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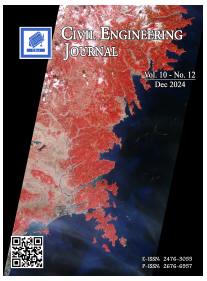

Measuring Belt and Road Initiative Perceptions: A Comparative Analysis of Thai Border and Non-Border Regions

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Abstract

This study aims to analyze and compare perceptions of the Belt and Road Initiative (BRI) between border and non-border regions in Thailand, addressing a gap in understanding how geographic proximity influences BRI project views. Using a sample of 3,200 respondents, this study employed confirmatory factor analysis and measurement invariance techniques to examine perceptions across eight key constructs related to BRI impacts. The findings reveal significant structural differences in BRI perceptions between border and non-border regions. Non-border regions generally showed more consistently positive perceptions across all constructs, while border regions demonstrated more varied and nuanced views. Notable differences were observed in perceptions of economic benefits, logistics improvements, and social impacts. This study contributes to the field by providing a comprehensive comparative analysis of BRI perceptions across different geographical contexts within a single country, employing advanced statistical methods to ensure valid comparisons. The results suggest the need for tailored approaches to BRI implementation and communication in different regions, implementing inclusive policy-making processes, and establishing robust monitoring and evaluation systems to address the varied perceptions and potential impacts of BRI projects in Thailand.

Keywords: China-Laos High-Speed Railway; Logistics and Transportation; Infrastructure Development; Transportation Planning.

1. Introduction

1.1. Research Background

The Belt and Road Initiative (BRI), launched by China in 2013, represents one of the most ambitious infrastructure development and investment projects in modern history. As a cornerstone of China's foreign policy, the BRI aims to enhance regional connectivity and foster economic cooperation between participating countries across Asia, Europe, and Africa [1]. Thailand, strategically located at the heart of Southeast Asia, has emerged as a key partner in this initiative, particularly with the development of high-speed rail networks exemplified by the China-Laos High-Speed Railway project. As neighboring countries observe the implementation and impacts of such projects, it becomes crucial to understand how these developments are perceived, especially in nations like Thailand that are poised to embark on similar infrastructure endeavors.

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Thailand's perception of the BRI and its potential impact on the country's economy is shaped by a complex interplay of strategic, economic, and socio-political factors. The initiative is seen as a modern Silk Road, offering both opportunities and challenges for Thailand, influencing its economic strategies and public perceptions [2]. Thailand's approach to the BRI involves a careful balance between hedging and cooperation, recognizing the economic opportunities presented by the initiative, such as infrastructure development and increased trade connectivity, while also being cautious of over-dependence on China. This strategic approach allows Thailand to benefit from the BRI while maintaining its autonomy in foreign policy decisions [3]. The perception and potential impact of the BRI in Thailand are influenced by several key factors. First, the country's strategic location makes it a crucial link in the Maritime Silk Road, potentially enhancing its role as a regional transportation hub [4]. Second, Thailand's long-standing economic ties with China and its outward-looking economic stance contribute to a generally positive view of the initiative [5]. However, this is tempered by concerns about debt sustainability, environmental impacts, and the need to balance relations with other major powers [6]. Third, the Thai government's own infrastructure development plans, including the Eastern Economic Corridor (EEC), align with many BRI objectives, creating opportunities for synergy and cooperation [7]. The BRI's focus on infrastructure development, particularly high-speed rail projects, is a significant factor in Thailand's perception. These projects promise to enhance connectivity and economic integration within the region. However, public risk perception, influenced by trust in government and enterprises, plays a crucial role in the acceptance and success of these projects. The public's emotional response to these developments can significantly impact their implementation [8, 9]. Thailand's strategy towards China's BRI expansion involves hedging with cooperation, indicating a nuanced approach to balancing its interests [10]. This approach reflects Thailand's historical ability to navigate complex international relationships and its desire to maintain strategic autonomy while benefiting from economic opportunities. The potential impact on Thailand's economy includes enhanced connectivity, trade facilitation, and infrastructure development, which contribute to Thailand's positive outlook on the BRI [11]. However, challenges such as environmental concerns and the need for sustainable development practices also shape Thailand's engagement with the initiative [12].

A key component of Thailand's engagement with the Belt and Road Initiative is the planned high-speed railway project, which aims to connect Thailand with China via Laos. This project is part of a broader vision to transform Thailand into a regional transportation hub, aligning with the country's long-term transport policies and economic development goals. The Thai government has been actively pursuing policies to enhance its transportation infrastructure, with a focus on improving connectivity both within the country and with its neighbors [13, 14]. The high-speed railway project, in particular, represents a significant step towards modernizing Thailand's transportation network and potentially boosting economic growth through increased trade and tourism. Thailand's transport policies have been evolving to address the challenges of rapid urbanization, economic growth, and regional integration. The country has been investing in various transportation modes, including road, rail, air, and sea, to create a comprehensive and efficient transport network [15]. The high-speed railway project is seen as a cornerstone of these efforts, promising to dramatically reduce travel times between major cities and facilitate the movement of goods and people across borders. However, the implementation of such large-scale infrastructure projects comes with its own set of challenges, including financial considerations, environmental concerns, and the need to balance national interests with international cooperation [8]. Public perception and acceptance of these major infrastructure projects, particularly the high-speed railway, play a crucial role in their success. Studies have shown that factors such as trust in government institutions, perceived benefits, and environmental concerns significantly influence public attitudes towards these projects [13]. The Thai government's ability to effectively communicate the benefits of the high-speed railway and address public concerns will be critical in garnering support for this ambitious undertaking. Moreover, the high-speed railway project and associated transport policies have implications beyond mere infrastructure development. They are intrinsically linked to Thailand's broader economic strategy, including efforts to boost regional trade, attract foreign investment, and enhance the country's competitiveness in the global market [10]. As such, the success of these initiatives could have far-reaching effects on Thailand's economic landscape and its position within the Southeast Asian region.

The Lao-China High-Speed Railway (LCHSR), which began operations in December 2021, serves as a crucial case study for Thailand as it contemplates its own high-speed rail project. This 414-kilometer railway, connecting Vientiane to the Chinese border, represents a significant milestone in the implementation of the Belt and Road Initiative in Southeast Asia [16]. Understanding the impact and public perception of the LCHSR is vital for Thailand for several reasons. Firstly, as a neighboring country, Thailand will be directly affected by the increased connectivity and potential economic shifts brought about by the LCHSR. Secondly, the LCHSR provides valuable insights into the challenges and opportunities associated with implementing such large-scale infrastructure projects in the region, offering lessons that could be applied to Thailand's own high-speed rail plans. The public perception of the LCHSR in Laos, particularly regarding its economic and social effects, offers a preview of the potential reception of similar projects in Thailand. Research has shown that factors such as education, tourism prospects, and foreign direct investment significantly influence the perceived benefits of the BRI projects among local populations [16]. These findings are particularly relevant for Thailand as it considers its own high-speed rail project, highlighting the importance of public engagement and clear communication of the project's benefits to ensure public support. Moreover, the LCHSR's impact on regional

dynamics and its role in enhancing connectivity between China and Southeast Asia have direct implications for Thailand's strategic position. As Thailand aims to position itself as a key transportation hub in the region, the success or challenges faced by the LCHSR could inform Thailand's approach to its own rail project and broader transport policies [10]. The Thai government and policymakers can learn from the Lao experience in managing public expectations, addressing environmental and social concerns, and maximizing the economic benefits of such mega-infrastructure projects. Furthermore, the public perception of the LCHSR in Laos and its spillover effects into Thailand could influence Thai public opinion regarding their own planned high-speed railway. This is particularly important given that public risk perception plays a crucial role in the acceptance and success of large infrastructure projects [8]. By studying the impact and reception of the LCHSR, Thai authorities can better anticipate and address potential concerns, tailor their communication strategies, and design policies that align with public expectations and national interests.

The impact of high-speed rail projects like the LCHSR extends beyond national boundaries, significantly affecting border regions and cross-border trade (Figure 1). In the context of Thailand, understanding the differences in perception of such projects between border and non-border areas is crucial for several reasons. Border regions often serve as economic gateways, with their economies heavily reliant on cross-border trade and movement of people. The introduction of high-speed rail connections can dramatically alter these dynamics, potentially bringing both opportunities and challenges to these areas [10]. In border regions, the perception of projects like the LCHSR may be more nuanced due to the direct and immediate impact on local economies and daily life. These areas might view such developments more favorably due to potential increases in trade, tourism, and economic opportunities. For instance, the Thailand-Laos border region could see significant changes in trade patterns and economic activities with the introduction of the LCHSR, potentially influencing local perceptions positively [17]. Conversely, there might also be concerns about increased competition, changes in traditional trade routes, or cultural impacts. Non-border areas, while not directly impacted by cross-border activities, may have different perceptions based on how they view the project's contribution to national economic development and connectivity. These regions might focus more on the broader economic benefits, potential for domestic tourism growth, or concerns about the cost and environmental impact of such large-scale projects [8]. The difference in perceptions between border and non-border areas is particularly relevant for Thailand as it considers its own high-speed rail project. Understanding these regional variations can help policymakers tailor their approach to address specific concerns and maximize benefits across different parts of the country. It can also inform strategies for public engagement and communication, ensuring that the needs and perspectives of both border and non-border communities are considered in the planning and implementation of such significant infrastructure projects [18]. Moreover, these differing perceptions can provide insights into the broader socio-economic impacts of Belt and Road Initiative projects in the region. By examining how various communities view and are affected by projects like the LCHSR, it can gain a more comprehensive understanding of the complex interplay between large-scale infrastructure development, regional economic integration, and local community dynamics [4].

