectivity—a precursor to prosperity. It not only deepens the business collaborations between the PRC and Europe but also plays a pivotal role in uplifting the vast inland areas of Eurasia through heightened trade opportunities. Acting as a strategic driver, CR Express accelerates hinterland development and facilitates industrial agglomeration.

The economic landscape in the PRC is undergoing a transformative shift, marked by the relocation of production from coastal to central and western provinces. This shift demands an efficient intercontinental transportation mode to overcome inland bottlenecks, a role CR Express adeptly fulfills. Furthermore, CR Express directly supports the PRC's economic evolution, aiding the transition from low value-added manufacturing to the production of higher-value goods. These goods require a delivery mode that is faster and more reliable than maritime but more cost-effective than air transportation. The railway mode, exemplified by CR Express, emerges as the preferred solution, offering reduced lead times and heightened supply chain efficiency.

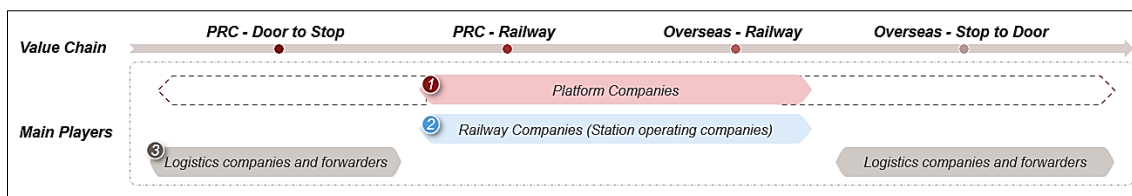
Beyond its transformative economic role, CR Express introduces new investment opportunities, including collaborative container-sharing initiatives and investments in logistics properties. In essence, CR Express transcends mere transportation, becoming a dynamic force shaping economic dynamics and fostering promising avenues for investment.

Environmentally, rail stands out as a sustainable modal choice for moving freight between the PRC and Europe, as it emits the lowest carbon emissions when compared to maritime, air, and road transportation. This is well aligned with the green development goals advocated by both the European Union (EU) and the PRC. Additionally, CR Express’s future operations will likely involve more cold-chain logistics and digitalization, which are key driving forces for technological innovations and environmental benefits, further solidifying the railway’s role in fostering a greener future.

1.2 Multilateral Cooperation

The rapid growth of CR Express has spurred collaboration among various players along the PRC–EU freight rail value chain. Within this collaborative framework, platform companies, which in the PRC are typically state-owned enterprises supported by municipal governments, assume a pivotal role (Figure 1).

Figure 1: Type of Players in the PRC–EU Freight Rail Value Chain



Source: AIB analysis.

Platform companies are expanding their value chain, transitioning from stop-to-stop services to comprehensive door-to-door solutions. They differentiate themselves by offering high-quality value-added services, including less than container load (LCL), cold chain, and efficient customs clearance to capture a larger market share. Emphasizing customer experience enhancement, they leverage digitalization to improve operational efficiency and establish a global network for proactive customer interaction and issue resolution.

For railway companies and station operating companies, alliances are cultivated to foster multilateral cooperation and standardization. For instance, in October 2017, a joint working group on CR Express was established by the national railway companies of the PRC, Belarus, Germany, Kazakhstan, Mongolia, Poland, and the Russian Federation.

Logistics companies and forwarders forge deeper collaborations with platform companies, establishing mutually beneficial relationships as both customers and service providers. They also invest in CR Express-related infrastructure, such as stations and locomotives, to facilitate business expansion. Global-leading companies like DHL, DB Schenker, and Maersk actively take part in the campaign as CR Express is widely recognized.

The PRC considers CR Express strategically important. Most platform companies in the PRC are state-owned and supported by government subsidies, reflecting the semi-marketized nature of CR Express. Nevertheless, national-level policies are geared toward steering the development of CR Express towards a higher degree of marketization. The relationships among the PRC's government, China Railway, and platform companies are illustrated in Figure 2.

Figure 2: Relationships among Government, China Railway, and Platform Companies



* China Railway's subcompany China Railway International Multimode Transportation Co. Ltd. (CRIMT) oversees the CR Express business.

Source: AIB analysis.

National government like the NDRC and the Ministry of Transportation provides policy support and high-level guidance. Provincial governments, municipal governments, and economic development zones are the major sources of subsidies.

Platform companies may be state-owned enterprises or rail operators acting on behalf of China Railway. For instance, while certain entities like the Xi'an International Hub solely provide standard stop-to-stop transportation, others such as Zhengzhou International Hub and Chongqing International Hub offer additional value-added services like door-to-door delivery and customs declaration.

China Railway,¹ as a state-owned enterprise, provides crucial infrastructure, traction, and wagons, and determines tariff policies. It plays a pivotal role in planning the number of freight trips in each city, processing applications from platform companies to formulate annual and monthly CR Express operational plans. Additionally, it collaborates with foreign national railway companies to synchronize operational plans.

The subsidy structure and total subsidy amounts vary across different cities, with platform companies typically adopting competition-oriented pricing strategies to maintain competitiveness. Consequently, those with substantial government subsidies enjoy notable pricing advantages, thereby influencing their competitive positioning in the market.

