American Journal of Business and Operations Research

ISSN: 2692-2967 Vol: 11, No. 01, 2025 PP. 23–30

Article DOI: https://doi.org/10.54216/AJBOR.110104

FULL LENGTH ARTICLE

Fostering Economic Growth and Global Trade through Digitalized International Transport Corridors: Examining the Role of the eTIR Convention in the Proposed China–Kyrgyzstan–Uzbekistan Railways for Uzbekistan's Development

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Received: October 20, 2023 Revised: November 29, 2023 Accepted: December 27, 2023 ⋆ Corresponding author

ABSTRACT

This study investigates the intricate dynamics of fostering economic growth and global trade through digitalized international transport corridors (ITCs), focusing on the proposed China–Kyrgyzstan–Uzbekistan (CKU) railway project within the framework of the eTIR Convention. Employing a comprehensive mixed-methods approach, integrating quantitative data from official sources, the research delves into the transformative potential of the CKU railway in linking Central Asia to China and Europe, thereby amplifying Uzbekistan's economic growth and global trade. Despite the project's potential to bolster trade competitiveness, stimulate regional integration, and foster economic diversification, the analysis uncovers challenges such as geopolitical tensions, environmental impacts, and financial sustainability, which could impede seamless implementation and operation. Leveraging the ARDL (2,1) model, the study reveals a direct dependency between the GDP growth rate and income from China to Uzbekistan, suggesting a substantial linear relationship. However, caution is advised in drawing definitive policy or economic implications, as further nuanced analysis and contextual understanding are imperative. The paper concludes by offering nuanced policy recommendations to enhance the governance and management of ITCs in Uzbekistan, emphasizing the necessity for a holistic and adaptive approach to navigate the complexities of such transformative projects, especially within the digitalized landscape and the context of the eTIR Convention.

Keywords: International Transport Corridors ▪ Digitalization ▪ Economic Growth ▪ Global Trade ▪ eTIR Convention ▪ China–Kyrgyzstan–Uzbekistan Railway

1. INTRODUCTION

The concept of corridors plays an important role in economic development as economies must be supported by efficient and sustainable logistics systems [3]. It comprises railways, short sea shipping routes and road linking urban nodes, maritime and inland ports, airports, and terminals. They have large number of impacts to global market such as fostering the efficient transportation of people and goods, ensuring access to jobs and services, enabling trade and economic growths, strengthening economic, social, territorial cohesion of the

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regions or countries involved, creating seamless transport systems across borders. Railways are an important component of transport corridors as they offer high capacity, speed, reliability, and low emissions compared to other modes. Railways can also connect ports to inland terminals or distribution centers, expanding the market area of a gateway and facilitating intermodal transport.

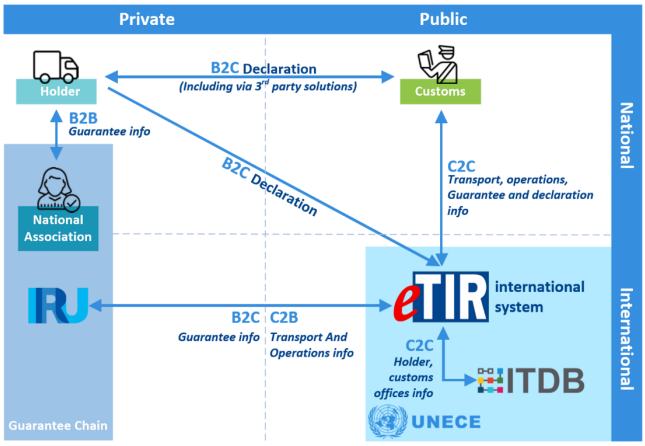

Figure 1. The eTIR system.

In the realm of international trade and transport, the electronic Transports Internationaux Routiers (eTIR) Convention emerges as a pivotal framework, signaling a transformative shift toward digitalized and streamlined transport operations. Envisioned as an extension of the longstanding TIR Convention, the eTIR Convention revolutionizes cross-border transport by introducing electronic documentation and communication systems. This digital evolution not only enhances the efficiency and security of international transport corridors but also facilitates seamless customs procedures, reducing transit times and operational costs [13].