A key aspect of this study is the comparative analysis of perceptions between border and non-border areas regarding the China-Laos High-Speed Railway project. This approach provides a unique and valuable perspective, allowing for the identification of differences in how the project is perceived based on geographic proximity. Such a comparative analysis is crucial for understanding the nuanced impacts of large-scale infrastructure projects across different regions and communities. To ensure the robustness and validity of this comparison, this study employs advanced statistical techniques, particularly focusing on measurement invariance. Measurement invariance is a critical statistical concept in comparative studies, as it ensures that the measurement instrument (in this case, the survey or questionnaire used to assess perceptions) functions equivalently across different groups [16]. This approach allows us to confidently attribute any observed differences in perceptions to genuine differences between border and non-border areas, rather than to measurement artifacts or biases. By establishing measurement invariance, it can make meaningful comparisons between these two groups and draw valid conclusions about how geographic proximity influences perceptions of the high-speed railway project. The use of measurement invariance in this context builds upon previous research methodologies in the field. For instance, studies on public risk perception of high-speed railway projects in Thailand have utilized structural equation modeling to analyze the relationships between various factors influencing public attitudes [20, 21]. This study extends this approach by specifically examining the invariance of these relationships across different geographic contexts.

Furthermore, this comparative analysis allows us to explore how factors such as economic expectations, environmental concerns, and cultural impacts may vary between border and non-border regions. It can reveal whether proximity to the project site leads to more positive perceptions due to anticipated direct benefits or if it perhaps intensifies concerns about potential negative impacts. These insights are invaluable for policymakers and project planners, as they can inform targeted strategies for public engagement and project implementation [22]. By employing this rigorous statistical approach, this study aims to contribute to the growing body of literature on the Belt and Road Initiative's impacts in Southeast Asia. It offers a methodologically sound basis for understanding the spatial dimensions of public perceptions towards major infrastructure projects, which can be applied not only to the China-Laos High-Speed Railway but also to future projects in Thailand and the broader region [10].

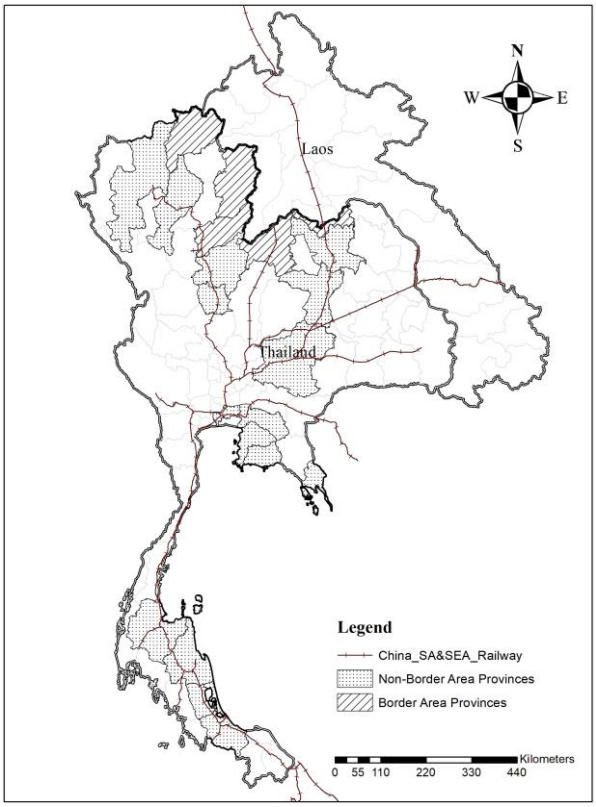

Figure 1. Railway networks connecting China with South (East) Asia [19]

1.2. Research Gap

The Belt and Road Initiative (BRI) and its flagship projects, such as the Lao-China High-Speed Railway (LCHSR), have garnered significant attention in academic literature. Existing research has primarily focused on the macroeconomic impacts, geopolitical implications, and policy aspects of these initiatives [22]. Studies have examined the potential economic benefits of the BRI for participating countries, including increased trade, foreign direct investment, and infrastructure development [1, 10, 11]. The LCHSR, as a key BRI project in Southeast Asia, has been analyzed in terms of its economic viability, impact on regional connectivity, and implications for Laos' development [16, 17]. Furthermore, studies have investigated the challenges and opportunities associated with these projects, including issues of debt sustainability, environmental concerns, and geopolitical tensions [8]. Wang et al. [4] highlighted issues of debt sustainability, while Cao et al. [12] focused on environmental concerns and geopolitical tensions. Public perception studies have been conducted, particularly in the context of risk assessment and social acceptance of large-scale infrastructure projects [13, 14, 23, 24].

However, several gaps remain in the current literature, which this study aims to address:

1) ***Comparative Analysis***: While there is a growing body of research on the BRI and LCHSR, there is a lack of comparative studies examining the perceptions of these projects across different geographic areas, particularly between border and non-border regions. This spatial dimension of public perception remains understudied, despite its potential to provide valuable insights into the localized impacts and reception of such projects.
2) ***Methodological Rigor***: The application of rigorous statistical techniques, such as measurement invariance, to ensure valid comparisons between different groups in the context of BRI projects is limited. This methodological gap hinders the ability to draw robust conclusions about regional variations in project perceptions.
3) ***Cross-Border Influence***: There is a paucity of research specifically examining how the implementation of BRI projects in neighboring countries, like the LCHSR in Laos, influences public perceptions and expectations in countries planning similar projects, such as Thailand.

1.3. Research Objective and Contribution

This study aims to conduct a comprehensive comparative analysis of perceptions regarding the Lao-China High-Speed Railway (LCHSR) between border and non-border areas in Thailand. The primary objective is to examine how geographic proximity to the project influences public expectations and attitudes towards high-speed rail development [2]. To ensure valid comparisons, the study employs advanced measurement invariance techniques, representing a methodological advancement in Belt and Road Initiative (BRI) research [1].

The study's contributions are: It provides unique insights into the spatial dynamics of public opinion on large-scale infrastructure projects [4]. The application of measurement invariance techniques enhances methodological rigor, ensuring observed differences are attributable to genuine variations [19]. From a policy perspective, the study offers crucial information for developing targeted approaches and region-specific policies [6, 25]. By proactively studying perceptions of the China-Laos project, it gathers invaluable insights for Thailand's planned high-speed rail development [16]. In the broader BRI literature, this study bridges the gap between macro-level analyses and micro-level studies of local perceptions [7]. Its practical relevance to Thailand's infrastructure plans makes it a valuable resource for policymakers and planners [26, 27].

2. Literature Review

This study is grounded in the theoretical framework of social representations theory [28, 29] and the theory of planned behavior [30, 31]. Social representations theory helps us understand how individuals and communities form perceptions and attitudes towards large-scale initiatives like the Belt and Road Initiative (BRI). It posits that people construct shared understandings of complex phenomena through social interactions and communication. In the context of this study, this theory informs our approach to analyzing how different regions in Thailand form their perceptions of the BRI and the Lao-China High-Speed Railway (LCHSR).

The theory of planned behavior complements this by providing a framework for understanding how these perceptions might influence attitudes and behaviors towards the BRI and related projects. This theory suggests that intentions and behaviors are shaped by attitudes, subjective norms, and perceived behavioral control. In this research, this helps explain how perceptions of the BRI might translate into support or opposition for similar projects in Thailand. Within this theoretical framework, this study examines several key constructs that shape the perceptions of the BRI. The BRI has significant scholarly attention since its launch, with researchers exploring its various impacts on participating countries. This section explores the various constructs that shape the perceptions of the BRI, particularly focusing on its economic, social, and developmental aspects.

Foreign Direct Investment (FDI) is a crucial aspect of the BRI, as it represents the flow of capital and resources across borders. The perception of FDI in the context of BRI is often associated with increased investment opportunities and economic growth potential. As noted by Hung [32], FDI plays a significant role in shaping attitudes towards the BRI, with many countries viewing it as a pathway to economic development. Li et al. [1] further emphasized that BRI participation has a positive impact on foreign investment in participating countries. The questionnaire items related to FDI focus on its potential to increase foreign investment, boost import and export volumes, improve exchange rates, and enhance trade between participating countries.

Tourism is another important construct in shaping perceptions of the BRI. The initiative is often seen as a catalyst for tourism development, both domestically and internationally. Ashraf et al. [33] reported that participation in the BRI has led to an 18.4% increase in the number of inbound tourists in participating countries. Similarly, Ahmad and Ullah [34] highlighted substantial increases in tourism revenues in BRI countries. The questionnaire items related to tourism explore perceptions about improved tourism development, increased tourist numbers, development of tourism-related infrastructure, and potential increases in tourism revenue.

Employment opportunities are a key consideration in the perception of BRI. The initiative is often viewed as a potential source of job creation and diversification of employment options. However, as noted by Khamphengvong et al. [16], the relationship between BRI participation and employment perceptions can be complex. Wang et al. [4] emphasized the potential for job creation through BRI-related infrastructure development. The questionnaire items in this construct focus on perceptions of increased job opportunities, higher compensation, job stability, and opportunities to work with foreigners.

Education is an important construct in shaping overall perceptions of the BRI. The initiative is often associated with increased educational opportunities and knowledge exchange. As suggested by Khamphengvong et al. [16], education is a significant factor influencing perceived benefits of the BRI. Gong [2] also highlighted the potential for enhanced educational cooperation and knowledge sharing among BRI countries. The questionnaire items related to education explore perceptions about increased educational opportunities, improved educational resources, international knowledge exchange, and the development of educational personnel.

Standard of Living and Social Aspects form a crucial construct in shaping perceptions of the BRI. This includes aspects such as infrastructure development, public utilities, and social equality. Cao et al. [12] emphasized the complex interplay between BRI projects and social-ecological factors. The questionnaire items in this construct focus on perceptions of improved living conditions, infrastructure development, enhanced amenities, improved public utilities, increased social equality, and environmental protection.

International Relations is a significant construct in shaping perceptions of the BRI. As noted by Punyaratabandhu & Swaspitchayaskun [10], the BRI has implications for regional cooperation and integration. Li et al. [1] also highlighted the potential for enhanced regional integration through BRI projects. The questionnaire items related to international relations explore perceptions about closer ties with neighboring countries, cultural exchange, promotion of soft power, and improved international cooperation frameworks.

Economic Impact is a central construct in shaping perceptions of the BRI. This includes aspects such as GDP growth, trade expansion, and industry development. As highlighted by Ma (2022) [11], the BRI has significant growth effects on economic integration in participating countries. Apaitan et al. [6] noted the importance of regional economic dynamics in shaping BRI perceptions. The questionnaire items in this construct focus on perceptions of increased exports, economic growth, border trade expansion, and industry growth.