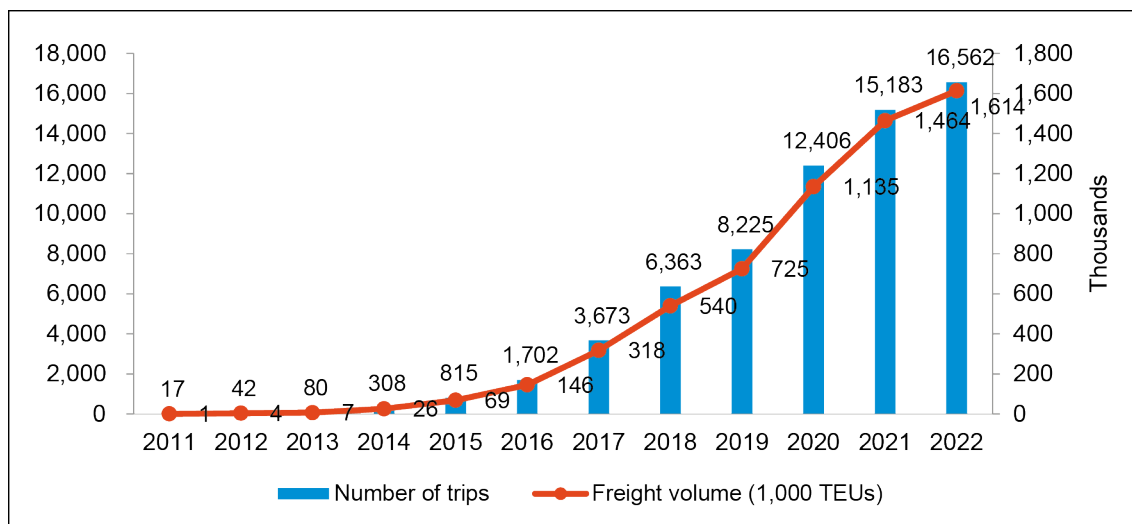
¹ The China Railway's sub-company China Railway International Multimode Transportation Co. (CRIMT) is in charge of the CR Express business.

1.3 Rapid Growth

Since its inception in 2011, the CR Express market has undergone remarkable growth and is anticipated to maintain a consistent upward trajectory in the long term. As the phased reduction of subsidies is underway, CR Express is transitioning toward a more market-oriented operational model. This evolution is expected to introduce some volatility in the short term, characterized by a gradual decline in the growth rate. Nevertheless, the long-term outlook remains optimistic, driven by the persistent demand for specific products and an increasing customer acceptance.

By the end of September 2023, CR Express had executed an impressive total of 78,000 trips between the PRC and Europe, transporting 7.4 million twenty-foot equivalent units (TEUs) of goods, and establishing connections with 217 cities in 25 European countries (NDRC 10 October 2023). The number of train trips soared from 17 in 2011 to 16,562 in 2022, marking a notable compound annual growth rate (CAGR) of 86%. Correspondingly, the freight volume surged from 1,000 TEUs in 2011 to 1,614,000 TEUs in 2022, reflecting a compelling CAGR of 96% (Figure 3).

Figure 3: Number of Trips and Freight Volume of PRC–Europe Railway Express Freight Trains (2011–2022)



TEU = Twenty-foot equivalent unit.

Source: The State Council Information Office of the People’s Republic of China: The Belt and Road Initiative: A Key Pillar of the Global Community of Shared Future, October 2023 (<http://www.scio.gov.cn/gxzt/dtzt/49518/32678/index.html> [accessed 11 October 2023]).

Several factors have contributed significantly to the remarkable growth of CR Express. First, favorable policy support laid the groundwork for its expansion, with government subsidies playing a crucial role in fostering a conducive market environment. Additional support, including substantial infrastructure investments and streamlined customs clearance procedures, has further propelled its rapid development. While subsidies are on a downward trend, ongoing policy support is expected to remain pivotal, diversifying to adapt to the evolving needs of CR Express.

Second, robust and enduring demand has been, and will continue to be, a key driving force for CR Express. The growth of the trade between the PRC and BRI countries has stimulated the demand for CR Express. The EU, the PRC's second-largest trade partner and a core focus of CR Express (constituting 70%–80%), will decisively shape CR Express's future demand trajectory.

Third, the expansion of infrastructure has been a key catalyst for CR Express's rapid growth, although this momentum is gradually slowing. Operational challenges and constraints have also led to delays, potentially impacting future growth. However, with ongoing infrastructure-upgrading plans and the concurrent standardization and digitalization efforts, it is anticipated that infrastructure capacity will quadruple over the next 10–20 years.

2. POLICY SUPPORT FOR CR EXPRESS DEVELOPMENT POTENTIAL

2.1 Inside the PRC

In the PRC, the growth of CR Express has been fueled by a combination of subsidies and favorable policies. During the initial development phase (2011 to 2018), the central government's subsidies played a pivotal role in cultivating the market. Recognizing the significance of CR Express, local governments, including provincial, municipal, and economic development zone authorities, aggressively subsidized it to capture market share. In 2018, the Ministry of Finance (MoF) urged local governments to reduce subsidies, aiming to accelerate the marketization of CR Express operations. The MoF specified subsidy reduction targets, gradually decreasing from 50% in 2018 to complete elimination by 2022. However, implementation varied across local governments, and subsidy reductions were postponed due to the COVID-19 pandemic. As of October 2023, renewed efforts to cut subsidies are underway, though the overall magnitude and timeline remain uncertain.

Favorable policies have also played a crucial role, including investments in infrastructure construction. The National Development and Reform Commission (NDRC) published the Development Plan for CR Express (2016–2020), supporting new railways and operational hubs. Development finance institutions (DFIs), such as the Asian Infrastructure Investment Bank (AIIB) and the Silk Road Fund, responded by investing in relevant projects. The central government invested in domestic railways and introduced policies favoring land use for railway-related construction. Additionally, the NDRC allocated ¥200 million in July 2020 to support the construction of demonstration projects in consolidation hubs (Zhengzhou, Chongqing, Chengdu, Xi'an, and Urumqi) to accelerate the formation of an efficient railway distribution system. Other favorable policies include streamlined customs clearance procedures, the development of information-sharing platforms, and the establishment of coordination and safeguard mechanisms for CR Express.

