

# *Geopolitics of the China-Kyrgyzstan-Uzbekistan railway: a cooperative game theory perspective*

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## **Abstract**

The China-Kyrgyzstan-Uzbekistan railway discussed for decades and encountered setbacks due to disagreements over financing, route alignment, and geopolitical concerns, has finally commenced its initial construction steps. Nevertheless, due to existing geopolitical tensions around Central Asia, the railway still faces risks way forward. The main objective of this paper is to consider possible approaches to the implementation of the cooperative game theory for the relationship between the major actors of the railway project and implication of the geopolitical factor on its future prospects. By applying to the cooperative game theory, we can analyze the strategic decisions of China, Kyrgyzstan, and Uzbekistan in the context of the railway project, as well as the influence of external actors. This approach can provide a structured way to understand the complexities of the geopolitical dynamics at play and predict potential outcomes.

**Keywords:** BRI, CKU railway, cooperative game theory, geopolitics, Shapley value

## **Introduction**

Located mainly in the middle part of the Eurasian continent, historically, Central Asia has been an important channel of exchange between Eastern and Western parts, as well as a crucial place in the world, and Central Asia has thus been called by geopoliticians “the geographical pivot of world history” (Bird et al, 2020). Because of the unique geopolitical location, Central Asia countries play a vital role during the process of Belt and Road Initiative (BRI), which can be regarded as one of the most important hubs.

Central Asia region is a core of the two main corridors of the BRI: the North belt goes through Central Asia and Russia to Europe and the Central belt passes through Central Asia and West Asia to the Persian Gulf and the Mediterranean. That in turn makes China-Kyrgyzstan-Uzbekistan (CKU) railway’s construction and operation a critical element of the BRI’s land route paths.

The functioning of the CKU railway benefits to its all participants as well as the countries of adjacent regions. The railway will not only connect the three countries, but also create a new transport corridor for the transportation of goods from China and Central Asian countries to the European Union and the Middle East. It is expected that after the completion of the railway route, thanks to the connection with the national railway system of Uzbekistan, the CKU railway will connect with interregional routes in the north-south and east-west directions. These include the Trans Afghan railway corridor, the Central Asia-Middle East corridor, the Lapis Lazuli Corridor, the Turkmenistan-Afghanistan railway line, Tajikistan and the Pakistan-Iran-Turkey railway line.

While the project holds immense economic and connectivity potential, its geopolitical implications are equally significant. By applying to the Shapley value solution of the cooperative game theory, we can better understand the dynamics of collaboration, competition, and mutual benefit among the three nations involved.

As a mathematical framework for analyzing strategic interactions among rational decision-makers cooperative game theory provides tools to model and predict the behavior of individuals or groups in competitive or cooperative scenarios where the outcome depends on the choices of all participants. This paper addresses the following research questions: 1) How does each country's strategic participation level influence the stability and fairness of cooperation for the CKU railway implementation? 2) Why is the geopolitical factor's affect crucial for successful and projected completion of the CKU railway?

Considering in the research the CKU railway project as a case study, we examine the cooperative game theory's effectiveness in improving coalition stability and total utility. It is important to note that while all railway participants are inclined and motivated for the construction of the railway, they are not explicitly capable to make final decision during the whole process of the CKU construction and completion. Instead, the outside players can be placed as the variables affecting crucially on this project development.

### **Cooperative game theory: a framework for analysis**

As a basis for cooperative game theory, the game theory itself is the study of mathematical modeling of strategic behavior of decision makers (players), in situations where one player's decisions may affect the other players. The founding assumption of game theory is that decision makers are rational players, so, while pursuing well-defined objectives, players take into account other decision-makers' rationality and, accordingly, build expectations on their behavior. There are two main branches of the game theory: the first, non-cooperative and the second is cooperative. The main distinction between the two is that non-cooperative branch models situations where players see only their own strategic objectives and thus binding agreements among the players are not possible, while cooperative one is based mainly on agreements to allocate cooperative gains (solution concepts). (Parrachino et la., 2006)

In a cooperative game, players can make binding agreements before and during the play of the game, and communication between the players is allowed. This assumption allows cooperative game theory to address challenges where trust, negotiation, and fairness are critical. In essence, the theory provides framework for understanding how groups of players can achieve mutual benefits through cooperation, while also considering the challenges of forming and maintaining

those cooperative arrangements, especially in the presence of externalities and competing interests. (Morrow, James D., 1957)

Cooperative game theory is also known as coalitional game theory is designed to model situations in which players form groups (i.e., coalitions) rather than acting individually. A central notion in the theory is the notion of the core. The core is the set of payoff allocations that guarantees that no group of players has an incentive to leave its coalition to form another coalition. Therefore, if we can find a core in a coalitional game, no coalition will break away, and it will choose the action that all of its members prefer. In addition, by repeating the coalitional game, a certain “stable” state is achieved, where no player can improve its utility in the following repetitions (MacKenzie and DaSilva, 2006).

An important aspect associated with the solution concepts of cooperative game theory is the equitable and fair sharing of the cooperation gains. (Hans Peters, 2015). The Shapley value is a foundational concept in the theory, offering a fair method to distribute payoffs among participants based on their individual contributions to a group’s success. It ensures that each player is rewarded proportionally to their marginal impact across all possible coalition formations (Lloyd Shapley, 1953).