Logistics and Transportation development is a key aspect of the BRI and an important construct in shaping perceptions. As noted by Wang et al. [4], transport infrastructure plays a crucial role in facilitating economic growth in BRI countries. Liu & Ma [35] also highlighted the importance of infrastructure development in shaping regional perceptions of the BRI. The questionnaire items related to logistics and transportation explore perceptions about reduced transportation costs, improved travel routes, enhanced logistics systems, development of economic corridors, and growth in the logistics industry.

3. Method

3.1. Questionnaire Design and Data Collection

To systematically investigate the perceptions of Thai people towards the Belt and Road Initiative (BRI), a comprehensive questionnaire was developed as the primary analytical instrument. The questionnaire design was guided by the research framework and structured to capture a wide range of relevant information. The instrument was divided into three main parts, each serving a specific purpose in data collection.

The first part of the questionnaire focused on gathering general information and travel behavior of the respondents. This section included questions about demographic characteristics such as gender, age, status, residential area, education level, occupation, and income. Additionally, it inquired about the respondents' preferred travel mode, providing a baseline understanding of their travel habits and preferences. The second part of the questionnaire delved into behaviors affecting the perception of benefits of Thai people towards the Belt and Road Initiative (BRI) policy. This section aimed to uncover the underlying behaviors and attitudes that might influence how respondents view the potential benefits of the BRI for Thailand and its citizens. The third and most extensive part of the questionnaire contained 41 questions designed to assess factors affecting the BRI. These questions were carefully crafted to cover eight key factors: foreign direct investment, tourism, employment, education, living standards and society, international relations, economy, and logistics and transportation. Each factor was represented by multiple items to ensure a comprehensive evaluation of respondents' perceptions. For instance, questions related to foreign direct investment assessed perceptions about increased foreign investment and trade opportunities, while tourism items explored views on potential increases in tourist numbers and tourism infrastructure development.

The data collection process for this study was carefully designed to ensure comprehensive coverage of both border and non-border areas in Thailand, as illustrated in Figure 1. For the border area sample, the study focused on provinces along Thailand's border with Laos PDR that are part of the BRI route. The Stratified Random Sampling method was employed to select key trade gateways, including Chiang Saen, Chiang Khong, Huai Kon, Phu Du, Ban Na Kraseng, Chiang Khan, and Nong Khai Checkpoints. This approach ensured representation of areas directly impacted by the BRI's cross-border infrastructure. For the non-border area sample, the study selected the most populous province in each of Thailand's five regions: Northern, Northeastern, Central, Eastern, and Southern. For instance, Bangkok represented the Central region, while Nakhon Ratchasima, Khon Kaen and Udon Thani represented the Northeastern region. This strategy aimed to capture perceptions from diverse geographical and demographic contexts within Thailand. The sample size was determined based on the number of indicators in the study, following the principle of 20 observations per indicator for confirmatory factor analysis. With 41 indicators in the questionnaire, the minimum sample size was calculated as 41 x 20 = 820. However, to enhance the robustness of the analysis and account for potential non-responses or invalid responses, the actual sample size collected was significantly larger, totaling 3,200 respondents. This comprehensive sampling approach, combining strategically selected border and non-border areas with a large sample size, ensures a representative and statistically powerful dataset for analyzing Thai perceptions of the Belt and Road Initiative.

The respondent selection process within each area followed a multi-stage random sampling technique. First, neighborhoods or districts within each selected area were randomly chosen. Then, households within these neighborhoods were selected using a systematic sampling method, such as selecting every nth house. In each selected household, an individual aged 18 or above was invited to participate in the survey. To ensure representation across different demographic groups, quota sampling was implemented based on key characteristics such as age, gender, education level, and income, with quotas set to approximately match the demographic profile of each region based on recent census data. Efforts were made to include respondents from various occupational backgrounds, including agriculturists, entrepreneurs, private sector employees, government employees, and students. Additionally, the selection process considered different travel modes to capture diverse perspectives on transportation-related aspects of the BRI. All participation was voluntary, with informed consent obtained from each respondent. This comprehensive selection process aimed to obtain a sample that accurately represents the diverse perspectives across different regions and demographic groups in Thailand, enhancing the validity and generalizability of our findings regarding perceptions of the Belt and Road Initiative.

While sampling strategy aimed for demographic representativeness, there were some challenges in achieving perfect parity between border and non-border regions. Notable differences included a slightly older population in border regions, a more balanced gender distribution in border regions, higher education levels in non-border regions, and higher income levels in non-border regions. These differences partly reflect actual demographic variations between border and non-border areas in Thailand. This study accounted for these variations in our analysis to ensure the validity of our comparisons. Despite these challenges, the large sample size and our stratified sampling approach provide a robust basis for analyzing perceptions across different regional and demographic contexts.

The sample consisted of 3,200 participants, with 1,660 from non-border regions and 1,540 from border regions (Table 1**)**. In non-border regions, the majority of respondents were female (63.6%), while in border regions, the gender distribution was more balanced (52.1% female, 47.9% male). The age distribution showed that the majority of respondents in both regions were from the 26-43 age group (Gen Y), comprising 54.0% in non-border regions and 56.7% in border regions. Regarding education, both regions showed a diverse range, with the highest percentage having a bachelor's degree (44.4% in non-border regions, 32.6% in border regions). The occupational distribution varied, with private employees being the largest group in non-border regions (35.5%) and entrepreneurs in border regions (24.5%). Income levels differed between the regions, with a higher percentage of higher-income respondents (>20,000 THB) in non-border regions (35.8%) compared to border regions (19.1%). The primary mode of travel in both regions was private vehicles, with a notably higher percentage in border regions (83.7%) compared to non-border regions (65.2%).

Table 1. Demographic data

Characteristics	Category	Non-border regions		Border regions	
		Frequency	Percentage	Frequency	Percentage
Gender	Male	605	36.4%	738	47.9%
	Female	1,055	63.6%	802	52.1%
Age	18–25 years old (Gen Alpha)	316	19.0%	175	11.4%
	26–43 years old (Gen Y)	897	54.0%	874	56.7%
	44–58 years old (Gen X)	361	21.8%	379	24.6%
	59–77 years old (Baby boomer)	86	5.2%	112	7.3%
Status	Single	707	42.6%	617	40.1%
	Married	783	47.2%	821	53.3%
	Widowed/Divorced/Separated	170	10.2%	102	6.6%
Residential area	Live in the city	733	44.2%	572	37.1%
	Live outside the city	705	42.4%	867	56.3%
	Live in the suburbs	222	13.4%	101	6.6%
Education	Primary education	121	7.3%	135	8.8%
	High school education	310	18.6%	320	20.8%
	Vocational education	168	10.1%	238	15.4%
	Associate degree	262	15.8%	277	18.0%
	Bachelor's degree	737	44.4%	502	32.6%
	Master's degree	56	3.4%	65	4.2%
	Doctoral Degree	6	0.4%	3	0.2%
Occupation	Agriculturist/Agricultural Organization	227	13.7%	269	17.5%
	Entrepreneur	286	17.2%	377	24.5%
	Private Employee	589	35.5%	445	28.9%
	Government Employee	170	10.2%	199	12.9%
	Student	204	12.3%	108	7.0%
	Others	184	11.1%	142	9.2%
Income	<=10,000 THB	356	21.4%	493	32.0%
	>10,001 THB −15,000 THB	319	19.2%	337	21.9%
	>15,000 THB −20,000 THB	391	23.6%	416	27.0%
	>20,000 THB	594	35.8%	294	19.1%
Modes of travel used	Private vehicle (Car/Motorbike)	1083	65.2%	1,289	83.7%
	Bus	262	15.8%	221	14.4%
	Railway	196	11.8%	16	1.0%
	Other (Airplane and Boat)	119	7.2%	14	0.9%

* Note: N = 3,200: Non-border regions (n = 1,660), Border regions (n = 1,540).

3.2. Data Analysis

The data analysis process for this study followed a systematic approach, as illustrated in Figure 2. This figure outlines a comprehensive analytical framework designed to ensure rigorous examination of the Belt and Road Initiative (BRI) perceptions across non-border and border regions in Thailand. The process began with data collection and preliminary analysis, followed by separate Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) for both non-border and border region samples. These steps were crucial in establishing the underlying factor structure of the BRI perception constructs in each context. The factor analysis approach combined both exploratory and confirmatory techniques. This study initially conducted EFA to uncover the underlying structure of the measured variables without imposing a preconceived structure on the outcome. The goodness of fit for EFA was assessed using criteria such as the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, Bartlett's test of sphericity, and the total variance explained by the extracted factors. Following EFA, this study proceeded with CFA to test and confirm the hypothesized measurement model derived from the exploratory analysis. The goodness of fit for CFA was evaluated using multiple indices to ensure a comprehensive assessment. These included the Chi-square (χ^2) test, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Standardized Root Mean Square Residual (SRMR), and Root Mean Square Error of Approximation (RMSEA). This study considered CFI and TLI values greater than 0.95, SRMR less than 0.08, and RMSEA less than 0.06 as indicators of good model fit, in line with established guidelines in structural equation modeling. In this study, parameter estimation for the CFA model was conducted using the Maximum Likelihood (ML) method. This approach allowed us to estimate factor loadings, which represent the strength of the relationship between each observed variable and its underlying latent construct. Additionally, this study estimated error variances associated with each observed variable and covariances among the latent constructs. These parameter estimates provided crucial information about the measurement properties of BRI perception scales and the relationships among different aspects of BRI perceptions.