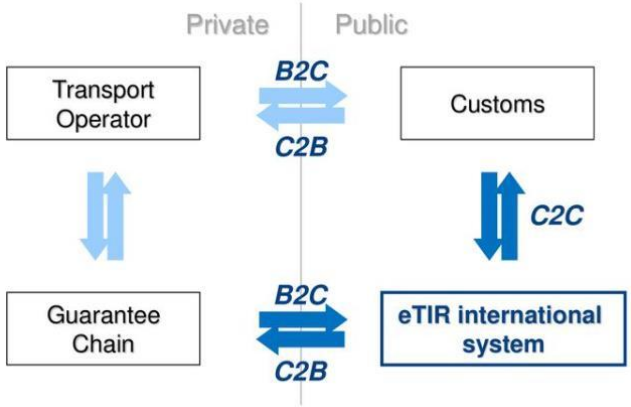

Figure 2. The eTIR system: a public–private partnership.

As this paper delves into the role of digitalized international transport corridors, particularly in the context of the proposed China–Kyrgyzstan–Uzbekistan Railway, the eTIR Convention stands as a cornerstone, exemplifying the ongoing paradigm shift in global logistics. Understanding the implications and applications of the eTIR Convention becomes imperative in navigating the complexities of modern transport systems and harnessing their potential to foster economic growth and global trade.

Changes in the transport infrastructure of the countries of Central Asia occur simultaneously with the main regional geo-economic development trends. Bespalyy (2022) noted that the proposed China–Kyrgyzstan–Uzbekistan railway would connect China with Central Asia and Europe through Kyrgyzstan and Uzbekistan [4]. The project has been on the table for two decades, but has faced many challenges; today, there is still an enormous amount of work to be done and significant hurdles to mount if this project will ever see completion [16].

The project is estimated to cost about $4.5 billion and would provide an alternative route for China's overland trade with Europe, bypassing Russia and Kazakhstan. The project is also seen to boost economic development and regional integration in Central Asia. The need for such transport links should be seen in the light of both Uzbekistan's and Kyrgyzstan's economic under-development, and having enhanced transport links to the wider world could go a long way towards revitalizing these struggling economies. For both landlocked states (in Uzbekistan's case, "double landlocked"), connecting to the outside world has been a big issue since gaining independence from the Soviet Union in 1991 [16]. The transport system of the Republic of Uzbekistan occupies an important place in the life support of its diversified economy and the implementation of the country's social policy. Its stable and effective functioning is a prerequisite for stabilizing, lifting, and restructuring the entire economy of the country, ensuring national security, improving conditions and raising the standard of living of the population [10].

This study aims to investigate the impact of reduced export time and the contribution of transport services in service exports, facilitated by international transport corridors, on the GDP of Uzbekistan. Specifically, the research seeks to address the following question: How do improvements in the efficiency and share of transport services within international transport corridors influence Uzbekistan's economic growth? In exploring this, particular attention is given to the role of the China–Kyrgyzstan–Uzbekistan (CKU) railway as a key international transport corridor. Additionally, the study integrates the transformative implications of the electronic Transports Internationaux Routiers (eTIR) Convention within the broader context of the CKU railway, acknowledging the digitalized advancements in transport operations. The findings contribute essential insights into the economic implications of international transport corridors and the CKU railway, providing a foundation for policy implications and recommendations to enhance Uzbekistan's economic development and global trade.

2. LITERATURE REVIEW

The role that international transport corridors plays in promoting global trade and supporting economic growth has been at the center of numerous studies. We begin this review by providing a summary of the research on international transport corridors from both global and regional perspectives. Then, we concentrate on research that specifically looks at transport routes through the China–Kyrgyzstan–Uzbekistan railway and its impact on the GDP of Uzbekistan.

Central Asia for many centuries was a vital hub linking regional and international communities via the historic Silk Road. The New Silk Road projects are instrumental in laying