Key principles include: *fairness* – the Shapley value accounts for every player’s contribution in all possible group arrangements, ensuring no one is over- or under-compensated. The second one is *efficiency* – the total payoff is fully distributed among participants without surplus or deficit. The third is *symmetry* – players who contribute equally receive identical payoffs, regardless of their order or label. The fourth principal *additivity* – if multiple games are combined, the Shapley value of the combined game is simply the sum of individual values. The Shapley value as a cooperative game theory solution can be a powerful tool to fairly distribute costs, benefits, and responsibilities among the participating nations (Lloyd Shapley, 1953).

In this article’s case, cooperative game theory examines how nation-states (players), can achieve collective gains through collaboration, even when their individual interests may diverge. The Shapley value solution of the theory focuses on the formation of coalitions, the distribution of benefits, and the mechanisms that ensure stability and fairness in partnerships. In the context of the CKU railway, the cooperative game theory provides a useful lens to analyze how China, Kyrgyzstan, and Uzbekistan can align their interests to maximize shared benefits while addressing internal and external potential conflicts of interests.

### **Recent situation around the CKU railway**

The main achievements between the parties to the railway to date are the beginning of the substantive construction phase of the railway that came into action on April 29, 2025. From that date elevation of the key control projects of the CKU segment in the Suzak district of the Jalalabad region of Kyrgyzstan were launched. (*Photo 1*)



**Photo 1. Ceremony of the start of China-Kyrgyzstan-Uzbekistan railway first tunnel construction in Jalalabad province of Kyrgyzstan, April 29, 2025.**

Source: Telegram channel of the Ministry of Transport of the Republic of Uzbekistan:  
[https://t.me/Mintrans\\_uz/20150](https://t.me/Mintrans_uz/20150)

The outcome of such a breakthrough in the practical construction have become intensive efforts of the main parties of the CKU railway and their concrete actions in recent three years. The final route of the CKU railway line was preliminarily agreed upon by representatives of the three countries in September 2022 at the Shanghai Cooperation Organization summit in Samarkand. At that time, the Agreement was signed between the Ministries of Transport of China, Kyrgyzstan and Uzbekistan, confirming the parties' commitments to build the railway and begin a feasibility study. To coordinate the construction of the road, a Project office for the China-Kyrgyzstan-Uzbekistan railway was opened in Bishkek in January 2023. As part of the China-Central Asia Summit in May 2023, the relevant ministries of the China, Kyrgyzstan and Uzbekistan signed a Memorandum on accelerating the implementation of the railway project.

In May 2024, the feasibility study of the railway project was basically completed, and the project promotion work entered the fast lane. On June 6, 2024 the Agreement between the governments of China, Kyrgyzstan and Uzbekistan on cooperation in jointly promoting the CKU railway project was signed. As a result, in September of the same year, the Limited Liability Company (LLC) "China-Kyrgyzstan-Uzbekistan Railway Company" was established and its first meeting was held following on October 11 with the participation of the heads of the railway administrations of the three countries.

The company was established in accordance with the legislation of Kyrgyzstan by three railway administrations of the parties (China State Railway Corporation, State Enterprise "NC" Kyrgyz Temir Zholu ", JSC" Uzbekistan Temir Yollari ") in order to implement the railway construction project. The activities of the created company as agreed are aimed at financing,

designing, constructing, operating and maintaining the CKU railway on the section through the territory of Kyrgyzstan. According to the agreements reached, the railway will run along the combined route "Kashgar - Torugart - Makmal - Jalal-Abad - Andijan" (Photo 2) with a total length of 523 km of which 213 km on the Chinese territory, 260 km in Kyrgyzstan and 50 km in Uzbekistan.<sup>1</sup> It was also decided that the road will include sections with different gauges - 1435 mm and 1520 mm.



Photo 2. Map of China-Kyrgyzstan-Uzbekistan final route

Source: <https://img.caixin.com/2025-06-20/175041382344834.jpg>

The project provides for the construction of 46 bridges (120 km) and 27 tunnels, which is 40% of the entire route.<sup>2</sup> It is also planned to build 20 railway stations (two promising), including 2 border stations, 1 transfer station, 4 intermediate stations and 13 sidings.<sup>3</sup>

The estimated cost of the project is within 5-8 billion US dollars. China's share in the joint venture will be 51%, and the share of Uzbekistan and Kyrgyzstan - 24.5% each. Half of this amount will be financed by the participating countries, and China will provide an additional \$2.35 billion in the form of a non-commercial loan.<sup>4</sup> In July 2024, Uzbekistan President Shavkat Mirziyoyev approved the allocation of \$255 million by Uzbekistan Railways for the project, with

<sup>1</sup> Agreement signed for China – Kyrgyzstan – Uzbekistan rail, <https://www.railwaypro.com/wp/agreement-signed-for-china-kyrgyzstan-uzbekistan-rail/>; 14.06.2024

<sup>2</sup> Tunnel construction for China-Kyrgyzstan-Uzbekistan railway begins in Kyrgyzstan, [https://24.kg/english/327810\\_Tunnel\\_construction\\_for\\_China-Kyrgyzstan-Uzbekistan\\_railway\\_begins\\_in\\_Kyrgyzstan/](https://24.kg/english/327810_Tunnel_construction_for_China-Kyrgyzstan-Uzbekistan_railway_begins_in_Kyrgyzstan/); 29.04.2025 - 24.kg news agency

<sup>3</sup> China-Kyrgyzstan-Uzbekistan railway: 48 bridges to be built, [https://24.kg/english/327956\\_China-Kyrgyzstan-Uzbekistan\\_railway\\_48\\_bridges\\_to\\_be\\_built/](https://24.kg/english/327956_China-Kyrgyzstan-Uzbekistan_railway_48_bridges_to_be_built/); 30.04.2025 - 24.kg news agency

<sup>4</sup> Construction of China-Kyrgyzstan-Uzbekistan railway to begin on 27 December, <https://www.gazeta.uz/en/2024/12/23/uzb-kz-china/>; 23.12.2024



the first \$14 million allocated by the end of last year.<sup>5</sup> Following it on November 5, the Kyrgyz government approved the allocation of \$14 million to support the construction of the railway.<sup>6</sup> The route will begin to receive the first freight and experimental passenger trains in 2026–2027. While full operation and possible electrification are planned for 2029–2031.<sup>7</sup>

### The players and their interests

**China:** As the initiator and primary financier of the CKU railway, for China, the project is a deliberate move to secure its position as a global trade hub and a key infrastructure blueprint that aligns with China's strategic and economic interests in Central Asia.