After establishing well-fitting measurement models for both non-border and border regions, then proceeded to test for measurement invariance. This step was critical to ensure that any comparisons made between the two groups were valid and meaningful. The measurement invariance testing focused on two key models, as outlined in Table 2, Model 3: Simultaneous model - This model tested for configure invariance, examining whether the same factor structure held across both non-border and border region groups. It served as the baseline model for comparison. Model 4: Factor loading, intercepts, structural paths held equal across groups - This model tested for strict invariance, constraining factor loadings, intercepts, and structural paths to be equal across the two groups. The objective of this measurement invariance testing was to determine whether the BRI perception constructs were measured equivalently across non-border and border regions. This study evaluated the change in model fit indices between Model 3 and Model 4, particularly focusing on ΔCFI, ΔRMSEA, and ΔSRMR. Following conventional guidelines, it considered $\Delta CFI \leq 0.01$, $\Delta RMSEA \leq 0.015$, and $\Delta SRMR \leq 0.03$ as indicators of invariance. This rigorous analytical approach, combining exploratory and confirmatory factor analysis with measurement invariance testing, allowed us to robustly examine the structure and comparability of BRI perceptions across different geographical contexts in Thailand. By ensuring measurement equivalence, it could confidently attribute any observed differences to true differences in perceptions rather than measurement artifacts, thus providing a solid foundation for understanding how the Belt and Road Initiative is perceived in different regions of Thailand. Mplus program is used for analyzing the data [36].

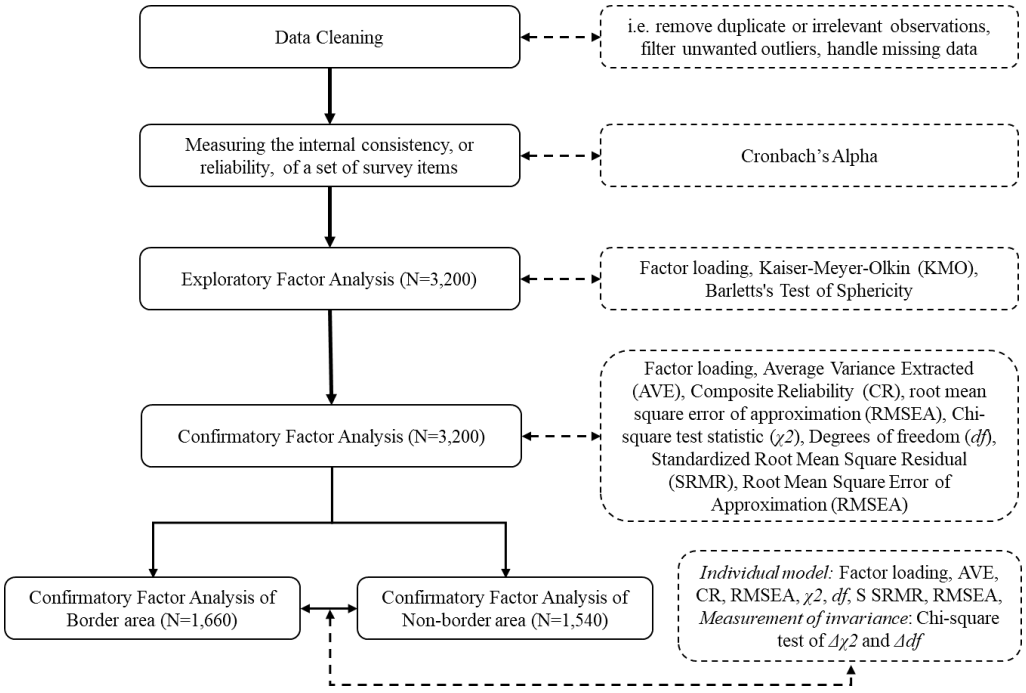

Figure 2. Data analysis procedure

Table 2. Model fit indices for invariance test

Description	χ^2	df	χ^2/df	CFI	TLI	SRMR	RMSEA (90% CI)	$\Delta\chi^2$	Δdf	p
Individual groups:										
Model 1: Non-border regions	2703.971	717	3.771	0.958	0.952	0.035	0.042 (0.041-0.044)			
Model 2: Border regions	2668.879	724	3.686	0.972	0.968	0.025	0.040 (0.039-0.042)			
Measurement of invariance:								1234.70	78	<0.001
Model 3: Simultaneous model	5620.573	1446	3.887	0.964	0.959	0.032	0.042 (0.041-0.044)			
Model 4: Factor loading, intercepts, structural paths held equal across groups	6855.273	1524	4.499	0.954	0.951	0.050	0.047 (0.046-0.048)			

Note: χ2 (chi-square): Chi-square test statistic. df: Degrees of freedom. χ2/df: Chi-square divided by degrees of freedom. CFI: Comparative Fit Index. TLI: Tucker-Lewis Index. SRMR: Standardized Root Mean Square Residual. RMSEA: Root Mean Square Error of Approximation. 90% CI: 90% Confidence Interval. Delta-χ2 ($\Delta\chi^2$): Change in chi-square. Delta-df (Δdf): Change in degrees of freedom. p: p-value (probability value).

4. Results

Table 1 presents the demographic data of the respondents from non-border and border regions. The sample consisted of 3,200 participants, with 1,660 from non-border regions and 1,540 from border regions. In non-border regions, the majority of respondents were female (63.6%), while in border regions, the gender distribution was more balanced (52.1% female, 47.9% male). The age distribution showed that the majority of respondents in both regions were from the 26-43 age group (Gen Y), comprising 54.0% in non-border regions and 56.7% in border regions. Regarding education, both regions showed a diverse range, with the highest percentage having a bachelor's degree (44.4% in non-border regions, 32.6% in border regions). The occupational distribution varied, with private employees being the largest group in non-border regions (35.5%) and entrepreneurs in border regions (24.5%). Income levels differed between the regions, with a higher percentage of higher-income respondents (>20,000 THB) in non-border regions (35.8%) compared to border regions (19.1%). The primary mode of travel in both regions was private vehicles, with a notably higher percentage in border regions (83.7%) compared to non-border regions (65.2%).

Table 3 presents a comprehensive statistical summary of the items measuring perceptions of the Belt and Road Initiative (BRI) across both non-border and border regions in Thailand. This table provides crucial insights into the distribution and reliability of our measurement items. Mean (M) values for all items are consistently above 4.5 on a 6-point scale in both regions, indicating generally positive perceptions of the BRI's potential impacts. This suggests that respondents in both border and non-border areas have favorable views of the initiative's potential benefits. Standard Deviation (SD) values range mostly between 0.8 and 1.3, indicating a moderate spread of responses. The slightly higher SD values in non-border regions for some items suggest more diverse opinions in these areas compared to border regions. Skewness (SK) and Kurtosis (KU) values for most items fall within the acceptable range of ±2, indicating approximately normal distributions. This supports the validity of our subsequent analyses that assume normality. Cronbach's alpha values for all constructs exceed 0.9, demonstrating high internal consistency reliability. This indicates that the items within each construct are closely related and likely measuring the same underlying concept. Notably, some items show slight differences between border and non-border regions. For example, tourism-related items (I5-I10) generally have higher means in border regions, possibly due to these areas' direct experience with cross-border tourism activities.

Table 3. Statistical summary

Item	Measures	Non-border regions				Border regions			
		M	SD	SK	KU	M	SD	SK	KU
	Foreign direct investment (Cronbach's α = 0.906)								
I1	CLHSR can increase foreign investment in Thailand.	4.899	1.141	-0.307	0.040	4.879	0.821	-0.244	0.938
I2	CLHSR can increase the volume of imports and exports of goods for Thailand.	4.975	1.315	-0.213	-0.433	4.908	0.873	-0.233	0.592
I3	CLHSR can create a balance in capital movement, resulting in improved exchange rates and financial system for Thailand.	4.951	1.363	-0.346	-0.403	4.896	0.962	-0.371	0.350
I4	CLHSR helps increase trade and investment between Thailand and foreign countries (such as Lao PDR and China).	5.014	1.284	-0.352	-0.328	5.034	1.017	-0.399	-0.207
	Tourism (Cronbach's α = 0.941)								
I5	CLHSR can improve tourism development both within Thailand and internationally.	4.973	1.234	-0.069	-0.540	5.115	0.957	-0.338	0.081
I6	CLHSR can increase the number of tourists.	4.989	1.304	-0.263	-0.665	5.224	1.007	-0.513	0.051
I7	CLHSR can lead to improved development of hotels, restaurants, and tourist attractions.	5.07	1.264	-0.221	-0.518	5.250	1.062	-0.446	-0.200
I8	CLHSR can encourage more people to use rail services for tourism	5.007	1.271	-0.102	-0.713	5.283	1.085	-0.369	-0.347
I9	CLHSR can increase tourism revenue.	5.008	1.299	-0.222	-0.568	5.323	1.136	-0.355	-0.445
I10	CLHSR can improve the development of public transportation connectivity (such as shuttle bus services for tourists at border checkpoints).	5.045	1.297	-0.166	-0.727	5.206	1.055	-0.322	-0.376