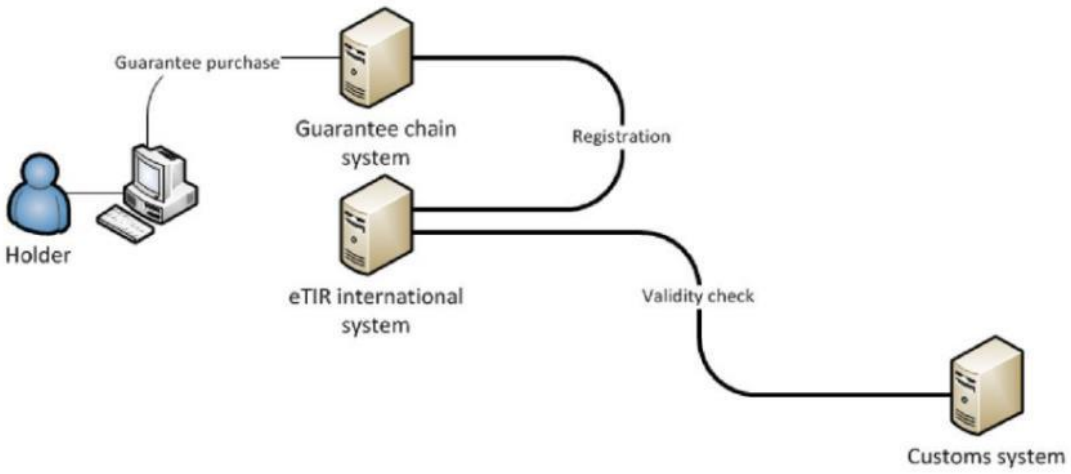

Figure 3. eTIR management of guarantee data by customs.

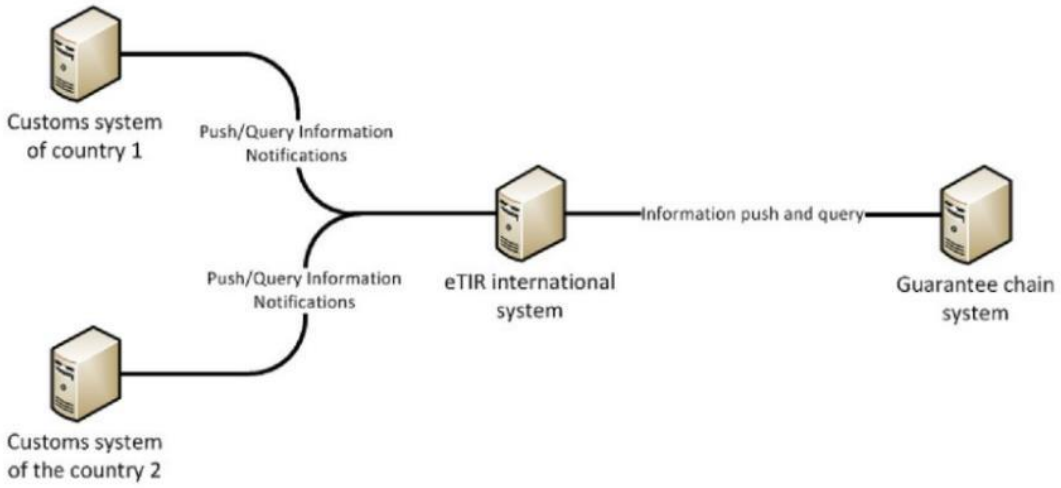

Figure 4. eTIR customs-to-customs data exchange.

the foundation for regional cooperation; creating political flexibility; improving economic growth; offering trade diversifications; and investing in transportation, mining and energy sectors. Fedorenko (2013) highlighted the project as a historically unprecedented chance for the Central Asian republics to become important players in the world economy by illustrating the various New Silk Road initiatives [6].

The importance of transport corridors for economic development has been the focus of several studies. The maximum speed of freight trains varies from 90 to 100 km/h. Despite the inherent heterogeneity of the corridor's infrastructure, traction and signaling system, the block trains of the same composition (capacity) are supposed to operate during the specified period [18].

Kumagai et al. (2019) showed that the railway connection and customs facilitation between China and Kyrgyzstan would have a positive impact on most regions in Central Asia, China, Russia, and Mongolia, but a negative impact on one region in northern Kyrgyzstan [12]. The study suggested that resource transfer from the benefiting regions to the suffering region may be a way to reduce regional gaps.