**BRI consolidation.** China seeks to bolster the Belt and Road Initiative by creating a more efficient trade route to Europe and the Middle East. Central Asia is the first place where the BRI was initiated and a demonstration zone for high-quality joint construction of the Belt and Road Initiative. The signing of the intergovernmental agreement of the CKU project nations in 2024 shows that the constructive cooperation between China and Central Asian countries in jointly building the BRI has been accelerating.

As main participants of the CKU railway, China, Kyrgyzstan and Uzbekistan have already achieved tangible and heavy results in collaboratively developing the BRI. The "Angren-Pap" railway tunnel in Uzbekistan Ferghana valley, the longest tunnel in Central Asia with its 19.2 km length, built by Chinese companies, was successfully completed on February 2016, ending the history of local people having to travel over mountains or detour through other countries. Another transport network the China-Kyrgyzstan-Uzbekistan highway officially opened to traffic on February 25, 2018, becoming an international transportation artery that crosses mountains and is unobstructed.

The CKU railway is considered a game-changer for the BRI, enhancing China's connectivity with Central Asia and beyond. It will provide a shorter and faster route for Chinese goods to reach Europe, the Middle East, and South Asia, bypassing longer routes through Russia or the Caspian Sea. Once completed, the CKU will solidify China's role as a key infrastructure and trade partner in Eurasia, reshaping continental logistics and geopolitics.

**Enhancing its presence in Central Asia.** Since its launch in 2013, the Belt and Road Initiative has played a crucial role in Beijing's plan to build stronger economic ties with Central Asia. As the abovementioned the two corridors among the BRI six ones cross Central Asia region connecting China with European Union and Middle East (*Photo 3*). Central to this effort is the construction of logistics hubs and railways including the CKU railway. It should be noted that the

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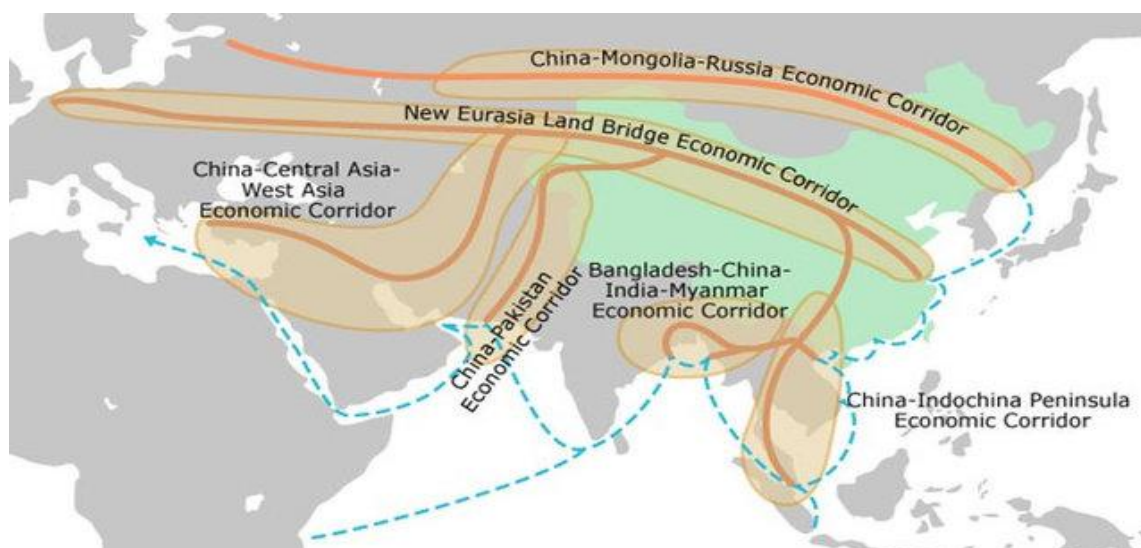
<sup>5</sup> Постановление Президента Республики Узбекистан, от 08.07.2024 г. № ПП-247, <https://lex.uz/ru/pdfs/7008648>

<sup>6</sup> Cabinet allocates \$14 million to China-Kyrgyzstan-Uzbekistan company, <https://24.kg/english/310276-Cabinet-allocates-14-million-to-China-Kyrgyzstan-Uzbekistan-company/>; 05.11.2024 - 24.kg news agency

<sup>7</sup> А.Лерон, Новый «южный коридор»: железная дорога Китай – Кыргызстан – Узбекистан, <https://www.rzd-partner.ru/kolonka-eksperta/novyy-yuzhnyy-koridor-zheleznaya-doroga-kitay-kyrgyzstan-uzbekistan-/>; 25.06.2025

distance of cargo transportation from China to Europe via Central Asia is 2 times shorter than by sea, and 2.5 times shorter than via the transport corridor through Russia.<sup>8</sup>

The need for the CKU railway dramatically increased with the beginning of Russia and Ukraine crisis and Western sanctions on Russian transport and other facilities. China's ambitions for the European market, particularly in the automotive sector, is emerging as a factor favoring the development of flows.<sup>9</sup> This is all the more true given that if the Trump administration implements the announced tariffs on Chinese products, China will more than ever need to turn to other markets, particularly Europe. Therefore, EU-China rail freight is likely to continue to face headwinds in coming years with the CKU railway and secure and alternative network for that cooperation.