	Employment (Cronbach's α = 0.921)								
I11	CLHSR helps provide me with more diverse job opportunities (such as in hotels, restaurants, and tourist attractions).	4.944	1.262	-0.121	-0.447	4.741	0.981	-0.215	0.092
I12	CLHSR helps increase my employment opportunities.	4.742	1.233	-0.171	-0.255	4.655	1.031	-0.153	-0.111
I13	CLHSR helps me earn higher compensation from work.	4.681	1.194	-0.265	-0.014	4.639	1.092	-0.211	0.000
I14	CLHSR helps make the company or business I work for more stable.	4.682	1.262	-0.254	-0.356	4.588	1.113	-0.348	0.220
I15	CLHSR helps provide me with more opportunities to work with foreigners (such as people from Lao PDR and China).	4.799	1.230	-0.310	-0.221	4.831	1.104	-0.280	0.208
	Education (Cronbach's α = 0.902)								
I16	CLHSR can increase educational opportunities for Thai people.	4.623	1.013	-0.023	0.595	4.745	0.855	-0.242	0.690
I17	CLHSR helps improve Thailand's educational resources (such as the number of schools, educational institutions, universities).	4.581	1.111	-0.014	0.196	4.558	0.954	0.004	-0.167
I18	CLHSR helps increase international knowledge exchange.	4.615	1.059	0.035	0.534	4.872	0.971	-0.181	0.296
I19	CLHSR helps improve the development of Thailand's educational personnel.	4.608	1.093	0.008	0.489	4.846	1.002	0.021	-0.167
I20	CLHSR enables Thai people to communicate better in foreign languages (such as English/Chinese).	4.737	1.071	0.011	0.195	5.049	1.030	-0.163	-0.411
I21	CLHSR helps increase the number of foreign students entering the Thai educational system (such as people from Lao PDR and China).	4.697	1.077	0.015	0.598	4.983	1.048	-0.095	-0.545
	Standard of living and social (Cronbach's α = 0.912)								
I22	CLHSR helps improve the living conditions and society of Thailand.	4.577	1.088	-0.083	0.256	4.806	0.910	-0.239	0.427
I23	CLHSR helps improve Thailand's infrastructure development (such as road networks).	4.611	1.178	-0.118	-0.248	4.820	1.006	-0.298	-0.057
I24	CLHSR helps improve Thailand's amenities (such as service businesses).	4.615	1.123	-0.090	0.050	4.934	1.028	-0.184	-0.243
I25	CLHSR helps improve Thailand's public utility systems (such as electricity, water supply, and telephone signals)	4.554	1.150	-0.147	-0.002	4.719	0.999	0.196	-0.001
I26	CLHSR helps increase social equality.	4.491	1.155	-0.137	0.129	4.594	1.085	0.118	0.140
I27	CLHSR helps reduce air pollution and contributes to environmental protection.	4.506	1.108	0.014	0.063	4.973	0.959	-0.074	-0.201
	International relations (Cronbach's α = 0.914)								
I28	CLHSR helps Thai people become closer to neighboring countries (such as Lao PDR).	4.69	1.058	-0.049	0.111	4.979	0.902	-0.235	-0.003
I29	CLHSR helps make Thai culture better known to foreigners (such as Thai food).	4.727	1.077	-0.046	0.084	5.002	0.931	-0.353	0.180
I30	CLHSR helps promote Thailand's various soft power elements (such as Thai art, dramas, and music).	4.713	1.091	-0.114	0.264	4.968	0.944	-0.210	0.009
I31	CLHSR helps improve good relations between Thailand and foreign countries.	4.667	1.106	0.042	0.033	5.037	0.953	-0.209	-0.145
I32	CLHSR contributes to the development of more effective international cooperation frameworks (such as the ASEAN cooperation framework).	4.78	1.158	-0.097	-0.532	5.070	0.968	-0.149	-0.527
	Economic (Cronbach's α = 0.902)								
I33	CLHSR can increase the export of Thailand's key industrial products (such as agricultural products).	5.049	1.166	-0.090	-0.556	5.090	0.951	-0.117	-0.188
I34	CLHSR can increase Thailand's economic value (GDP) growth.	4.853	1.156	-0.087	-0.431	4.982	0.961	-0.150	0.090
I35	CLHSR can increase border trade between Thailand and Lao PDR.	5.029	1.277	-0.219	-0.647	5.188	1.050	-0.375	-0.378
I36	CLHSR can boost the growth of Thailand's tourism industry (such as hotel businesses, restaurants, and services).	5.063	1.252	-0.344	-0.333	5.198	1.073	-0.391	-0.205
	Logistics and transportation (Cronbach's α = 0.921)								
I37	CLHSR reduces the cost of goods transportation.	4.902	1.270	-0.127	-0.450	4.945	0.962	-0.014	0.055
I38	CLHSR can further develop travel routes connecting to Thailand.	4.987	1.276	-0.074	-0.883	5.036	1.013	-0.152	-0.202
I39	CLHSR improves Thailand's transportation and logistics systems.	4.763	1.200	-0.086	-0.546	5.075	1.067	-0.155	-0.440
I40	CLHSR enhances the development of economic corridors linking Thailand and Lao PDR (such as the Luang Prabang-Indochina-Mawlamyine Economic Corridor 'LIMEC', the Greater Mekong Subregion 'GMS Economic Corridors', and the China-Indochina Peninsula Economic Corridor 'CICPEC').	4.961	1.259	-0.091	-0.821	5.020	1.024	0.069	-0.264
I41	CLHSR boosts the growth of Thailand's logistics industry (such as E-commerce businesses and transportation businesses)	5.052	1.246	-0.122	-0.645	5.275	1.056	-0.343	-0.238

Note: CLHSR denotes China-Laos High-Speed Railway. Lao PDR denotes Lao People's Democratic Republic. M =Mean, SD=Standard deviation, SK=Skewness, KU=Kurtosis. Non-border regions (n = 1,660). Border regions (n = 1,540).

Table 2 presents the model fit indices for the measurement invariance test, which is crucial for validating our comparative analysis between border and non-border regions. This test ensures that our measurement model is consistent across both groups, allowing for meaningful comparisons. The table shows fit indices for four models: *Model 1:* Non-border regions, *Model 2:* Border regions, *Model 3:* Simultaneous model (configural invariance) and *Model 4:* Constrained model (factor loadings, intercepts, and structural paths held equal across groups). For Models 1 and 2, we see good fit indices for both non-border and border regions individually (CFI > 0.95, TLI > 0.95, SRMR < 0.05, RMSEA < 0.05). This indicates that our measurement model fits well within each group separately. Model 3, the simultaneous model, tests for configural invariance. This model shows excellent fit (CFI = 0.964, TLI = 0.959, RMSEA = 0.042, SRMR = 0.032), indicating that the basic structure of the model is equivalent across both groups. This is a crucial finding, as it suggests that respondents in both border and non-border regions conceptualize the constructs in a similar manner. Model 4 tests for a stricter form of invariance by constraining factor loadings, intercepts, and structural paths to be equal across groups. While this model still demonstrates acceptable fit (CFI = 0.954, TLI = 0.951, RMSEA = 0.047, SRMR = 0.050), there is a notable decrease in fit compared to Model 3. The significant change in chi-square ($\Delta\chi 2$ = 1234.70, Δdf = 78, $p < 0.001$) between Models 3 and 4 suggests that there are some differences in the measurement model between the two groups. This indicates that while the overall structure of the model is similar across groups (as shown by the good fit of Model 3), there are some nuanced differences in how specific items relate to their constructs between border and non-border regions. These results have important implications for our study: They validate our approach of comparing border and non-border regions, as the basic structure of perceptions is similar across groups. They highlight the presence of some regional differences, justifying our detailed comparative analysis. They suggest that while we can make broad comparisons between the two groups, we should also be attentive to nuanced differences in how BRI perceptions are structured in border versus non-border areas. They underscore the complexity of BRI perceptions and the importance of considering regional contexts in policy-making and project implementation.

Table 4 displays the parameter estimates from the Confirmatory Factor Analysis (CFA) for both non-border and border regions, providing critical information about the measurement model's validity and reliability. All standardized factor loadings (λ) are statistically significant ($p < 0.001$), indicating strong relationships between observed variables and their respective latent constructs. In non-border regions, all loadings are above 0.7, while in border regions, most are above 0.6, suggesting strong construct validity. The Average Variance Extracted (AVE) values all exceed 0.5, and Composite Reliability (CR) values are above 0.8 for both regions. This demonstrates good convergent validity and reliability of the constructs, indicating that the items effectively represent their intended constructs. R^2 values, representing the proportion of variance in each item explained by its latent construct, are generally higher in non-border regions. This suggests that the measurement model fits slightly better in non-border areas. Notably, there are some differences in factor loadings and R^2 values between the two regions, particularly in constructs such as Foreign Direct Investment and Education. For instance, the Foreign Direct Investment construct shows higher loadings (0.867-0.892) in non-border regions compared to border regions (0.701-0.798). This suggests that the perception structures may vary somewhat between non-border and border regions, aligning with the results from the measurement invariance test. These differences underscore the importance of our comparative approach and highlight the need for region-specific strategies in implementing and communicating about BRI projects.

5. Discussion

5.1. Non-Border Regions

Figure 3 shown CFA result of BRI impact factors among non-border region groups. Regarding Foreign Direct Investment (FDI), the analysis of non-border regions reveals high factor loadings (λ) ranging from 0.867 to 0.892, indicating strong relationships between observed variables and the FDI construct. The high factor loadings suggest that non-border regions perceive FDI as a crucial aspect of the Belt and Road Initiative (BRI). This could be due to the potential for increased investment opportunities, economic growth, and technological advancements brought by foreign investments. These findings are consistent with previous research by Khamphengvong et al. [16], who found that FDI plays a significant role in shaping attitudes towards the BRI. Similarly, Li et al. [1] highlighted the positive impact of BRI participation on foreign investment in participating countries [18].

Tourism in non-border regions demonstrates high factor loadings (λ) between 0.828 and 0.878, indicating a strong relationship between observed variables and the tourism construct. The high factor loadings for tourism suggest that non-border regions view tourism as a significant potential benefit of the BRI. This perception may be driven by expectations of increased international visitors, improved tourism infrastructure, and economic gains from the tourism sector. These results align with findings from Ahmad & Ullah [34], who reported an 18.4% increase in inbound tourists in BRI participating countries. Similarly, Tritto & Camba [7] identified tourism as a main driver of socio-economic benefits in BRI countries.