Akhmet et al. (2021) examined the impact of Uzbekistan's economic and political reforms on regional cooperation in Central Asia [2]. It finds that Uzbekistan's initiative has improved interstate relations, political dialogue, mutual understanding, and trade among the CAR countries and highlighted the role of cross-border and inter-regional cooperation in fostering regional integration. In this paper it was assumed that the current problems with unresolved visa issues, gray trade, and insufficient communication between the countries would be resolved in the near future. Karymshakov and Sulaimanova (2021) suggested several policy recommendations for Central Asian countries, such as highlighting the need for regional infrastructure development projects that were not confined to single-country perspectives to facilitate regional trade; calling for deliberate government policy that considers the cost-efficient effects of different types of transportation, as they have different effects on trade facilitation; and warning that the positive impact of physical infrastructure declines over time and needs to be supported by other policies that create a favorable environment for international trade facilitation, such as reducing regulatory burden and developing manufacturing and other processing industries in Central Asian countries [11].

Dadabaev and Djalilova (2021) discussed how Uzbekistan has pursued various transportation projects with its main international partners, namely Russia, China, South Korea and Japan, to enhance its connectivity and integration with

the regional and global markets. They argued that Uzbekistan has adopted a pragmatic and flexible approach to balance the interests and expectations of these partners, while also pursuing its own national interests and development goals [5].

Naz et al. (2022) explored how the KKH Silk Road's challenges affect public sentiment in both China and Pakistan, and proposed a "vision" for achieving mutual benefits through CPSR negotiations. By improving communication, community involvement, and energy supply, the KKH Silk Road can boost economic recovery and partnership in Asia and transform China's global position [15].

Salawu et al. (2022) examined the research focus, methods, and gaps in the literature on trade logistics and international trade development from 1999 to 2019 from the transport and logistics management perspective, including a developing economy with 134 peer-reviewed articles, and highlighted the structural backbone and potential areas for research opportunities in the field [17].

Jalolova, Amirov, et al. (2022) examined the importance of rail transportation in the economy of the nation and the difficulties of competitiveness and fragmentation of the transportation system [9]. The study suggested a number of initiatives to boost the effectiveness of railway transport management, including enhancing the transport network, fostering conditions, designing effective transportation corridors, and establishing advanced logistics systems [1].

Jalolova, Sangirova, et al. (2022) examined the rise of the Uzbek transport and logistics industry and offered recommendations to improve it, including developing a logistics strategy, limiting intermediaries, enhancing transportation infrastructure, modernizing storage facilities, lowering transport tariffs, developing an integrated cargo tracking system, and incorporating advanced logistics technologies. These suggestions would boost the nation's transit potential, increase the quality and availability of transportation, and cut the price of logistics. The study also emphasized the need for current economic science to improve the scientific methods of logistics.

The transport system of the Republic of Uzbekistan occupies an important place in the life support of its diversified economy and the implementation of the country's social policy. Its stable and effective functioning is a prerequisite for stabilizing, lifting and restructuring the entire economy of the country, ensuring national security, improving conditions and raising the standard of living of the population. The Republic of Uzbekistan has an extensive transport system that provides internal and external transportation of goods and passengers, and its economic ties with countries located close and far. The Republic of Uzbekistan has such components of the transport complex as railway, river transport, air, automobile, and pipelines. The country has established transport communications and means of communication with developed and developing countries [10].

The study by Ijaz Uddin et al. (2023) provides valuable insights into the enhancement of institutional quality as a catalyst for economic development in developing nations. Published in *Research in Globalization*, the research employs the Co-integration Structural Auto Regressive Distributed Lag (CS-ARDL) approach, offering a novel methodological perspective [8]. The authors delve into the nuanced relationship between institutional quality and economic development, shedding light on the mechanisms through which improvements in institutional frameworks can positively impact the economic trajectories of developing nations. The utilization of the CS-ARDL approach adds a distinctive analytical dimension, allowing for a more nuanced understanding of the dynamic interplay between institutional quality and economic development. This research contributes to the broader literature on development economics by offering fresh insights into the role of institutions in shaping economic outcomes, which is particularly pertinent to the present study's exploration of the economic implications of international transport corridors, including the proposed China–Kyrgyzstan–Uzbekistan railway. The findings of Uddin et al. (2023) may serve as a valuable reference in contextualizing the broader economic development landscape and institutional considerations within the scope of this study [7].

Changes are already being implemented with the support of international organizations, and some national projects have also been launched. Kazakhstan is an example of the efforts being made by the region to rapidly modernize the transport infrastructure. The country has launched an ambitious road construction program: the Western Europe–Western China International Transit Corridor (WE–WC) project under CAREC. However, further improvements are needed to bring the region's infrastructure network up to international standards. Central Asia must improve transport links with the rest of the world. To do this, it is necessary to increase the number of direct flights from the leading cities of the world and within the region, especially in Kyrgyzstan and Tajikistan, where transport links remain poorly developed compared to Kazakhstan and Uzbekistan. Transport accessibility is critical to attract foreign investors and tourists.