*Photo 3. Map of six economic corridors of the Belt and Road Initiative*

*Source: china-trade-research.hktdc.com/business-news/article/The-Belt-and-Road-Initiative/The-Belt-and-Road-Initiative/obor/en/1/1X000000/1X0A36B7.htm*

The CKU railway will allow China to transport goods to Europe seven to eight days faster than existing land routes by providing a direct, efficient corridor to the continent. This development not only strengthens China's connectivity but also enhances its role as a dominant trade and infrastructure player in the region. Uzbekistan's existing connections with Turkmenistan and Iran could position the CKU railway as one of the shortest routes between China and Western Europe. With the CKU corridor operational and its transport capacity from 7 to 13 million tons of

<sup>8</sup> Ф.Жураев (2021), "Ключевые приоритеты Узбекистана по всестороннему развитию транспортных коридоров в Центральной Азии", <https://isrs.uz/ru/maqolalar/klucevye-prioritety-uzbekistana-po-vsestoronnemu-razvitiu-transportnyh-koridorov-v-centralnoj-azii>

<sup>9</sup> Building bridges and facing realities: Europe and China's automotive future in a shifting global order, <https://www.acea.auto/message-dg/building-bridges-and-facing-realities-europe-and-chinas-automotive-future-in-a-shifting-global-order/>; 30.04.2025

cargo per year,<sup>10</sup> Uzbekistan and Kyrgyzstan are set to emerge as vital transit countries for Chinese exports.

**Kyrgyzstan:** As a landlocked country with limited economic resources, Kyrgyzstan views the railway as an opportunity to boost its economy through transit fees, job creation, and increased foreign investment. The project also aligns with Kyrgyzstan's broader goal of integrating into regional and global trade networks. However, the country also faces challenges related to financing, environmental concerns, and potential debt dependency on China.

**Trade and transit benefits.** During all the years of discussing the railway project, official Kyrgyzstan has advocated its accelerated implementation, but with its own conditions. The CKU project will become a stimulating factor not only for providing jobs in the country, but also initiate the creation of a large construction infrastructure in Kyrgyzstan. The country aims to become a key transit corridor between China and Central Asia, Europe, and the Middle East, boosting its economy through transit fees which can reach about \$200 million annually<sup>11</sup> and logistics development. The railway is schemed to be linked to potential transport networks to Pakistan (via Afghanistan) or Turkey (via Turkmenistan and Azerbaijan) that could further enhance Kyrgyzstan's transit role.

Kyrgyzstan currently relies heavily on re-exports of Chinese goods, particularly through the Dordoi and Kara-Suu markets. The railway would reduce transportation costs and time, making Kyrgyz exports (agriculture, minerals, textiles) more competitive in Chinese, Uzbek, and European markets. A railway would cut transport costs by 30-40%, making exports more competitive.<sup>12</sup>

**Improving domestic connectivity.** The railway would link remote southern regions (Osh, Jalal-Abad) to Bishkek and international markets. Kyrgyzstan is interested in developing its internal infrastructure, as the length of its railways is only 424 km. The country's railway infrastructure consists of unconnected routes in the north and south that provide access to the railway networks of Kazakhstan and Uzbekistan. Hence, the CKU railway presents an opportunity for Kyrgyzstan to connect the north and south of the country, as it has not built railways since independence. (Khitakhunov, 2024) The expected transit revenues will substantially contribute to the growth of Kyrgyzstan's transport services. Thus, Kyrgyzstan will benefit in terms of developing its internal rail network, gaining access to international markets, and increasing transit revenues. This

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<sup>10</sup> China-Kyrgyzstan-Uzbekistan railroad to transport up to 13mln cargo per year, <https://qazinform.com/news/china-kyrgyzstan-uzbekistan-railroad-to-transport-up-to-13mln-cargo-per-year-6d2c72>; 20.06.2024

<sup>11</sup> Implementation of CKU railway project brings about \$200 mln to Kyrgyzstan – expert, <https://en.archive.kabar.kg/news/implementation-of-cku-railway-project-brings-about-200-mln-to-kyrgyzstan-expert>; 19.06.2024.

<sup>12</sup> Перспективы Кыргызстана стать сухопутным аналогом Суэцкого канала, [https://24.kg/ekonomika/326735\\_perspektivy\\_kyrgyzstana\\_stat\\_suhoputnyim\\_analogom\\_suetskogo\\_kanala/](https://24.kg/ekonomika/326735_perspektivy_kyrgyzstana_stat_suhoputnyim_analogom_suetskogo_kanala/); 21.04.2025 - 24.kg news agency



could also reduce regional disparities between the north and south, which have been a source of political tension.