Table 4. Parameters estimation of measurement model

Constructs and indicators	Non-border regions			Border regions		
	λ	*t*-value	R^2	λ	*t*-value	R^2
Foreign direct investment	**(AVE = 0.773, CR = 0.932)**			**(AVE = 0.565, CR = 0.838)**		
I1	0.870	127.902**	0.757	0.701	45.896**	0.492
I2	0.867	125.946**	0.752	0.730	51.324**	0.534
I3	0.892	150.324**	0.795	0.774	61.362**	0.599
I4	0.888	145.904**	0.788	0.798	67.566**	0.636
Tourism	**(AVE = 0.738, CR = 0.944)**			**(AVE = 0.662, CR = 0.921)**		
I5	0.853	111.678**	0.728	0.763	62.782**	0.582
I6	0.828	95.345**	0.686	0.799	72.839**	0.638
I7	0.852	110.910**	0.726	0.825	85.532**	0.681
I8	0.878	131.519**	0.770	0.849	99.914**	0.720
I9	0.874	130.066**	0.765	0.842	96.871**	0.708
I10	0.868	123.057**	0.753	0.799	75.185**	0.638
Employment	**(AVE = 0.732, CR = 0.932)**			**(AVE = 0.684, CR = 0.915)**		
I11	0.841	102.231**	0.707	0.789	62.571**	0.623
I12	0.859	106.159**	0.737	0.868	81.170**	0.753
I13	0.851	105.482**	0.724	0.818	59.954**	0.669
I14	0.854	110.985**	0.730	0.737	55.485**	0.543
I15	0.873	121.274**	0.763	0.911	64.925**	0.830
Education	**(AVE = 0.639, CR = 0.914)**			**(AVE = 0.511, CR = 0.861)**		
I16	0.806	80.045**	0.650	0.634	36.741**	0.402
I17	0.788	73.118**	0.622	0.581	30.647**	0.337
I18	0.837	95.912**	0.701	0.789	65.714**	0.623
I19	0.829	89.578**	0.688	0.771	59.128**	0.595
I20	0.758	63.053**	0.575	0.743	52.454**	0.552
I21	0.775	68.147**	0.601	0.746	53.258**	0.557
Standard of living and social	**(AVE = 0.677, CR = 0.926)**			**(AVE = 0.583, CR = 0.892)**		
I22	0.845	102.861**	0.714	0.799	67.621**	0.638
I23	0.851	106.876**	0.724	0.827	86.388**	0.684
I24	0.823	92.231**	0.677	0.855	89.251**	0.732
I25	0.843	103.585**	0.711	0.676	46.525**	0.457
I26	0.805	83.056**	0.649	0.659	42.372**	0.434
I27	0.767	65.004**	0.589	0.742	45.591**	0.551
International relations	**(AVE = 0.673, CR = 0.911)**			**(AVE = 0.626, CR = 0.893)**		
I28	0.820	88.297**	0.673	0.786	70.134**	0.618
I29	0.799	79.166**	0.639	0.787	70.574**	0.619
I30	0.780	71.849**	0.609	0.733	54.659**	0.537
I31	0.862	111.057**	0.742	0.830	86.655**	0.689
I32	0.837	96.792**	0.701	0.816	81.474**	0.665
Economic	**(AVE = 0.707, CR = 0.906)**			**(AVE = 0.680, CR = 0.894)**		
I33	0.844	102.172**	0.712	0.784	70.210**	0.614
I34	0.819	86.985**	0.671	0.805	74.272**	0.648
I35	0.850	106.473**	0.723	0.836	92.516**	0.700
I36	0.849	103.107**	0.720	0.870	106.424**	0.757
Logistics and transportation	**(AVE = 0.721, CR = 0.928)**			**(AVE = 0.639, CR = 0.898)**		
I37	0.843	103.122**	0.711	0.721	52.989**	0.519
I38	0.880	129.496**	0.774	0.799	74.186**	0.639
I39	0.804	82.256**	0.646	0.814	80.251**	0.663
I40	0.853	111.056**	0.728	0.803	76.328**	0.644
I41	0.863	118.553**	0.745	0.853	99.605**	0.728

Note: ** significant at $\alpha = 0.001$. AVE denotes Average Variance Extracted. CR denotes Composite Reliability. λ is Standardized estimates.

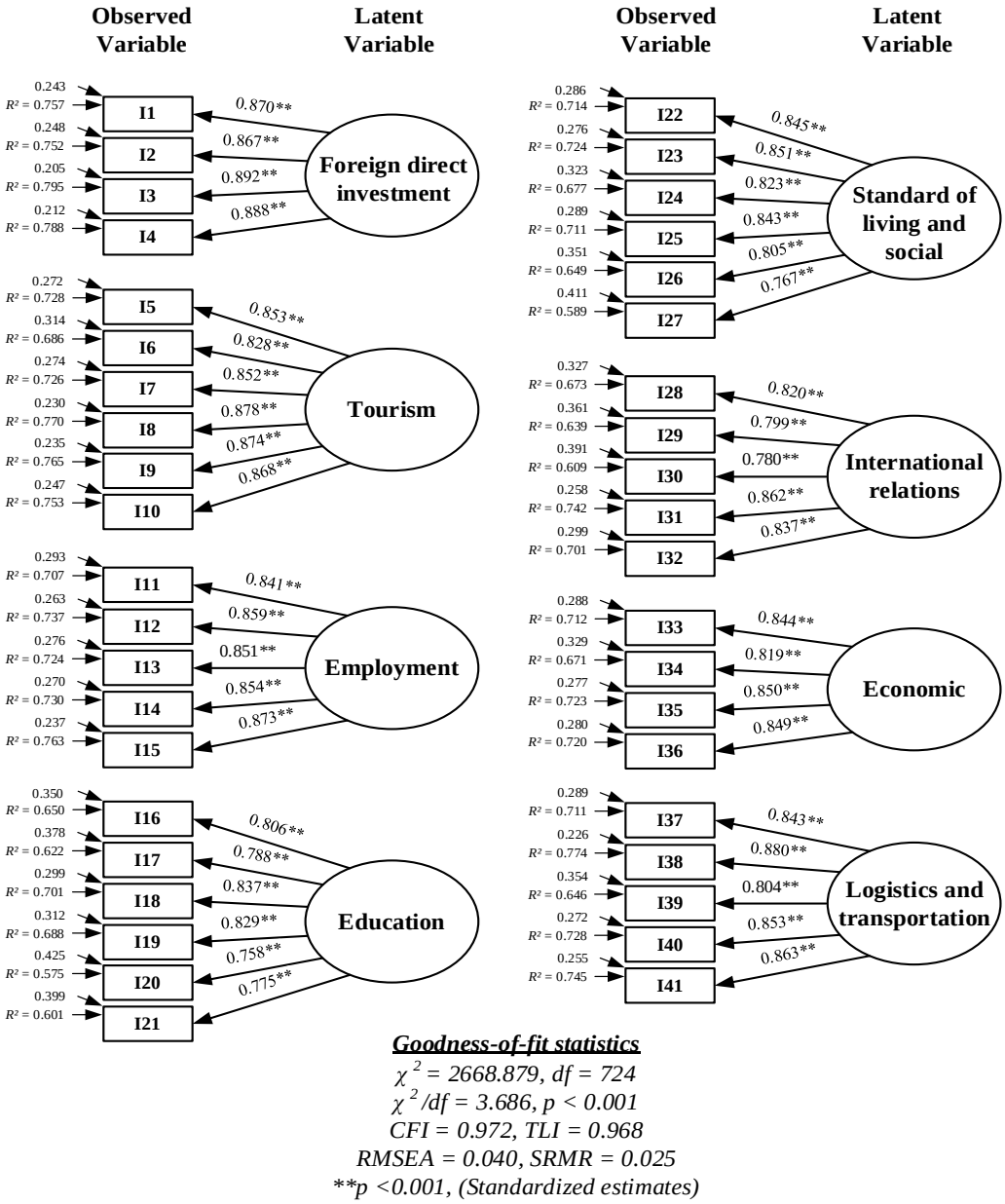

Figure 3. CFA of BRI impact factors among non-border region groups

Employment in non-border regions shows high factor loadings (λ) ranging from 0.841 to 0.873, indicating strong relationships between observed variables and the employment construct. The high factor loadings suggest that non-border regions perceive employment opportunities as a significant potential benefit of the BRI. This could be due to expectations of job creation in various sectors, including infrastructure development, tourism, and related industries. However, these findings contrast with Khamphengvong et al. [16], who did not find a positive relationship between employment and perceived BRI benefits. This difference might be attributed to varying economic contexts or the specific focus on non-border regions in the current study. Wang et al. [4] also emphasized the potential for job creation through BRI projects.

Education in non-border regions demonstrates high factor loadings (λ) between 0.758 and 0.837, indicating strong relationships between observed variables and the education construct. The high factor loadings suggest that non-border regions perceive educational benefits as an important aspect of the BRI. This could be due to expectations of increased international knowledge exchange, improved educational resources, and enhanced opportunities for students and researchers. These findings are consistent with Hung [32], who identified education as a significant factor influencing perceived benefits of the BRI. Similarly, Gong [2] highlights the potential for enhanced educational cooperation and knowledge sharing among BRI countries.

Standard of living and social aspects in non-border regions show high factor loadings (λ) ranging from 0.767 to 0.851, indicating strong relationships between observed variables and the construct. The high factor loadings suggest

that non-border regions perceive improvements in living standards and social aspects as significant potential benefits of the BRI. This could be due to expectations of enhanced infrastructure, public utilities, and overall quality of life improvements. These results align with findings from Khamphengvong et al. [16], who highlighted the importance of living standards in shaping perceptions of BRI benefits. Similarly, Cao et al. [12] emphasized the potential for improved social conditions and quality of life in BRI-participating countries.

International relations in non-border regions demonstrate high factor loadings (λ) between 0.780 and 0.862, indicating strong relationships between observed variables and the construct. The high factor loadings suggest that non-border regions perceive improved international relations as a significant potential benefit of the BRI. This could be due to expectations of enhanced diplomatic ties, cultural exchanges, and increased cooperation with other countries. These findings are consistent with Punyaratabandhu & Swaspitchayaskun [10], who highlighted the importance of international cooperation in the BRI context. Similarly, Li et al. [1] emphasizes the potential for improved regional cooperation and integration among BRI participating countries.

Economic aspects in non-border regions show high factor loadings (λ) ranging from 0.819 to 0.850, indicating strong relationships between observed variables and the economic construct. The high factor loadings suggest that non-border regions perceive economic benefits as a crucial aspect of the BRI. This could be due to expectations of increased trade, GDP growth, and overall economic development resulting from BRI initiatives. These results align with findings from Ma [11], who reported significant growth effects of economic integration in BRI countries. Similarly, Apaitan et al. [6] highlights the potential for enhanced economic cooperation and development among BRI participating countries.