Salawu et al. (2022) examined the research focus, methods, and gaps in the literature on trade logistics and international trade development from 1999 to 2019 from the transport and logistics management perspective, including a developing economy with 134 peer-reviewed articles, and also highlighted the structural backbone and potential areas for research opportunities in the field.

Zhao et al. (2023) examined the literature on the International Land–Sea Trade Corridor (ILSTC), a recent corridor that connects Western China and ASEAN and has an impact on their commerce, economic development, and modes of transportation. They explored the research trend on ILSTC using methodologies for literature analysis, and categorized the chosen works into three research clusters: trade and economy, development status, and importance [19]. Analysis first examined the primary research questions and literature findings to show the development of the ILSTC research, after which it examined the specifics of the ongoing study [4].

Bespalyy (2023) determined the state and future development prospects of the transport networks in Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan, which are part of Central Asia (CA). The study explores that transportation infrastructure is crucial to the region's integration with the neighboring regions and the global economy as well as its economic and social development, and analyzed the main features and challenges of the transport infrastructure of CA,

such as its geographical location, natural conditions, historical legacy, institutional framework, technical standards, financial resources, and environmental impact. Balbaa (2023) discussed how the China–Kyrgyzstan–Uzbekistan (CKU) railway project, which was originally conceived in the mid-1990s, has been revived and advanced in recent years, as part of China's Belt and Road Initiative (BRI) and the regional cooperation frameworks such as the Shanghai Cooperation Organization (SCO) and the Central Asia Regional Economic Cooperation (CAREC) Program. He pointed out that the CKU railway project has significant strategic and economic implications for China and the Central Asian countries, as well as for other neighboring regions and global markets [3].

However, there is a lack of studies that assess the impact and effectiveness of specific transport corridor projects in Central Asia, such as the China–Kyrgyzstan–Uzbekistan railway project and its benefits to the GDP growths and economic sustainability of Uzbekistan. This research paper aims to fill this gap by examining the impact of China–Kyrgyzstan–Uzbekistan on fostering trade and stimulating economic growth in Uzbekistan using a quantitative research method and analyzing data.

3. RESULTS

In this research, we have analyzed the statistics on the volume of trade between China and Uzbekistan. The volume of exports from China to Uzbekistan was selected. Based on the statistics of the value of exports to our country in the period from 1997 to 2022, it was determined and researched that there is a correlation between the annual growth rate of the gross domestic product of Uzbekistan and this value.

As mentioned above, in order to scientifically prove the practical importance of the China–Uzbekistan–Kyrgyzstan railway project, we selected statistics related to the foreign trade of China and Uzbekistan. We used STATA software to analyze the data. Table 1 presents a description of the data.

Table 1. Descriptive statistics.

Variable	Obs.	Mean	Std. Dev.	Min	Max
GDP growth rate (%)	26	6.126	1.817	2	9.47
Imports from China (million USD)	26	10004.293	5270.228	3104.71	21922.34

The line graph shows changes of GDP growth rate in percentage in Uzbekistan from 1997 to 2022. It is observed that GDP growth rate decreased slowly to reach about 4% by 2004. However, this downward trend was suddenly broken and the GDP growth rate rose sharply from 2004 to 2007 and reached its peak. From 2007, GDP growth rate showed a significant decline, reaching 2% in 2020. Starting from 2020, a high rise of GDP is observed, and in 2021 it dropped again to approximately 5%.

Overall, GDP growth rate reached its highest percentage in 2007. Thus, that period for Uzbekistan trade was more effective and positive.