However, there are fears that the railway could only deepen the north-south division within Kyrgyzstan, since "the railway will disproportionately increase the economic benefits for the southern regions of Kyrgyzstan, which will give them even greater leverage over the center." Among Kyrgyz skeptics, there is an opinion that the railway threatens Kyrgyzstan's national security. From their point of view, "the re-magnetization of the south of Kyrgyzstan to Kashgar could radically change the balance of power in the region, which could not only strengthen the positions of some self-sufficient southern clans, but may even lead to the disintegration of the country."<sup>13</sup>

Despite the intention officially speed up the construction of the railway, there have been largely internal contradictions about the profitability of the project for the republic, the lack of its own financial resources, as well as external factors that repeatedly put Kyrgyzstan in an indecisive position in the process of making specific decisions on the project. Unlike Uzbekistan and China, there were initially skeptical and oppositional opinions within Kyrgyzstan regarding the benefits of the CKU railway for the country.

*Firstly, the lack of financial opportunities.* Bishkek clearly understands that the country does not have the finances to build a section of the railway through its territory. Given the difficult mountainous terrain of Kyrgyzstan, the railway tracks should pass at an altitude of over 3,000 m. Russia, Kazakhstan and Uzbekistan refused to finance the Kyrgyz section of the railway. Based on this, Kyrgyz side has built its negotiating strategy. Kyrgyzstan is seeking to diversify its partners providing loans for the construction of the railway, attracting international financial structures as the World Bank and Asian Development Bank as well as countries such as Japan and India.

Alternative partners may view the construction of the railway as an opportunity to counterbalance China's presence in Central Asia and thus be willing to provide Kyrgyzstan with significant funds. In 2022, the Indian company Rail Vikas Nigam, controlled by the Indian Ministry of Transport, together with the Kyrgyz Industry Open Joint Stock Company, established a joint venture (JV) in the Kyrgyz Republic. The new JV is engaged in the construction of internal railways and other infrastructure projects in the country.<sup>14</sup>

During the spring sessions of the World Bank and the International Monetary Fund on April 24-25, 2025, Deputy Director of the National Investment Agency under the President of the Kyrgyz Republic Damirbek Bikulov emphasized that the World Bank acts not only as a financial donor, but also as a strategic partner of the republic. Particular emphasis was placed on the need to support key regional projects - the Kambarata HPP and the China-Kyrgyzstan-Uzbekistan railway.<sup>15</sup> These

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<sup>13</sup> Кубат Рахимов, Железная дорога Китай-Кыргызстан-Узбекистан: новый геополитический миф, [https://www.vb.kg/doc/215164\\_jeleznaja\\_doroga\\_kitay\\_kyrgyzstan\\_uzbekistan\\_novyy\\_geopoliticheskiy\\_mif.html](https://www.vb.kg/doc/215164_jeleznaja_doroga_kitay_kyrgyzstan_uzbekistan_novyy_geopoliticheskiy_mif.html) 06.02.2013.

<sup>14</sup> RVNL forms a new JV in Kyrgyz Republic, <https://www.railway-technology.com/news/rvnl-forms-jv-kyrgyz-republic>; 12.12.2022.

<sup>15</sup> Национальное агентство по инвестициям на пленарной сессии Всемирного банка и Международного валютного фонда, <https://invest.gov.kg/ru/2025/04/28/>; 28.04.2025.

initiatives are called the most important elements of transboundary infrastructure that ensure sustainable development, energy and water security, as well as deepening interstate integration.<sup>16</sup>

*Second, the perception of the railway among the Kyrgyz public as an instrument of Chinese expansion.* The implementation of Chinese economic projects in Kyrgyzstan has resulted in the emergence of a large number of local Chinese workers, and there are serious concerns that the construction of the railway will lead to an increase in the number of Chinese migrants and facilitate future migration due to easier access to Kyrgyzstan. The Kyrgyz public has become increasingly suspicious of the railway over time, viewing it as a useless piece of infrastructure that allows China to encroach on its sovereignty. This concern is intensified by the growth of Kyrgyzstan's external debt to China, which amounted to \$1.7 billion as of the end of January 2024, which is approximately half of the country's total external debt.<sup>17</sup> In addition, the Kyrgyz side is not interested in China financing the project under the "resources in exchange for investments" scheme. This practice is perceived extremely negatively in Kyrgyzstan.

**Uzbekistan:** Uzbekistan, the most populous country in Central Asia, sees the railway as a way to diversify its trade routes and reduce its reliance on Russian infrastructure. The project will enhance Uzbekistan's connectivity to China and Europe, fostering economic growth and regional influence. Since the beginning of its discussions at the highest level, Tashkent has not ceased to advocate for the speedy implementation of the project due to the following interests.

*First, improving transport infrastructure will reduce the time of delivery of goods from Uzbekistan by almost 15%,<sup>18</sup> which is the largest reduction among the countries of the BRI. Reducing the shipping time, in turn, will lead to an increase in Uzbekistan's exports by 13-23%.<sup>19</sup> The higher expected growth is the combined effect of completed BRI transport projects and reforms that halve border-crossing delays.*

Moreover, the construction of the China-Kyrgyzstan-Uzbekistan railway and the construction of the Trans-Afghan railway initiated by Uzbekistan are interconnected. In the event of the construction of the CKU railway through Uzbekistan, there will be an outlet to Turkmenistan, to the city of Turkmenbashi, which is located on the shores of the Caspian Sea. And the cargo that gets there by rail can easily be sent across the Caspian Sea to the Caucasus, Turkey and the Black Sea. Another option for delivering goods to the Black Sea will be through the port of Baku in Azerbaijan, and also to Europe - through the ports of Iran. Compared to the railways currently used, this will be more profitable, both in terms of shorter distances and in terms of freight costs.