Moving forward, policy support will still play a key role in the growth of CR Express and policies will be more diversified than before to meet the changing needs. In the short term, government subsidies are expected to persist for a few more years but will gradually be phased out. CR Express is poised to transition to a market-oriented approach, with local governments exploring alternative means, such as development financing, to support and encourage the international expansion of platform companies.

2.2 Outside the PRC

Beyond the PRC, EU countries are actively investing in railways as a sustainable transportation mode. Driven by environmental and climate concerns, the EU and its member states are increasingly focusing on policies aimed at enhancing rail competitiveness and promoting the development of rail infrastructure. The Connecting Europe Facility (CEF), an EU fund established in 2014 to support infrastructure investments, particularly within the Trans-European Networks, has been a significant contributor. The fund spans various sectors, including transport, energy, and digital and telecommunication projects, fostering greater connectivity among EU member states. Notably, the CEF Transport fund allocated 70% of its €23.2 billion budget from 2014 to 2020 to rail investments. Looking ahead, the commitment to rail remains strong, with 71% of the €25.8 billion fund for 2021–2027 earmarked for rail projects (European Commission 2022). This strategic allocation underscores the EU's dedication to sustainable and interconnected rail systems as a key component of its future transportation landscape.

In Germany, the LuFV III program (2020–2029) stands as the most extensive rail modernization initiative to date, boasting an impressive €86 billion investment with the goal of increasing the share of rail freight in all inland freight transport in Germany from the current 17%–18% to 25% by 2030. This substantial funding, contributed by both the Federal Government (€62 billion) and Deutsche Bahn AG (€24 billion), is dedicated to the maintenance and modernization of the existing rail network (International Railway Journal 2020). The program empowers Deutsche Bahn AG to allocate an annual average of €8.4 billion for the upkeep and enhancement of the national rail network, marking a significant increase from the €5.6 billion under the previous LuFV II program—an impressive 44% rise in spending. Under this program, Deutsche Bahn AG is set to renew approximately 2,000 km of track and 2,000 switches annually and renovate 2,000 railway bridges within this decade. Under State Aid SA.51956 (2018–2023), rail freight operators are compensated for up to 45% of their track access charges. Subsidies are granted to DB Netz AG and then deducted from the total access fee that rail operators would need to pay.

In summary, favorable policies for the railway sector can expand the rail network, enhance rail transport efficiency and capacity, and lower operating costs and transportation tariffs, thereby improving the railway's competitiveness in the freight transportation market.

3. DEMAND ANALYSIS FOR CR EXPRESS DEVELOPMENT POTENTIAL

3.1 Evolving Global Trade Landscape

International trade is the primary driver of demand for CR Express, with the growing trade between the PRC and BRI countries further fueling this demand. Despite the unprecedented disruptions caused by the COVID-19 pandemic, the trade between the PRC and BRI countries has displayed remarkable resilience, with these nations assuming an increasingly significant role in the PRC's international trade, marked by a higher growth rate.

The global trade landscape is undergoing notable changes, characterized by the accelerated reorganization of global industrial value chains and the emergence of new trade channels. COVID-19 has prompted a decentralization of global value chains (GVCs), leading many companies to adopt a “using but not relying on GVC” approach (Bomin et al. 2020). In 2023, global trade growth was expected to slow to 1.7% following a 2.7% expansion in 2022 and a substantial 9.4% increase in 2021 (WTO 2023). The international trade system has been adversely affected by anti-globalization sentiments, trade protectionism, and unilateral actions in certain countries. Notably, while world trade contracted in 2020, the PRC’s share of global exports climbed from 12% in December 2019 to 15% in January 2021, although it subsequently settled at 13% in November 2021 (OECD 2022). The PRC’s trade with BRI countries demonstrated not only remarkable resilience but also sustained growth throughout and beyond the pandemic.

These shifting dynamics in the global trade landscape hold significant implications for the PRC. First, it is imperative for the PRC to actively maintain the positive momentum in its economic and trade relationships with BRI countries to explore new avenues for growth. This becomes especially crucial in the light of trade tensions with the US and the adverse effects of the pandemic. Second, the PRC’s proactive development of rail logistics networks and transportation infrastructure is essential to facilitate the creation of new trade channels and solidify its competitive position within the evolving global supply chain. The continued advancement of CR Express aligns seamlessly with these strategic directions for the PRC’s economic and trade development.

3.2 PRC–EU Trade Overview

In the PRC’s international trade landscape, the EU had been the largest trading partner for 16 consecutive years from 2004 to 2019, until the Association of Southeast Asian Nations (ASEAN) assumed the top trade partner’s role in 2020–2022 (Economic and Commercial Office of the Mission of the People’s Republic of China to the European Union 2019; People’s Daily 2023). The PRC maintained its position as the EU’s second-largest trading partner and the primary source of imports for a continuous 15-year stretch, spanning from 2005 to 2019. Remarkably, in 2021, the PRC displaced the United States as the EU’s leading trading partner in goods (European Parliament 2023). For the EU, both imports from and exports to the PRC have witnessed remarkable growth in the past decade. However, in the last three years, the growth in imports has outpaced that of exports (Figure 4).

Assuming that the PRC and the EU maintain a stable relationship, bilateral trade between them is expected to grow steadily in tandem with the EU’s gross domestic product (GDP). As illustrated in Figure 5, the EU’s GDP experienced a robust rebound in 2021 following the COVID-19 outbreak and has continued to grow over the past two years. Although the International Monetary Fund (IMF) anticipated a marginal growth of 0.7% for the EU’s GDP in 2023, it is projected to expand consistently at a rate of 1.5%–2.1% annually over the next five years. This trajectory positions EU–PRC trade within a stable growth pattern, contingent on the successful management of their bilateral relationships.