The given line graph illustrates the changes in imports of goods and services from China to Uzbekistan, evaluated in millions of US dollars. A cursory glance at the line graph is enough to make it clear that imports from China showed

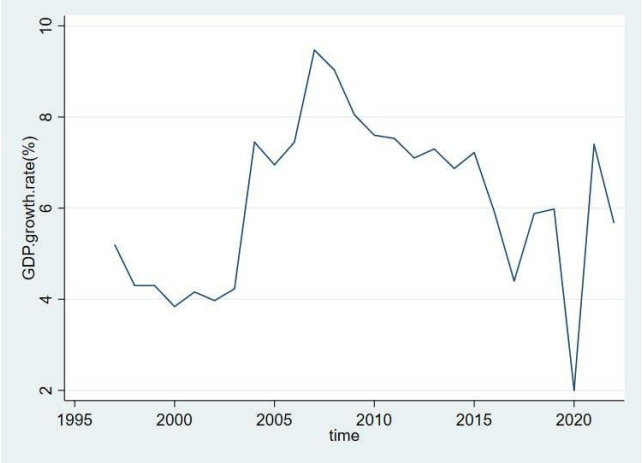

Figure 5. GDP growth rate in percentage in Uzbekistan from 1997 to 2022.

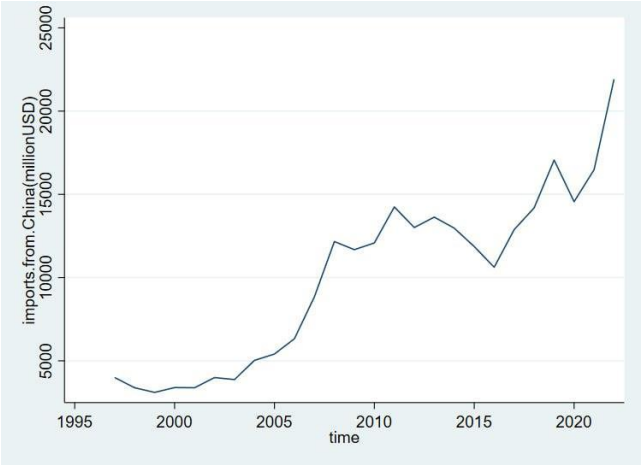

Figure 6. Changes in imports of goods and services from China to Uzbekistan, 1996–2022.

an upward trend from 1996 to 2022, reaching approximately 22,500 million US dollars.

From 2012 to 2016 there was a steady decrease in imports, after which this indicator stabilized and continued to rise until 2022.

Overall, it can be clearly seen that the income from imports of goods and services from China to Uzbekistan is highly developed. In these positive dynamics, a significant role is played by establishing partnerships between Uzbekistan and China and the high efficiency of the developing transport sector for delivering goods to Uzbekistan's markets.

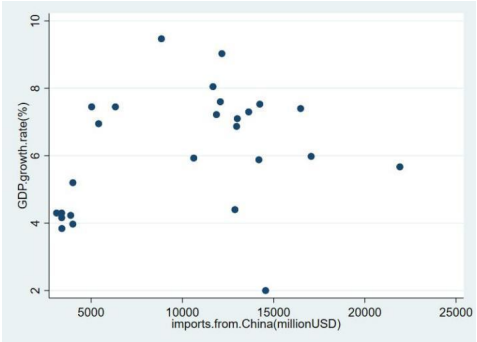

Figure 7. Linear relationship between GDP growth rate and income from China to Uzbekistan.

It can be shown that the linear relationship between GDP growth rate and income from China to Uzbekistan is not so strong for each year of analysis. However, it has common relationships when GDP growth rate reached 4% and imports from China reached about 2,500 million US dollars. A similar situation developed when GDP growth rate reached 7–9% and imports from China reached about 11,000–15,000 million US dollars.

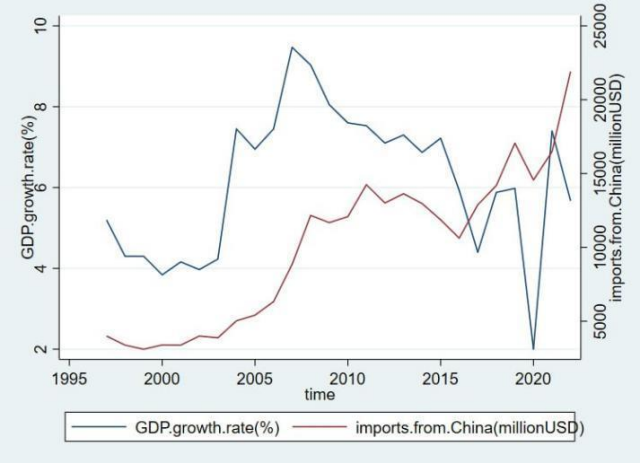

Figure 8. Uzbekistan's GDP growth rate and income of imports from China to Uzbekistan from 1996 to 2022.