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<sup>16</sup> <https://www.akchabar.kg/news/kyrgyzstan-prizval-vsemirnyj-bank-usilit-podderzhku-klyuchevykh-proektov-vklyuchaya-zheleznyuyu-dorogu-knrkrruz>

<sup>17</sup> Kyrgyzstan external debt reaches \$4.6 billion, [https://24.kg/english/294665\\_Kyrgyzstans\\_external\\_debt\\_reaches\\_46\\_billion](https://24.kg/english/294665_Kyrgyzstans_external_debt_reaches_46_billion); 22.05.2024, Bishkek - 24.kg news agency

<sup>18</sup> World Bank press-release from 02.04.2021 "Улучшение транспортной связанности в Центральной Азии требует комплексного подхода", <https://www.vsemirnyjbank.org/ru/news/press-release/2021/04/02/improving-transport-connectivity-in-central-asia-requires-a-coherent-approach>;

<sup>19</sup> South Caucasus and Central Asia: The Belt and Road Initiative Uzbekistan Country Case Study, <https://openknowledge.worldbank.org/server/api/core/bitstreams/7b901f03-d114-54de-a13b-6012a28f7934/content>, June 2020

*Second, obtaining stable income from the transit of foreign cargo between China, the EU and the Middle East.* In particular, if the volume of cargo transportation from China along this route is provided at the level of 4 million tons per year, then the annual income from transit will amount to 200 million dollars in the first 5 years alone.<sup>20</sup> In case of its connection to the corridor "Uzbekistan-Turkmenistan-Iran-Oman", transit income can increase twofold or more.

*Third, reducing the country's transit dependence on the Kazakh direction of Uzbekistan's export deliveries.* It accounts for about 50% of the total volume of Uzbekistan's export deliveries to foreign markets.

*Fourth, strengthening the position of Uzbekistan in Central Asia,* increasing its role as a key transport and transit hub in the region between the largest markets of Eurasia.

Uzbekistan's integration into global value chains will be largely determined by the targeted development and modernization of international transport routes and infrastructure capabilities in the field of foreign trade transportation. Currently, the volume of foreign transportation in Uzbekistan is about \$330 million, including cargo transit - about \$200 million. According to forecasts, the growth of Uzbekistan's foreign trade turnover with other countries by 2030 by 3.8 times will make it possible to increase the volume of foreign transportation by 2.9 times, or by \$280 million annually. According to rough estimates, the total increase in foreign trade turnover in these areas by 2030 may amount to about \$800 billion. Cargo in the amount of \$176 billion can be transported through the Central Asian countries. And, given the transport and transit capabilities, Uzbekistan can compete in the transportation of cargo through its territory in the amount of about \$75 billion (9.4%).

### **Non-cooperative external players/geopolitical implications**

The CKU railway has far-reaching geopolitical implications for Central Asia and beyond. By enhancing regional connectivity, the project could reduce the influence of traditional powers like Russia and create new opportunities for economic integration. It also positions China as a dominant player in Central Asia, potentially reshaping the region's geopolitical landscape. Additionally, the project may exacerbate regional rivalries, particularly if other Central Asian countries feel excluded from its benefits.

**Kazakhstan** is not a supporter of the implementation of the China-Kyrgyzstan-Uzbekistan railway, which bypasses Kazakhstan. At the moment, Kazakhstan, in fact, holds in its hands all the railway corridors from the Central Asian countries to the Russian Federation and China. Over the years of independence, Kazakhstan has built more railways than all the CIS countries combined, including Russia. Despite the growing volumes of railway transportation from China to Europe in recent years, the project may face strong competition from the already built railways on the territory of Kazakhstan through the Dostyk and Khorgos crossings.

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<sup>20</sup> Железнодорожный проект Китай-Кыргызстан-Узбекистан достигает стадии реализации – Часть первая, <https://www.newscentralasia.net/2024/07/01/zheleznodorozhnyy-proyekt-kitay-kyrgyzstan-uzbekistan-dostigayet-stadii-realizatsii-chast-pervaya/>; 01.07.2024

In the case of connecting Kashgar with Andijan by rail through the territory of Kyrgyzstan and the construction of the Kokand-Angren railway through the Kamchik pass, most of the cargo that now comes from China to Uzbekistan through Kazakhstan may go along the China-Kyrgyzstan-Uzbekistan railway line. Kazakhstan's railways will be forced to enter into a tariff war. For this reason, Kazakhstan benefits from the alarmist mood in the Kyrgyz Republic regarding the construction of the China-Kyrgyzstan-Uzbekistan railway.

**Russia.** At the official level, during negotiations with the head of Kyrgyzstan Sadir Japarov within the framework of the CSTO summit in 2022, the head of the Russian Federation V. Putin stated that Moscow “will not oppose the construction of the China-Kyrgyzstan-Uzbekistan railway”. In this light, as Deputy general director of Russian Railways S. Pavlov stated in an interview with Russian media, “it is in Russia’s interests for the new China-Kyrgyzstan-Uzbekistan railway to be completed as soon as possible, so that the railway could thus help share the burden of the Trans-Siberian Railway, which has encountered problems.” It was also noted that Russian Railways is interested in participating in the construction and operation of the CKU railway line. According to him, when the new route is put into operation, the company will be able to distribute the cargo of the Trans-Siberian Railway through the southern branch.<sup>21</sup>

In 2019, the Russian side allocated \$3 million to develop a feasibility study for the railway construction project. However, such Russian financial support could have become a distraction. Russia has extensive experience in Kyrgyzstan, when it offered to support a project, started negotiations, wasted everyone's time and withdrew from the project at the last minute. This is exactly what happened in 2016, when Moscow did not fulfill its financial promises for two energy projects, the implementation of which had to be suspended. Russia is not interested in the economic development of Kyrgyzstan, since it depends on cheap labor in the country, since about 350 000 Kyrgyz citizens work in Russia in low-paid positions.<sup>22</sup>

Moreover, the construction of the CKU railway bypassing Russian territory to the markets of Europe and the Middle East does not meet the interests of Moscow. The corridor could reduce freight traffic from the Kazakh-Russian route by 10-15%. Moreover, due to anti-Russian sanctions, it has become difficult to move goods along Russian highways. Some European countries have had to switch to a slower and more expensive rail and sea route, crossing the Caspian by ship, bypassing Russia. The new line will provide an alternative, non-Russian, rail-only route between China and Europe.