Figure 4: EU–PRC Trade (2011–2022)

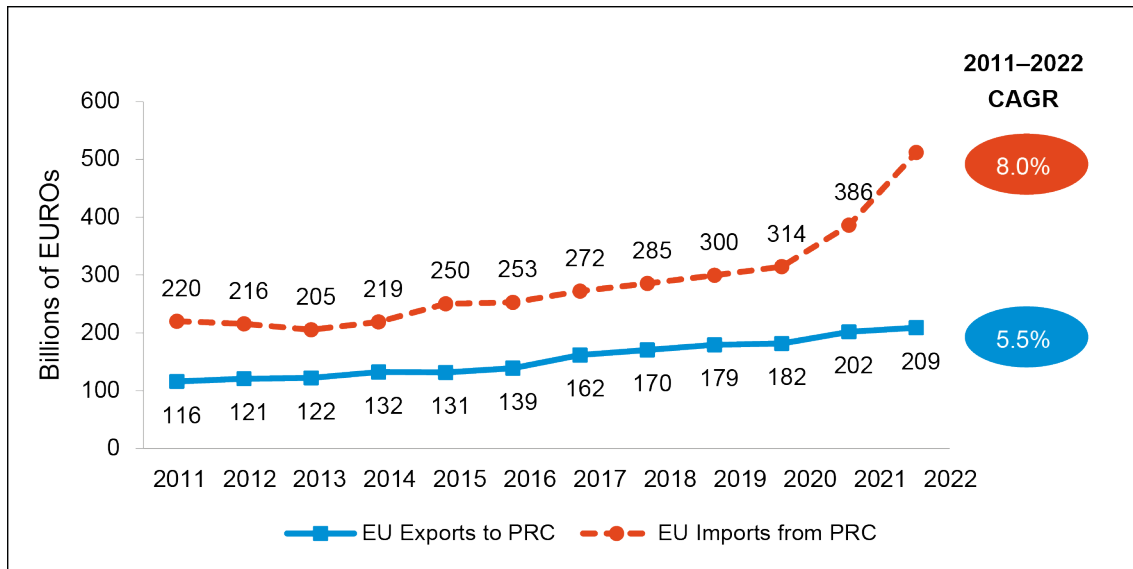
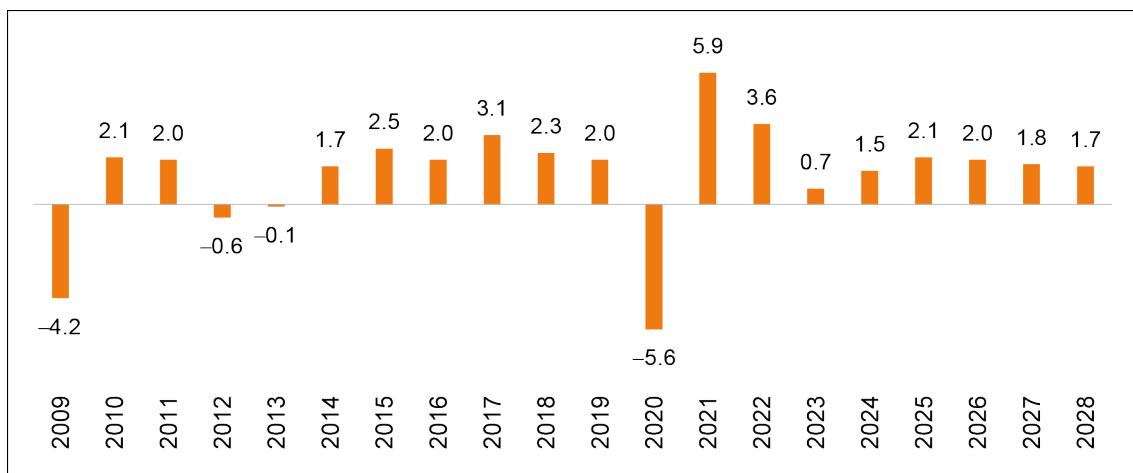


Figure 5: EU’s GDP in a Steady Growth State in the Next Five Years



EU = European Union; GDP = gross domestic product.

Source: International Monetary Fund, World Economic Outlook (October 2023) (<https://www.imf.org/external/datamapper/profile/EU> [accessed 13 October 2023]).

Given that the EU represents the lion’s share, ranging from 70% to 80%, of CR Express’s market, it is clear that the EU’s influence will be pivotal in determining the future trajectory of CR Express’s growth. As the long-term prospects for the PRC–EU bilateral trade are promising, driven by their robust complementarity and a relatively favorable bilateral relationship, the outlook for increased demand for CR Express within the EU market appears promising.