The line graph shows Uzbekistan's GDP growth rate and income of imports from China to Uzbekistan from 1996 to 2022. During these years both indicators experienced a similar pattern, which means that income from the import of goods and services from China to Uzbekistan is directly related to changes in GDP in Uzbekistan.

GDP growth rate reached a peak of about 9% by 2006 before it fell, after which a dynamic of oscillation from falling to rising was observed, reaching a minimum of 2% by 2020. However, the income from imports of goods and services illustrated positive dynamics with a slight decrease from 2012 to 2016.

Before starting the research, we checked both time series for stationarity; Figure 9 shows the results of the Dickey–Fuller test. Data were brought to a stationary state after first-order differentiation. Positive Dickey–Fuller results often indicate the presence of a unit root, which suggests that there is a trend component in the data. A unit root implies that the time series has not reached a stable, consistent level and is subject to ongoing changes.

By determining the optimal lags, we obtained a table from which the formula for the autoregressive distributed lag (ARDL) model can be derived. The selected specification is an ARDL(2,1) regression with the following summary statistics:

Sample:	1999–2022	Number of obs.	24
Log likelihood	−38.095208	$F(4,19)$	6.28
Prob. $> F$	0.0021	R^2	0.5693
Adjusted R^2	0.4786	Root MSE	1.3300

Table 2. ARDL(2,1) regression table.

Variable	Term	Coef.	Std. Err.	t	$P>\|t\|$	95% CI
GDP growth rate	L1.	0.237	0.191	1.240	0.231	[−0.164, 0.638]
GDP growth rate	L2.	0.568	0.202	2.810	0.011	[0.145, 0.990]
Imports from China (million USD)	Current	0.001	0.000	2.890	0.009	[0.000, 0.001]
Imports from China (million USD)	L1.	−0.001	0.000	−2.950	0.008	[−0.001, −0.000]
Constant	_cons	1.569	1.101	1.420	0.171	[−0.736, 3.873]

The ARDL(2,1) model suggests that there are lagged terms for both the dependent variable (the change in GDP growth rate) and the independent variables (GDP growth rate and imports from China in million USD). The "(2,1)" notation indicates that there are two lagged values of the dependent variable and one lagged value of the independent variable. The formula for this ARDL(2,1) model can be represented as follows:

$$\Delta GDP_t = b_0 + b_1 GDP_{t-1} + b_2 \Delta GDP_{t-1} + b_3 Imports_{t-1} + b_4 \Delta Imports_t + \varepsilon_t. \quad (1)$$

Here, ΔGDP_t is the dependent variable, representing the change in GDP growth rate; GDP_{t-1} is the lagged value of the GDP growth rate variable at lag 1; ΔGDP_{t-1} is the lagged and differenced value of the GDP growth rate variable; $Imports_{t-1}$ is the lagged value of imports from China at lag 1; and $\Delta Imports_t$ is the differenced value of imports from China. The terms b_0, b_1, b_2, b_3, b_4 are coefficients estimated by the regression, while ε_t represents the error term or residual.

The coefficients are estimated values obtained from the regression analysis and are specific to the dataset and the variables involved. They represent the impact of each independent variable on the dependent variable in the model. The CUSUM test graph in Figure 10 indicates that the results obtained from the study are within the confidence interval.

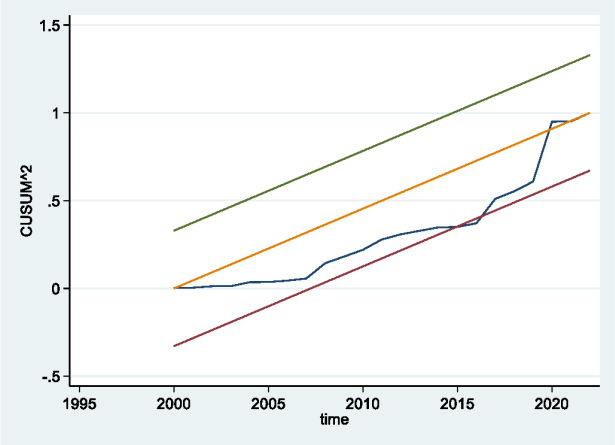

Figure 10. The CUSUM test graph.