Russia believes that diversification of access of the region's countries to external markets will weaken its geopolitical influence in Central Asia and will lead to a strengthening of China's presence here. According to different opinions, it was under pressure from Moscow that the Kyrgyz side has been delaying the implementation of the railway project for all these years.

<sup>21</sup> РЖД готовы участвовать в строительстве пути из Китая в Узбекистан, <https://uz.kursiv.media/2023-06-14/rzhd-gotovy-uchastvovat-v-stroitelstve-puti-iz-kitaya-v-uzbekistan/>; 14.06.2023.

<sup>22</sup> Число мигрантов из Кыргызстана в России сократилось вдвое [https://24.kg/obschestvo/315781\\_chislo\\_migrantov\\_izkyrgyzystana\\_vrossii\\_sokratilos\\_vdvoe/](https://24.kg/obschestvo/315781_chislo_migrantov_izkyrgyzystana_vrossii_sokratilos_vdvoe/); 30.12.2024.

### **The Cooperative game: aligning interests for mutual gain**

The CKU railway project exemplifies a cooperative game where the three nations must negotiate their roles, responsibilities, and benefits to ensure the project's success. Key elements of this cooperative framework include:

**Coalition Formation:** The success of the CKU railway depends on the formation of a stable coalition among China, Kyrgyzstan, and Uzbekistan. Each country brings unique resources to the table: China provides financing and technical expertise, Kyrgyzstan offers geographic access, and Uzbekistan contributes its market potential and regional influence. By pooling these resources, the coalition can achieve outcomes that would be unattainable individually.

**Benefit Distribution:** A critical challenge in cooperative games is ensuring that benefits are distributed fairly among participants. In the case of the CKU railway, this involves negotiating transit fees, revenue-sharing mechanisms, and investment terms. Cooperative game theory suggests that a fair distribution should reflect each country's contribution to the project while ensuring that no player feels disadvantaged.

**Conflict Resolution:** Despite the potential for mutual gain, conflicts may arise over issues such as environmental impact, labor standards, and geopolitical alignment. Cooperative game theory emphasizes the importance of negotiation, compromise, and the establishment of dispute-resolution mechanisms to maintain coalition stability.

**Long-Term Stability:** For the CKU railway to succeed, the coalition must ensure long-term stability. This requires building trust, fostering transparency, and creating institutions that facilitate ongoing collaboration. Cooperative game theory highlights the role of repeated interactions and reputation in sustaining cooperative behavior over time.

**Common interest.** Opening strategic routes to sea ports and international markets through the implementation of the CKU railway significantly solves the problem of the persistent transport isolation of Central Asia. Transport isolation seriously restrains the economic growth of the countries of the region and contributes to a 20% lag in development compared to maritime states. At the same time, the Central Asian states, having no direct access to sea ports, bear significant transport and transit costs, which reach 60% of the cost of imported goods. The planned railway has significant potential to create a new strategic Eurasian logistics network along the BRI route, connecting China with Iran, Turkey and Europe, while avoiding sanctions against Russia. In addition, this route will provide Central Asian states with additional direct rail links to central regions of China.

### **The Shapley value solution application to the CKU Railway Project**

- Defining the players and their contributions:
  - **China:** Provides financing, technology, and access to global markets.
  - **Kyrgyzstan:** Offers transit rights, land, and regional connectivity.
  - **Uzbekistan:** Enhances Central Asian trade links and demand for transport.



- **Possible coalitions and their values:**
  - **China alone (C):** Limited benefit without transit.
  - **Kyrgyzstan alone (K):** No railway without China's investment.
  - **Uzbekistan alone (U):** No direct benefit without the railway.
  - **China + Kyrgyzstan (C+K):** Partial route, but lacks Uzbekistan's demand.
  - **China + Uzbekistan (C+U):** Needs Kyrgyzstan's land for connectivity.
  - **Kyrgyzstan + Uzbekistan (K+U):** No funding or tech without China.
  - **All three (C+K+U):** Full economic and logistical benefits.

- Calculating marginal contributions:

The Shapley value evaluates each country's contribution by considering all possible orders of joining the coalition:

Order of Entry	Marginal Contribution of China (C)	Kyrgyzstan (K)	Uzbekistan (U)
$C \rightarrow K \rightarrow U$	$V(C) - 0 = \text{Low}$	$V(C+K) - V(C)$	$\frac{V(C+K+U) - V(C+K)}{V(C+K+U) - V(C+K)}$
$C \rightarrow U \rightarrow K$	$V(C) - 0 = \text{Low}$	$\frac{V(C+K+U) - V(C+U)}{V(C+K+U) - V(C+U)}$	$V(C+U) - V(C)$
$K \rightarrow C \rightarrow U$	$V(C+K) - V(K)$	$V(K) - 0 = 0$	$\frac{V(C+K+U) - V(C+K)}{V(C+K+U) - V(C+K)}$
$K \rightarrow U \rightarrow C$	$V(C+K+U) - V(K+U)$	$V(K) - 0 = 0$	$V(K+U) - V(K) = 0$
$U \rightarrow C \rightarrow K$	$V(C+U) - V(U) = 0$	$\frac{V(C+K+U) - V(C+U)}{V(C+K+U) - V(C+U)}$	$V(U) - 0 = 0$
$U \rightarrow K \rightarrow C$	$V(C+K+U) - V(K+U)$	$V(K+U) - V(U) = 0$	$V(U) - 0 = 0$