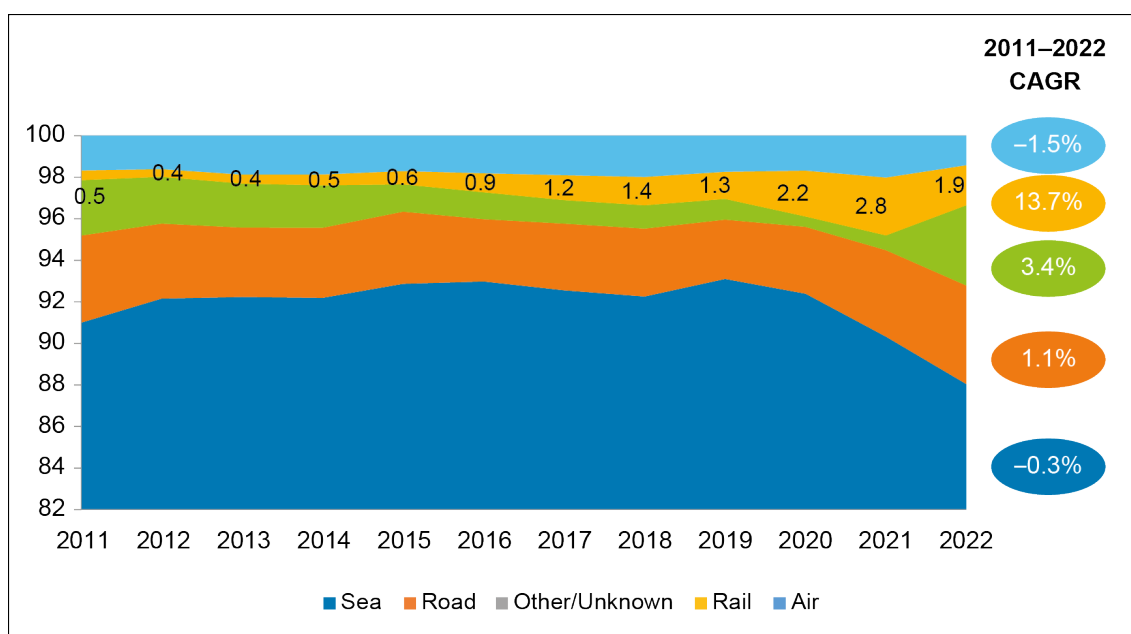
3.3 PRC–EU Trade by Transport Mode

With regard to EU–PRC trade by transport mode, rail represented an average of just 2.3% of the total goods by weight over the three years from 2020 to 2022 (Figure 6). However, rail stands out as the most rapidly expanding transport mode across all modes, boasting a remarkable CAGR of 13.7% from 2011 to 2022. This rapid growth significantly

outpaces that of road transportation, which holds a CAGR of 1.1%, as well as the “other/unknown” category, with a CAGR of 3.4%. Conversely, both sea and air modes have experienced contractions, registering CAGRs of -0.3% and -1.5%, respectively.

The shifting landscape in transport mode share suggests that land transport, particularly rail, has captured a portion of maritime transport’s market share over the past 12 years. It is expected that more companies will increasingly favor rail (CR Express), given its competitive advantages over sea and air transport, in the foreseeable future. As CR Express continues to enhance its resilience and efficiency, industry experts anticipate that CR Express’s share of total EU–PRC trade in goods will reach 5% in the long term.

Figure 6: Share of Transport Mode in EU–PRC Trade (2011–2022) (%)



EU = European Union.

Source: Eurostat, Extra-EU trade since 2000 by mode of transport, by HS2-4-6, data set: ds-058213 (https://ec.europa.eu/eurostat/databrowser/view/ds-058213__custom_7823335/default/table?lang=en [accessed 13 October 2023]).

Rail transport serves as a complementary mode of transportation, bridging the gap between air and sea transport. Notably, it offers a cost advantage, being two to three times more economical than air transport, while also significantly reducing the transit time, requiring only half the duration of maritime transport (Table 1). Rail transport is particularly suitable for high-value-added products that necessitate shorter lead times. This segment of products constitutes the core demand that propels the growth of CR Express, which is anticipated to gradually gain a foothold in the market share of maritime transport. Additionally, it may make inroads into a portion of air transport, owing to the consolidation services provided by rail operators.

Table 1: Comparison of Different Transport Modes between Shanghai, the PRC, and Hamburg, Germany

	Air	Rail	Sea	Road
Time	3 ~ 7 days	15 ~ 18 days	30 ~ 35 days	15 days in winter 12 days in summer
Cost	20 RMB/KG in off seasons 40 RMB/KG in peak time	10~12 RMB/KG	~10 RMB/KG	12 RMB/KG
Reliability	<ul style="list-style-type: none"> Stable lead time Vulnerable to bad weather conditions 	<ul style="list-style-type: none"> Stable lead time Least affected by weather turbulences 	<ul style="list-style-type: none"> More likely to have delay Affected by seasonal variations 	<ul style="list-style-type: none"> Less stable lead time Relatively higher chance of accidents or breakdowns

EU = European Union.

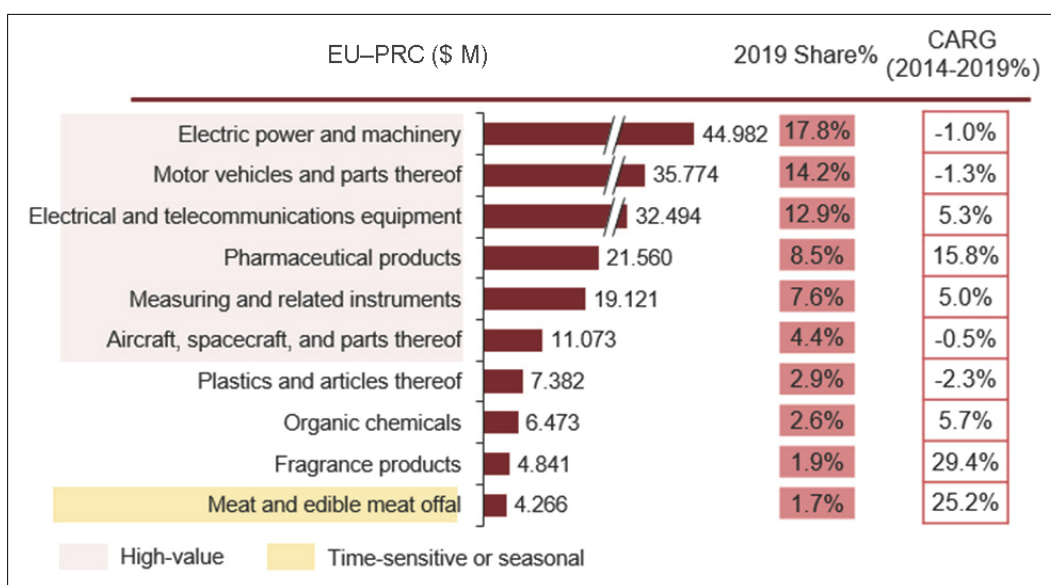
Source: AIB analysis.

3.4 CR Express’s Target Freight Categories

CR Express remains an attractive choice for transporting high-value products, including electronics, auto parts, high-end clothing and accessories, machinery, high-end furniture, artwork, and time-sensitive goods like seasonal clothing, fresh food, and seasonal toys.