The ARDL(2,1) model offers insights into the dynamics of the change in GDP growth rate, considering the influence of lagged and differenced variables. It highlights the importance of changes in imports from China in explaining variations in GDP growth rates and suggests that past trends in GDP

Dickey-Fuller test for unit root Number of obs = 24

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-7.654	-3.750	-3.000	-2.630

MacKinnon approximate p-value for Z(t) = 0.0000

Dickey-Fuller test for unit root Number of obs = 24

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-3.805	-3.750	-3.000	-2.630

MacKinnon approximate p-value for Z(t) = 0.0029

Figure 9. Dickey–Fuller test results.

growth rates can have a lasting impact on the current rate of change.

4. DISCUSSION

The discussion of this study delves into the pivotal role that transport corridors, particularly the proposed China–Kyrgyzstan–Uzbekistan (CKU) railway, play in the economic development of Uzbekistan. Recognizing the broader concept of corridors as vital components supporting efficient and sustainable logistics systems, encompassing railways, short sea shipping routes, and road networks linking key urban nodes, ports, airports, and terminals, underscores their substantial impact on global markets. Railways, in particular, emerge as crucial elements offering high capacity, speed, reliability, and environmental efficiency.

The CKU railway project, aiming to connect China with Central Asia and Europe through Kyrgyzstan and Uzbekistan, holds immense promise but confronts enduring challenges and hurdles, despite being on the table for two decades. With an estimated cost of $4.5 billion, the project not only presents an alternative overland trade route for China to Europe but also holds potential to stimulate economic development and regional integration in Central Asia.

It is essential to highlight the transformative impact of the electronic Transports Internationaux Routiers (eTIR) Convention within the context of the proposed China–Kyrgyzstan–Uzbekistan (CKU) railway project. The eTIR Convention introduces a digitalized paradigm to international transport corridors, streamlining documentation and communication systems. By enabling electronic processes, the eTIR Convention contributes to reducing transit times, enhancing efficiency, and promoting secure cross-border transport operations. This digital evolution aligns with the overarching theme of fostering economic growth and global trade through digitalized international transport corridors, as emphasized in this study. The eTIR Convention's influence on the observed dynamics, particularly in the relationship between GDP growth rate and income from China to Uzbekistan, underscores its significance in shaping the success and effectiveness of the CKU railway project. Moreover, it becomes an integral aspect to consider in the formulation of policies and strategies for the governance and management of international transport corridors, emphasizing the need for an adaptive approach to leverage the full potential of digitalization in the evolving landscape of global logistics [14].

The discussion contextualizes the need for such transport links within the economic challenges faced by Uzbekistan and Kyrgyzstan, emphasizing the transformative impact on their struggling economies. Moreover, it underscores the integral role of the transport system in Uzbekistan's diversified economy, emphasizing its crucial contribution to stabilizing and restructuring the country's economic landscape.

Finally, the discussion bridges the study's objectives with its findings, exploring the significant implications of reduced export time and the share of transport services in service exports on Uzbekistan's GDP, as facilitated by international transport corridors, particularly the CKU railway. This section concludes by reiterating policy implications and recommendations for future research, acknowledging the multifaceted economic, social, and geopolitical dimensions involved in the complex landscape of international transport corridors.

5. CONCLUSION

In conclusion, our comprehensive analysis underscores a clear linear relationship between Uzbekistan's GDP growth rate and the income from China, indicating a direct dependency with potential long-term impacts on the economic landscape. While these findings significantly contribute to our understanding of the intricate dynamics influenced by the proposed China–Kyrgyzstan–Uzbekistan (CKU) railway, it is crucial to

highlight the transformative role of the electronic Transports Internationaux Routiers (eTIR) Convention in this context. The eTIR Convention introduces a digitalized framework that enhances the efficiency and security of international transport corridors, thereby influencing the observed dynamics. As we consider the multifaceted aspects of the CKU railway project, including geopolitical considerations, environmental impacts, and financial sustainability, a nuanced contextual understanding becomes imperative. This underscores the need for a comprehensive perspective in drawing concrete policy or economic implications from the model results. Acknowledging the complex interplay of factors, this conclusion emphasizes the holistic approach required for policy formulation and calls for further research. It recognizes the intricate web of influences, including the transformative impact of the eTIR Convention, shaping the success and implications of such projects in the evolving global economic landscape.

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