Average (Shapley Value):

- **China:** Highest (major financier and tech provider)
  - **Kyrgyzstan:** Moderate (transit rights essential)
  - **Uzbekistan:** Lower but critical (demand driver)
- Practical allocation scenarios:
    - **Cost-sharing:** China bears the largest share (~50-60%), Kyrgyzstan (~30%), Uzbekistan (~10-20%).
    - **Revenue distribution (tolls/trade gains):** China (40%), Kyrgyzstan (35%), Uzbekistan (25%).

- **Operational control:** China leads construction, Kyrgyzstan manages local logistics, Uzbekistan handles regional trade links.
- Advantages of using the Shapley value:
  - **Fairness:** Reflects actual contributions rather than political bargaining.
  - **Incentivizes participation:** Ensures no country is exploited.
  - **Transparency:** Clear mathematical framework reduces disputes.
- Challenges and considerations:
  - **Subjectivity in valuation:** Estimating economic benefits is complex.
  - **Geopolitical factors:** Non-economic influences (e.g., Russia's stance) may override game theory.
  - **Dynamic conditions:** Future trade shifts may require recalculations.

However, applying it to non-cooperative players (like Russia and Kazakhstan) in the context of the CKU railway requires careful consideration, as the Shapley value assumes players can form binding agreements, which may not hold here. Since Russia and Kazakhstan are not part of this project but are affected by it, we can analyze their implicit "participation" in the broader geopolitical game.

- Treating Russia and Kazakhstan as "outside players" affecting the coalition:
  - Russia and Kazakhstan's influence can be incorporated as external factors (e.g., by adjusting the value function based on their reactions, such as imposing trade barriers or offering competing routes).
  - The Shapley value would then distribute gains among the three active members, considering how Russia/Kazakhstan's actions impact the coalition's stability.
- Including them as players with zero or negative contribution:
  - If we consider Russia and Kazakhstan as part of a larger "Eurasian transport game," their absence from the railway project could be modeled as a non-cooperative stance.
  - Their Shapley value might be zero (if they contribute nothing) or even negative (if they actively oppose the project, reducing its value for others).
- Practical Implications:
  - If Russia and Kazakhstan block alternative routes or impose sanctions, the value of the China-Kyrgyzstan-Uzbekistan railway increases (since it becomes more critical).
  - Their absence from the coalition means they do not share in its benefits, but they may still influence outcomes through external pressure.

In this case, Russia and Kazakhstan's exclusion from the railway project means they do not receive a Shapley allocation, but their geopolitical actions could indirectly shape the distribution of gains among the active members.

## Final Thoughts

Analyzing this trilateral project through cooperative game theory provides insights into how the three countries can align their interests, distribute costs and benefits, and ensure stable cooperation. China seeks to expand the BRI, secure efficient trade routes to Europe and the Middle East, and reduce dependence on Russian transit. Kyrgyzstan and Uzbekistan aim to boost economic growth, improve infrastructure, and gain transit fees while balancing geopolitical influences (China vs. Russia).

- The project is a grand coalition - China + Kyrgyzstan + Uzbekistan, where cooperation maximizes collective benefits (trade efficiency, regional development). The success of the CKU railway will depend on cooperation among stakeholders and the ability to navigate complex challenges. Bilateral agreements (e.g., China-Kyrgyzstan or Kyrgyzstan-Uzbekistan segments alone) would yield suboptimal outcomes, reinforcing the need for full trilateral participation.

- The Shapley value solution models fair distribution of costs (construction, maintenance) and benefits (transit fees, trade gains). China, as the largest economy, may bear higher costs but gains long-term trade advantages, while Kyrgyzstan and Uzbekistan negotiate for financial aid, debt relief, or employment opportunities.

- A hybrid model combining the Shapley value with diplomatic agreements would optimize fairness and feasibility, ensuring long-term collaboration among China, Kyrgyzstan, and Uzbekistan.

- Geopolitical impacts of non-cooperative external players (e.g., Russia, wary of losing influence) may attempt to disrupt the coalition, requiring mechanisms to ensure stability. The core solution in game theory ensures no subset of players has an incentive to break away, implying the need for balanced concessions.

## Conclusion

The China-Kyrgyzstan-Uzbekistan railway is a prime example of how cooperative game theory can be applied to understand complex geopolitical and economic interactions. By forming a stable coalition, aligning their interests, and addressing potential conflicts, China, Kyrgyzstan, and Uzbekistan can unlock significant mutual benefits. However, the success of the project will depend on their ability to navigate the challenges of benefit distribution, conflict resolution, and long-term stability. As the CKU railway moves forward, it will serve as a test case for the power of cooperation in an increasingly interconnected world. The success of the railway will depend on the ability of its key participants to overcome internal and external challenges while maintaining a balance between national interests and regional cooperation. The Shapley value provides a robust method for distributing costs and benefits in the CKU railway project, ensuring equitable cooperation. While it must be adjusted for real-world constraints, it offers a principled foundation for negotiations.

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