The majority of the top-traded categories of goods in PRC–EU trade align well with the suitability of CR Express, with machinery, electronic products, motor vehicles, and auto parts emerging as pivotal categories (Figures 7 and 8). Thanks to ongoing industrial upgrades, it is anticipated that these key categories will display even more value added and continue their growth trajectory, thereby solidifying their significance for CR Express.

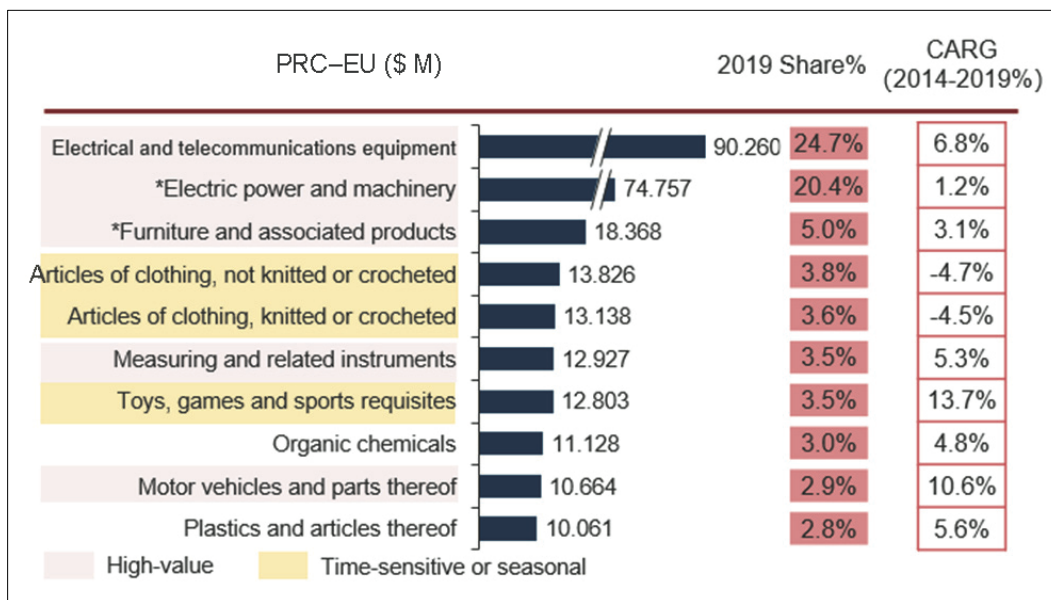
Figure 7: Target Categories for CR Express (from EU to the PRC)



EU = European Union.

Source: AIB analysis.

Figure 8: Target Categories for CR Express (from the PRC to EU)^a



EU = European Union.

^a High-end furniture and machineries are considered high-value cargo.

Source: AIB analysis.

Fueled by a consumption upgrade, there is a surging demand from Chinese consumers for products associated with cold chain logistics, cross-border e-commerce, and other mid- to high-end products. Additionally, pharmaceutical products are also emerging with strong growth potential, suitable for CR Express transport.

Overall, the target goods for CR Express are expected to be more diversified with more mid- to high-end goods, providing a strong demand base for CR Express growth.

3.5 CR Express as the Preferred Choice

Based on feedback from CR Express’s customers, it’s evident that CR Express is rapidly evolving into a critical transportation channel in the Eurasian freight transport system. Even though prices are anticipated to rise in the future due to the reduction of subsidies, the demand for CR Express is unlikely to wane as long as it maintains its reputation for delivering consistently high levels of services.

Our interviews with CR Express’s primary customers have highlighted the following advantages and promising prospects:

Forwarders’ views on CR Express advantages:

- High reliability: Despite peak season congestion in transit and loading zones, most CR Express trains adhere to their schedules reliably, remaining largely unaffected by adverse weather conditions.
- Short lead time: CR Express significantly reduces lead times compared to maritime transport.

- **Cost efficiency:** In comparison to air transport, CR Express offers a far more economical option. With subsidies in place, it can even outcompete maritime transport. This makes it an ideal choice for products less sensitive to shipping costs but in need of swift delivery.
- **Environmentally friendly:** As a result of low-carbon environmental requirements and the economic development along its routes, some portions of CR Express are operated by European companies, such as Deutsche Bahn. With the growing acceptance of CR Express, the proportion operated by European companies is increasing.

Forwarders' expectations for the future:

- **Global railway leadership:** While the PRC may not be as competitive in the maritime transport market, its railway system ranks as a global leader with a promising future.
- **Emerging supply chain channel:** Eurasian rail freight transport has evolved into a vital supply chain channel. Despite its relatively smaller size currently, it is increasingly becoming a significant consideration for forwarders in their route planning.
- **Role of policy and market demand:** Policies continue to drive the growth of CR Express, but market demand is also on the rise. Rigid demand is gradually taking shape, especially for products like machinery, electronic items, clothing, and other high-value goods.
- **New demand drivers:** The rise of cross-border e-commerce and the need for cold-chain logistics are expected to generate new demand for CR Express in the future.
- **Growing participation:** CR Express is attracting a growing number of participants, and they are actively exploring the opportunities it presents.

In summary, CR Express is on the path to becoming a key player in the global logistics landscape, driven by its impressive reliability and efficiency, as well as the evolving needs and expectations of the market and its participants.

3.6 Other Geographic Markets of CR Express

Beyond the EU, the PRC also trades with ASEAN, the Russian Federation, and Central Asia. Rail transport, a key mode of transportation in the PRC's trade with Central Asia and the Russian Federation over the last few decades, is expected to maintain a relatively stable share in these regions. However, when it comes to trade between the PRC and ASEAN, the demand for rail transport remains limited.