Logistics and transportation in non-border regions demonstrate high factor loadings (λ) between 0.804 and 0.880, indicating strong relationships between observed variables and the construct. The high factor loadings suggest that non-border regions perceive improvements in logistics and transportation as significant potential benefits of the BRI. This could be due to expectations of enhanced connectivity, reduced transportation costs, and improved trade facilitation. These findings are consistent with Wang et al. [4], who emphasized the crucial role of transport infrastructure in facilitating economic growth in BRI countries. Similarly, [35] highlights the potential for improved regional connectivity and trade through enhanced logistics and transportation infrastructure.

5.2. Border Regions

Figure 4, shown CFA result of BRI impact factors among border region groups. Foreign direct investment (FDI), the parameter estimates for FDI in border regions show moderate to high factor loadings (λ) ranging from 0.701 to 0.798, indicating reasonably strong relationships between observed variables and the FDI construct. The relatively high factor loadings suggest that border regions perceive FDI as an important aspect of the Belt and Road Initiative (BRI), albeit slightly less strongly than non-border regions. This could be due to the direct exposure of border regions to cross-border investments and trade, leading to a more nuanced view of FDI impacts. These findings align with Khamphengvong et al. [16], who identified FDI as a main driver of socio-economic benefits in BRI countries. However, the slightly lower factor loadings compared to non-border regions suggest a more complex perception of FDI in border areas, possibly due to direct experience with cross-border economic activities. Tritto & Camba [7] also noted heterogeneous effects of BRI investments across different geographical contexts.

Tourism in border regions demonstrates high factor loadings (λ) between 0.763 and 0.849, indicating strong relationships between observed variables and the tourism construct. The high factor loadings suggest that border regions view tourism as a significant potential benefit of the BRI. This perception may be driven by the direct experience of cross-border tourism and expectations of increased international visitors due to improved connectivity. These results are consistent with Ahmad & Ullah [34], who reported substantial increases in tourism revenues in BRI participating countries. The strong perception of tourism benefits in border regions may reflect the immediate impact of increased cross-border movement facilitated by BRI projects. Gong [2] also highlighted the importance of geographical proximity in shaping BRI perceptions.

Employment in border regions shows high factor loadings (λ) ranging from 0.737 to 0.911, indicating strong relationships between observed variables and the employment construct. The high factor loadings, particularly for certain indicators, suggest that border regions perceive employment opportunities as a crucial potential benefit of the BRI. This could be due to direct observations of job creation in cross-border trade, logistics, and tourism sectors. Interestingly, these findings show a stronger perception of employment benefits in border regions compared to Khamphengvong et al. [16], who did not find a positive relationship between employment and perceived BRI benefits. This difference might be attributed to the unique economic dynamics of border regions in the context of BRI projects. Wang et al. [4], Bunnak et al. [18] also emphasized the potential for job creation through BRI-related infrastructure development.

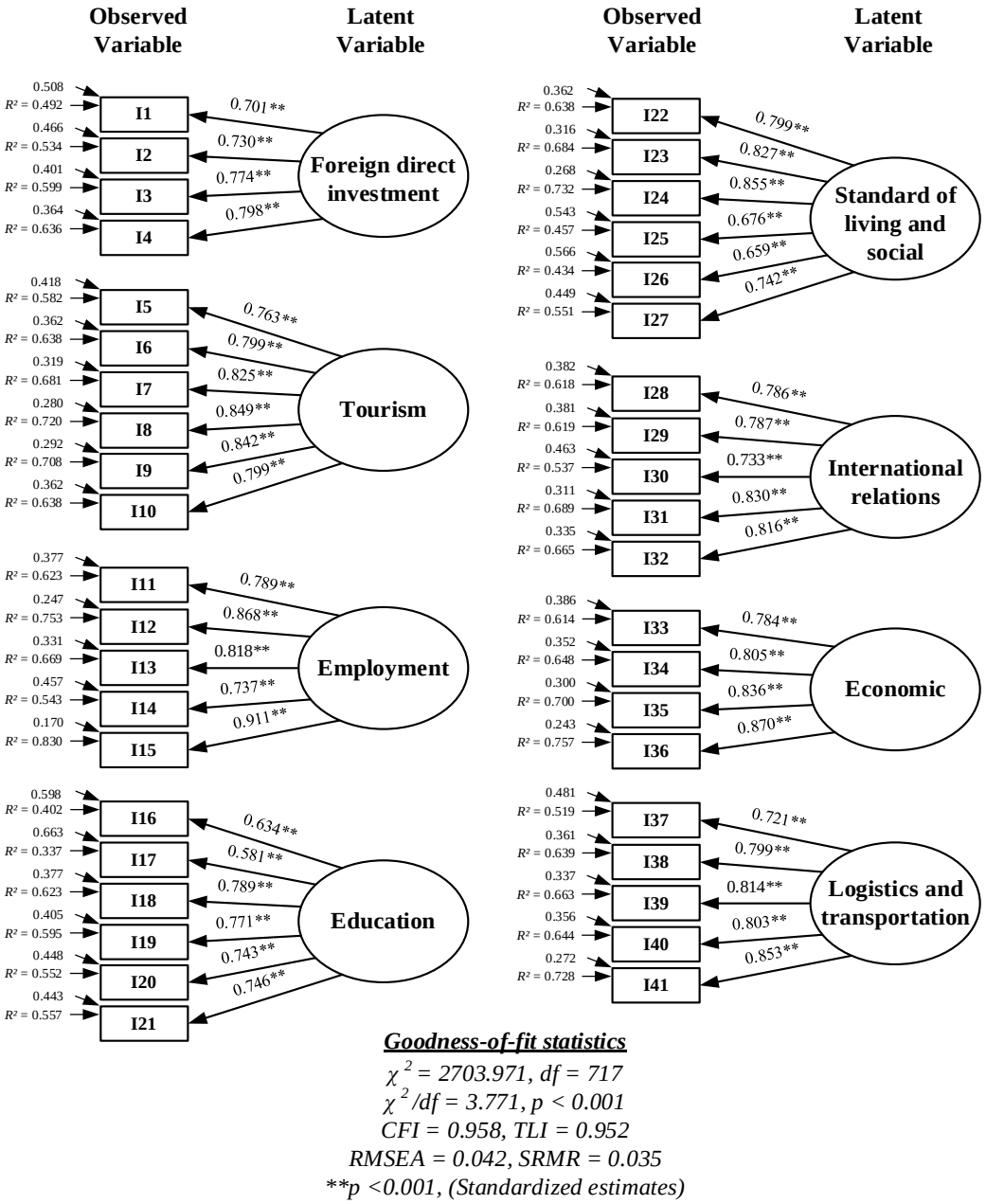

Figure 4. CFA of BRI impact factors among border region groups

Education in border regions demonstrates moderate factor loadings (λ) between 0.581 and 0.789, indicating moderate to strong relationships between observed variables and the education construct. The moderate factor loadings suggest that border regions perceive educational benefits as a relevant aspect of the BRI, though perhaps less prominently than other factors. This could be due to a focus on more immediate economic impacts in border areas. These findings show a slightly lower emphasis on education compared to Khamphengvong et al. [16], who identified education as a significant factor influencing perceived benefits of the BRI. This difference might reflect the specific priorities and experiences of border regions in the context of BRI implementation. Li et al. [1] also noted regional variations in BRI perceptions.

Standard of living and social aspects in border regions show moderate to high factor loadings (λ) ranging from 0.659 to 0.855, indicating moderate to strong relationships between observed variables and the construct. The varying factor loadings suggest that border regions perceive improvements in living standards and social aspects as important potential benefits of the BRI, with some aspects being more prominent than others. This could be due to direct experiences of social and economic changes resulting from increased cross-border activities. These results partially align with findings from Kuik & Rosli [17], who highlighted the importance of living standards in shaping perceptions of BRI benefits. The varied factor loadings in border regions might reflect a more nuanced understanding of the social impacts of BRI projects based on direct experiences. Cao et al. [12] also emphasized the complex interplay between BRI projects and social-ecological factors.

International relations in border regions demonstrate high factor loadings (λ) between 0.733 and 0.830, indicating strong relationships between observed variables and the construct. The high factor loadings suggest that border regions perceive improved international relations as a significant potential benefit of the BRI. This could be due to direct experiences of increased cross-border cooperation and cultural exchanges. These findings are consistent with Punyaratabandhu & Swaspitchayaskun [10], who emphasized the importance of international cooperation in the BRI context. The strong perception of international relations benefits in border regions may reflect their role as frontline areas for international engagement under the BRI. Li et al. [1] also highlighted the potential for enhanced regional integration through BRI projects.

Economic aspects in border regions show high factor loadings (λ) ranging from 0.784 to 0.870, indicating strong relationships between observed variables and the economic construct. The high factor loadings suggest that border regions perceive economic benefits as a crucial aspect of the BRI. This could be due to direct observations of increased trade, economic activities, and development resulting from BRI initiatives in border areas. These results align with findings from Ma [11], who reported significant growth effects of economic integration in BRI countries. The strong economic perceptions in border regions may reflect their position as key areas for realizing the economic potential of BRI projects. Apaitan et al. [6] also noted the importance of regional economic dynamics in shaping BRI perceptions.

Logistics and transportation in border regions demonstrate high factor loadings (λ) between 0.721 and 0.853, indicating strong relationships between observed variables and the construct. The high factor loadings suggest that border regions perceive improvements in logistics and transportation as significant potential benefits of the BRI. This could be due to direct experiences of enhanced connectivity, reduced transportation costs, and improved trade facilitation in border areas. These findings are consistent with Wang et al. [4], who emphasized the crucial role of transport infrastructure in facilitating economic growth in BRI countries. The strong perception of logistics and transportation benefits in border regions likely reflects their critical role as transit points for BRI-related trade and connectivity projects. Liu & Ma [35] also highlighted the importance of infrastructure development in shaping regional perceptions of the BRI.

5.3. Comparative Analysis of Border and Non-Border Regions

This section provides a comparative analysis of the perception models between border and non-border regions, highlighting key differences and their implications for the Belt and Road Initiative (BRI) in Thailand.