For Central Asia, rail transport was in operation long before the emergence of CR Express and has played a pivotal role in facilitating trade with the PRC over the last few decades. Although Central Asia represents a relatively modest portion of the PRC's total foreign trade, the trade between the PRC and Central Asia presents an upward trend with large fluctuations, and steady growth could be expected given relatively stable political climates and rapid economic growth. CR Express is well positioned to provide more services for this region.

ASEAN overtook the EU as the PRC's top trade partner in 2020 and has maintained its top position since then. However, the demand for CR Express in the PRC–ASEAN trade remains limited, as it does not offer significant advantages over sea transport. As a result, substantial growth in the short term is challenging for the PRC–ASEAN route. Future strategic directions may involve exploring multimodal transportation options to connect ASEAN with the PRC and the EU. The degree of policy support will also be a key factor in the development of the PRC–ASEAN route.

4. SUPPLY OF INFRASTRUCTURE FOR CR EXPRESS DEVELOPMENT POTENTIAL

4.1 Infrastructure

The rapid expansion of CR Express has been met with infrastructure limitations and operational challenges, leading to delays and concerns about future growth. However, with comprehensive infrastructure upgrade plans and the development of standardization and digitalization, we anticipate a substantial increase in CR Express's capacity, potentially exceeding four times the current volume over the next 10 to 20 years.

Several critical infrastructure constraints have become apparent along the CR Express routes, which, when targeted for improvement, can significantly enhance capacity without necessitating substantial investments:

- a. Port of Belarus–Małaszewicze (Belarusian–Polish border): This bottleneck is one of the most significant, affecting nearly all CR Express routes. The Polish side processes fewer than 14 trains daily, causing peak-time delays of 5 to 10 days. While logistics providers are exploring alternative ports, these are still in their nascent stages. In 2019, the total utilization rate of all ports entering the EU stood at 24%. The introduction of additional ports could notably increase CR Express capacity.
- b. Overloaded railways and insufficient rolling stock supply in Central Asia and the Russian Federation: In 2020, a shortage of rolling stock in Kazakhstan and the Russian Federation resulted in block train congestions and cancellations in locations like Alatau, Horgos, and Manchuria. The Trans-Siberian Railway is close to its operational limits, with a cap of 2.5 to 3 million TEUs per year, and extreme weather conditions further complicate the situation.
- c. Capacity limitations in Chinese logistics hubs: Key logistics hubs in the PRC are grappling with capacity restrictions. These limitations include Xi'an (3,000 trains per year), Zhengzhou (1,800 trains per year), Chengdu (1 million TEUs per year, including domestic railways), and Wuhan (500 trains per year).

To unlock the potential for CR Express to quadruple its capacity by 2040, a collaborative effort involving relevant countries, industry associations, and service providers is essential. The fourfold capacity increase is a conservative estimate, as it primarily pertains to upgrading existing, well-established routes. If new routes be developed, more capacity could be added. Examples of major improvement projects include:

- a. Małaszewicze Station Improvement:
 - Poland State Railways, a dominant railway operator, plans to expand the station, increasing daily passages from 14 to 55 by 2028. Storage capacity will rise from 2.5 million to 15+ million TEUs by 2026.
 - The exploration of alternative ports, such as Kaliningrad, is considered a viable option. However, their immaturity and potential sensitivity to political factors need to be taken into account.
 - a. Railway Upgrades in Central Asia:
 - Kazakhstan is implementing extensive national infrastructure projects that will enable a tenfold increase in transit transport capacity by 2050.
- b. Exploration of the New Middle Corridor Route:
 - A portion of the Middle Corridor remains in its early stages of development. The BTK railway (Baku–Tbilisi–Kars), completed in 2017, presents a recent addition. The exploration of new corridors will be especially sensitive to subsidy reductions due to their high operational risks.

4.2 Operations

On the operations slide, insufficient standardization, technical limitations, and managerial issues also pose challenges.

- a. Insufficient standardization. Different countries along the routes are required to use local customs codes, and adapting to different systems is both time- and cost-consuming. In addition, the billing of lading still lacks standardization, making it hard to develop property right and derivative functions such as proof for shipment insurance or logistics financing.

Efforts for improvement include: 1) The customs clearance process has been reduced to 4 hours, 2 hours, and 1 hour respectively in the EU, the Russian Federation, and the PRC. 2) The CIM/SMGS (CIM – Uniform Rules Concerning the Contract of International Carriage of Goods by Rail; SMGS – The Agreement on International Goods Transport by Rail) consignment has been widely used in CR Express since 2017, showing the potential to remove regulatory discrepancies. 3) Some platform companies are piloting trials of logistics financing.

- b. Technical limitations. The target clients of CR Express, especially those in the EU, pay a lot of attention to supply chain stability and visibility. However, due to the complexity of multimode transportation, the processes still lack real-time visibility. The digitalization of rail operations is insufficient compared to other transportation modes. Online payment systems for rail are yet to be fully developed.

Efforts for improvement include: The Global Positioning System (GPS) and temperature-control devices are used by some operators but not on a large scale. Meanwhile, today's solutions focus mainly on locations, still lacking real-time information on shipment status (e.g., customs clearance, gauge conversion).

- c. Service issues. The service level lagged behind developed economies. Many markets alongside the routes had suboptimal logistics services, scoring particularly low in customs clearance procedures, according to the World Bank.

Many believe that the congestion in Małaszewicze is caused not only by infrastructure limitations but also service issues.

Efforts for improvement include: The logistics service providers are striving to improve their services. Some providers have dedicated overseas teams to deal with possible unexpected conditions.

4.3 Investment Opportunities

Given the infrastructure limitations and operations challenges, there are many investment opportunities to construct, modernize, and upgrade rail infrastructure, and to adopt or develop new technologies and digital solutions.

On the rail infrastructure side, investment opportunities include:

- a. Port
 - Port capacity enlargement:
 - Duisburg: involved in 30% of the PRC–EU trade, Duisburg Port faces space limitations, processing up to 50 trains per week (of which 35–40 are with the PRC). Expansion to 100 PRC-bound trains per week is planned.
 - Smart ports:
 - System update and best practices include optical character recognition (OCR), automated guided vehicles (AGVs), real-time navigation, etc.
- b. Railway
 - Railway capacity enlargement:
 - Trans-Siberian Railway: almost overloaded with a limit of 2.5 to 3 million TEUs per year. Modernization project would be in progress until 2035.
 - Middle Corridor: BTK Railway's capacity is expected to grow, yet the expansion plan has been stymied by the political climate, and by public resistance in countries alongside.
 - Modernization:
 - Railway speed up: some rail lines in Europe have been in operation for a long time and possess low efficiency. Railway speed falls to only 18 km/h entering the EU.
 - Greenification: replace diesel with electricity powered by renewable energy, such as wind (e.g., the Netherlands) and solar (e.g., Italy, UK).

On the technology side, there are also investment opportunities for digitalization, including online systems, intelligent decision-making, and information sharing.

- a. Online systems:
 - Automation: order processing has not been fully automated. Online payment is still in its early stage of development.
 - Real-time visibility: GPS and temperature-control devices have not been used on a large scale. Today's solutions focus mainly on locations, lacking real-time information on shipment status (e.g., customs clearance, gauge conversion).

b. Data analytics:

- Predictive maintenance: using sensors to collect real-time data and identifying repair needs are in the early stage. There is also a need to centralize various measurements to make the maintenance processes more efficient.
- Intelligent decision-making based on big data and AI application (e.g., smart networks and line planning, business forecasting, site selection planning, scheduling, route optimization).

c. Information sharing:

- One window for data delivery: establish an interconnected ecosystem and uniformly recognized data network involving all the participants (rail operators, freight forwarders, ports and terminals, customs authorities, etc.) to promote information sharing, reduce duplicated paperwork, increase bill of lading standardization, and increase efficiency.

REFERENCES

- Bomin, J., R. Daniel, and R. Roberto. 2020. From Just in Time, to Just in Case, to Just in Worst-Case: Simple Models of a Global Supply Chain under Uncertain Aggregate Shocks. <https://www.nber.org/papers/w29345> (accessed 4 March 2024).
- Economic and Commercial Office of the Mission of the People's Republic of China to the European Union. 2019. *China–EU Trade and Economic Relations in Numbers*. http://eu.china-mission.gov.cn/eng/gdxw/201906/t20190620_8198078.htm (accessed 16 October 2023).
- European Commission. 2018. *Competition Policy, SA. 51956*. <https://competition-cases.ec.europa.eu/cases/SA.51956> (accessed 16 October 2023).
- . 2022. *The Connecting Europe Facility Supporting European Infrastructure*. <https://op.europa.eu/en/publication-detail/-/publication/8c3a0887-f823-11ec-b94a-01aa75ed71a1> (accessed 4 March 2024).
- European Parliament. March 2023. The European Union and Its Trade Partners. <https://www.europarl.europa.eu/factsheets/en/sheet/160/the-european-union-and-its-trade-partners> (accessed 16 October 2023).
- European Union. 2022. *Investing in European Networks, the Connecting Europe Facility Supporting European Infrastructure, June 2022*. <https://cinea.ec.europa.eu/system/files/2022-06/CEF%20Implementation%20Brochure%20-%20June%202022.pdf> (accessed 31 May 2023).
- International Railway Journal*. 2020. Germany Approves €86bn Rail Infrastructure Programme, 15 January 2020. <https://www.railjournal.com/financial/germany-approves-e86bn-rail-infrastructure-programme/> (accessed 16 October 2023).
- National Development and Reform Commission (NDRC) 2023. *The Construction and Development Planning of China-Europe Railway Express (2016–2020)*. <https://zfxgk.ndrc.gov.cn/web/iteminfo.jsp?id=384> (accessed 31 May 2023).
- . 2022. *China Railway Express Development Report 2021*. 8 August. https://www.ndrc.gov.cn/fzggw/jgsj/kfs/sjdt/202208/t20220818_1333112.html (accessed 4 March 2024).
- National Development and Reform Commission (NDRC), *Cong Liang, Deputy Director of the NDRC, attended the press conference on the white paper “Co-building the Belt and Road Initiative: Major Practices in Building a Community with a Shared Future for Mankind” to introduce relevant situations and answer reporters’ questions*. https://www.ndrc.gov.cn/fzggw/wld/cl/liddt/202310/t20231010_1361129.html (accessed 11 October 2023).
- OECD. 2022. *International Trade During the COVID-19 Pandemic: Big Shifts and Uncertainty*. <https://www.oecd.org/coronavirus/policy-responses/international-trade-during-the-covid-19-pandemic-big-shifts-and-uncertainty-d1131663/> (accessed 31 May 2023).
- Office of the Leading Group for Promoting the Belt and Road Initiative and China State Railway Group Co., Ltd. 2021. *China Railway Express Development Report (2021)*. <https://www.ndrc.gov.cn/fzggw/jgsj/kfs/sjdt/202208/P020220818311703111697.pdf> (accessed 31 May 2023).

- People's Daily*. 2023. Our Country's Import and Export Scale Exceeded 40 Trillion Yuan for the First Time, Maintaining its Status as the World's Largest Trader of Goods for Six Consecutive Years. 14 January 2023. https://www.gov.cn/xinwen/2023-01/14/content_5736849.htm (accessed 16 October 2023).
- WTO. 2023. *Trade Growth to Slow to 1.7% in 2023 Following 2.7% Expansion in 2022*. https://www.wto.org/english/news_e/news23_e/tfore_05apr23_e.htm (accessed 31 May 2023).