5.3.1 Key Structural Differences in BRI Perceptions between Border and Non-Border Regions

The analysis reveals notable structural differences in how border and non-border regions perceive the BRI. Non-border regions generally show higher and more consistent factor loadings across all constructs, suggesting a more uniformly positive perception of BRI benefits. In contrast, border regions demonstrate more varied factor loadings, indicating a more nuanced and potentially pragmatic view of the BRI's impacts. This difference aligns with findings from Gong [2], who noted that perceptions of the BRI vary significantly based on geographical proximity to BRI projects. The more varied perceptions in border regions may be attributed to their direct exposure to the immediate effects of BRI implementation, including both positive and potentially challenging aspects.

5.3.2 Economic and Investment Perceptions

Both regions show strong perceptions of economic and FDI benefits, but with subtle differences. Non-border regions demonstrate slightly higher factor loadings for FDI (0.867-0.892) compared to border regions (0.701-0.798). This difference could be explained by what Li et al. [1] describe as the "anticipation effect" in non-border regions, where expected benefits may be slightly inflated due to less direct experience with BRI projects. Border regions, however, show particularly high loadings for certain economic indicators, possibly reflecting immediate observable impacts. This aligns with Tritto & Camba [7] findings on the heterogeneous effects of BRI investments across different geographical contexts.

5.3.3 Logistics and Connectivity Perceptions

Interestingly, both regions show strong perceptions of logistics and transportation benefits, but with slightly different emphases. Non-border regions have higher loadings for broader concepts of connectivity (0.804-0.880), while border regions show high loadings for specific improvements in transportation (0.721-0.853). This difference could be explained by what Wang et al. [4] describe as the "proximity effect" in infrastructure projects, where areas closer to project sites (border regions) tend to focus on immediate, tangible benefits, while more distant areas (non-border regions) may emphasize broader, long-term connectivity improvements.

5.3.4 Social and Cultural Dimensions

Both regions recognize the social and cultural implications of the BRI, but with different intensities [26]. Non-border regions show more consistent and generally higher loadings for education (0.758-0.837) and international relations

(0.780-0.862) compared to border regions (education: 0.581-0.789; international relations: 0.733-0.830). This difference might be explained by Khamphengvong et al. [16] what term the "exposure effect," where border regions' direct experiences with cross-cultural interactions may lead to a more measured view of these benefits. Non-border regions, with less direct exposure, may hold more idealized perceptions of these aspects.

5.3.5 Employment and Standard of Living

Interestingly, border regions show higher factor loadings for employment (0.737-0.911) compared to non-border regions (0.841-0.873), particularly for certain indicators. This could be attributed to what Punyaratabandhu & Swaspitchayaskun [10] describe as the "immediate impact effect," where border regions may observe more immediate job creation in sectors related to cross-border trade and logistics. However, perceptions of standard of living improvements are more varied in border regions (0.659-0.855) compared to non-border regions (0.767-0.851). This variability aligns with findings from Rigg et al. [37], who noted that the impacts of large-scale economic initiatives on living standards can be highly localized and varied, particularly in border areas [17].

5.3.6 Tourism Perceptions

Both regions show strong perceptions of tourism benefits, but with slight differences in emphasis. Non-border regions have more consistent high loadings across all tourism indicators (0.828-0.878), while border regions show particularly high loadings for certain aspects (0.763-0.849). This difference could be explained by what Ashraf et al. [33] term the "destination effect," where border regions may focus more on specific aspects of tourism directly relevant to their area, while non-border regions may have a more generalized view of tourism benefits.

5.3.7 Implications for BRI Implementation

These structural differences in BRI perception between border and non-border regions have significant implications for policy-making and BRI implementation in Thailand: *Targeted Communication Strategies:* As suggested by Jomnonkwao, et al. [13], Hurley et al. [25], communication strategies about BRI benefits should be tailored to address the specific perceptions and concerns of border and non-border regions. *Balanced Development Approach:* The varied perceptions in border regions highlight the need for a balanced approach to BRI implementation [38], addressing both economic opportunities and potential social and environmental challenges, as emphasized by Liu and Ma [35]. *Inclusive Policy-Making:* The differences in perception underscore the importance of inclusive policy-making that considers the varied experiences and expectations of different regions, aligning with recommendations from Lindberg & Biddulph [39], Leng [40] for more livelihood-inclusive BRI narratives. *Monitoring and Evaluation:* The varied perceptions, particularly in border regions, suggest the need for robust monitoring and evaluation mechanisms to track the actual impacts of BRI projects and address any discrepancies between perceived and realized benefits, as proposed by Zhang and James [41], Farazi et al. [42]. *Regional Cooperation:* The strong perceptions of international relations benefits in both regions highlight the potential for enhanced regional cooperation through the BRI, as discussed by Yang and Li [43], Park [44], but with a need to address the more nuanced views in border regions.

5.4. Major Findings and Policy Implications

Structural differences in BRI perception: Non-border regions generally showed higher and more consistent factor loadings across all constructs, suggesting a more uniformly positive perception of BRI benefits. Border regions demonstrated more varied factor loadings, indicating a more nuanced and potentially pragmatic view of the BRI's impacts. This difference in perception between non-border and border regions can be attributed to several factors. Cultural distance may play a role, as non-border regions typically have less direct exposure to cross-border interactions, potentially leading to more idealized perceptions of international cooperation [2]. The economic structure of non-border regions, often more diversified and less dependent on border trade, might contribute to a more optimistic view of BRI's potential to boost various sectors [11]. Additionally, non-border regions might be more aligned with national-level narratives about the BRI, which tend to emphasize potential benefits. The political discourse at the national level often focuses on the macro-benefits of such initiatives, which may resonate more strongly in areas not directly impacted by cross-border dynamics [10]. In contrast, border regions' more varied perceptions likely stem from their direct experience with cross-border activities, leading to a more realistic assessment of both opportunities and challenges [17]. The economies of border regions are often more directly impacted by changes in cross-border relations, which could lead to a more cautious perspective [7]. Furthermore, past experiences with cross-border initiatives and their impacts may influence current perceptions in border regions [22].

This study reveals significant differences in BRI perceptions between border and non-border regions in Thailand, necessitating tailored policy approaches. The results recommend developing region-specific communication strategies that address unique perceptions and concerns of each area. For border regions, the focus should be on concrete, immediate benefits and potential challenges, while non-border regions may benefit from emphasis on long-term, broader economic and social advantages. A balanced development approach is crucial, particularly in border regions where

perceptions are more varied. This can be achieved through inclusive policy-making mechanisms that involve stakeholders from both border and non-border regions, ensuring diverse perspectives are considered in BRI implementation. To support this, the results propose implementing participatory planning workshops across regions, aligning with Lindberg & Biddulph [39] call for more livelihood-inclusive BRI narratives. Enhanced monitoring and evaluation systems are necessary to track and assess the actual impacts of BRI projects, especially in border regions. This can help address any discrepancies between perceived and realized benefits. Establishing regional BRI information centers in key locations can provide tailored information about projects, addressing specific perceptions and concerns identified in each region, as emphasized by Jomnonkwao et al. [13], Bunnak et al. [18], Hurley et al. [25] for effective communication in large infrastructure projects. Targeted skills development programs should be implemented, focusing on employability skills in border regions and broader educational benefits in non-border areas. This approach can be complemented by developing special economic zones in border regions, capitalizing on the strong perceptions of employment and economic benefits identified in this study, aligning with Tritto & Camba [7] findings on the heterogeneous effects of BRI investments. To address the strong perceptions of international relations benefits identified in both regions, cultural exchange programs between Thailand and other BRI countries should be implemented. This aligns with Park [44] emphasis on enhancing regional cooperation through the BRI. Additionally, ensuring transparent and participatory Environmental Impact Assessment (EIA) processes for BRI projects can address the varied perceptions of environmental impacts, as supported by Liu and Ma [35] research. By adopting these tailored approaches and implementing region-specific strategies, policymakers can work towards more effective, equitable, and sustainable implementation of BRI projects in Thailand, considering the diverse perceptions and needs of different regions within the country.

6. Conclusion

This study conducted a comprehensive analysis and comparison of Belt and Road Initiative (BRI) perceptions between border and non-border regions in Thailand. The primary objective was to identify and quantify the differences in how these diverse geographic regions perceive the BRI project, with a particular focus on how proximity to the project influences public expectations, concerns, and overall attitudes towards high-speed rail development. The research addressed a significant gap in the existing literature by providing a comprehensive comparative analysis of BRI perceptions across different geographical contexts within a single country. While previous studies have examined BRI perceptions at a national or international level, few have delved into the nuanced differences between border and non-border regions. This study contributes to the field by employing advanced measurement invariance techniques, representing a methodological advancement in BRI research. The key contributions of this study include providing a unique comparative perspective on BRI perceptions between border and non-border regions in Thailand. Employing rigorous statistical methods, including measurement invariance techniques, to ensure the validity of comparisons between different geographical groups. Offering insights into the spatial dynamics of public opinion regarding large-scale infrastructure projects like the BRI. Informing policy-making processes by highlighting region-specific perceptions and concerns related to BRI implementation.

This study has limitations based on its parameter results. Lower factor loadings for certain constructs in border regions suggest potential measurement issues or conceptual differences. Varying factor loadings between regions for some constructs indicate the need for more nuanced measurement instruments. Future research could, Develop and validate region-specific measurement scales. Conduct longitudinal studies to differentiate between perception changes and actual project impacts. Employ mixed-method approaches to provide deeper insights into regional differences. Expand the study to other BRI countries to determine if observed differences represent a broader pattern.

7. Declarations

7.1. Author Contributions

Conceptualization, T.C. and F.W.; methodology, T.C. and S.J.; software, V.R.; validation, D.C. and R.K.; formal analysis, D.C. and K.T.; investigation, R.K. and S.J.; data curation, K.T.; writing—original draft preparation, T.C. and F.W.; writing—review and editing, T.C. and S.J.; visualization, T.C. and D.C.; supervision, V.R. and S.J.; project administration, S.J. and R.K.; funding acquisition, S.J. All authors have read and agreed to the published version of the manuscript.

7.2. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

7.3. Funding

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7.4. Institutional Review Board Statement

This research was approved by the Ethics Committee for Research Involving Human Subjects, Suranaree University of Technology (COE No.7/2567).

7.5. Conflicts of Interest

The authors declare no conflict of interest.

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