The Role of Rail Transport in Economic Development: A Customer Perspective

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Abstract

The present study aims to examine and explain the role of rail transport in Iran's economic development from the customers' perspective. This research was conducted using a survey method, employing a questionnaire distributed among 384 rail transport customers. The validity of the questionnaire was confirmed by five experts, and its reliability was assessed through Cronbach's alpha coefficient, with values exceeding 0.7 for all variables, indicating satisfactory reliability of the measurement tool. Data analysis was performed using SPSS software. The results revealed that rail transport has a significant impact on attracting global business opportunities, economic competitiveness, traffic congestion reduction, and road maintenance. Additionally, this study examined the relationship between rail infrastructure development and its impact on economic productivity. The findings indicated that increased investment in the rail transport sector can enhance transportation efficiency and improve Iran's trade conditions. One of the most critical outcomes of this study was identifying the challenges hindering the expansion of the rail system, including high development costs and a lack of attractiveness for private investors. This research can assist policymakers in developing appropriate strategies to improve rail transport. The findings align with international studies in this field, emphasizing the importance of this sector in sustainable economic development. It is recommended that precise planning be undertaken to expand rail networks and enhance service quality in this domain.

Keywords: Rail transport, Economic development, Customers, Economic competitiveness, Global business.

1 | Introduction

Rail transport is considered one of the most critical infrastructure components in any country's economy. Due to its unique characteristics-such as high safety, lower energy consumption compared to road transport,

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and the ability to carry heavy loads-it plays a vital role in economic growth and development [1]. Many countries have significantly improved economic productivity and facilitated domestic and international trade by investing in rail network expansion [2].

Despite Iran's considerable potential in rail transport, the development of this sector has faced numerous challenges. High costs associated with constructing new railway lines and the need for substantial investments have hindered its rapid expansion [3]. On the other hand, rail transport can reduce road traffic congestion and accidents, leading to lower social and economic costs associated with traffic-related incidents [4].

Given the strategic importance of rail transport, it is essential to examine its impact on Iran's economic development from the perspective of customers. As the primary users of this system, customers provide valuable insights into its performance and efficiency, which can inform future policymaking [5]. One of the key aspects of rail transport development is analyzing its economic impact on various sectors of society [6]. In many countries, rail transport has contributed to sustainable economic growth by reducing transportation costs and increasing efficiency [7]. In Iran, evaluating whether rail transport has had similar effects is crucial.

The study by Soretire et al. [8], titled "Economic sustainability of Nigeria's rail transport system", found that Nigeria's railway system has a significant impact on local economic development. Additionally, expert interviews reinforced this finding, showing that improving rail services and infrastructure can accelerate local economic growth. Similarly, Chesnov et al. [9] conducted a study on the relationship between rail freight transport demand and service quality using an elasticity-based approach. Their results indicated that the quality of rail transport services directly affects freight transport demand [10]. The elasticity analysis showed that improving rail infrastructure, enhancing safety, and upgrading service levels lead to increased freight transport demand. Moreover, financial, economic, and quantitative analyses revealed that investment in asset modernization and maintenance, increasing cargo transport volume, and optimizing train weight contribute to improving the sustainability and competitiveness of the rail transport system [11].

Bagheri Pormehr et al. [10] examined the impact of infrastructure investment on Iran's economic growth using a vector error correction model. Their findings demonstrated that investment in the transportation sector has a positive and significant effect on Iran's economic growth. However, the extent of this impact depends on development strategies and effective management [13].

Aliyeva [11], in her study "The role of regional cooperation in rail transport development and its impact on competitiveness and economic growth", highlighted that regional cooperation in rail transport enhances trade diversification, attracts foreign direct investment, and increases participation in global production networks. Improved rail infrastructure boosts global competitiveness, promotes economic development, and facilitates connectivity between people, goods, and services at both regional and international levels. Furthermore, rail transport, with its high energy efficiency and safety standards, is an economical and sustainable option for passenger and freight transport, although it requires higher capital investment and is less flexible than road transport. Previous studies have primarily focused on the technical and economic aspects of rail transport, but customer perspectives have received less attention.

In addition to cost reduction, rail transport can contribute to sustainable development [12]. Lower fossil fuel consumption, reduced air pollution, and decreased road traffic congestion are among its key advantages. However, inadequate investment and the lack of fleet modernization have led to reduced efficiency in this sector [13]. This study aims to analyze the role of rail transport in Iran's economic development from the perspective of customers. The findings of this research can assist policymakers in making informed decisions to enhance the rail transport system. Additionally, the study can identify the strengths and weaknesses of the system and propose strategies for its improvement. Thus, the main research question is: what is the role of rail transport in Iran's economic development from the customers' perspective?

2 | Methodology

This descriptive-analytical study was conducted using non-probability convenience sampling. The statistical population consisted of 384 railway transport customers in Iran, selected using Cochran's formula. Data were collected through a validated questionnaire comprising 25 questions across four key dimensions: economic competition, traffic congestion and accidents, global business opportunities, and transport improvement. The validity of the questionnaire was confirmed through face and content validity by five experts, while its reliability was assessed using Cronbach's alpha coefficient (0.863). Data analysis was performed using the Kolmogorov-Smirnov test and one-sample t-test in SPSS 25 software.

3 | Findings

The analysis of demographic factors revealed that male respondents constituted the majority (68.5%) compared to females. Regarding marital status, married individuals (63.0%) outnumbered single respondents. In terms of age groups, the highest proportion of participants fell within the 31-40 age range (45.1%). Concerning educational background, bachelor's degree holders represented the largest share (51.6%). Therefore, married men aged 31 to 40 with a bachelor's degree comprised the dominant group in the study sample.

Table 1. One-sample Kolmogorov-Smirnov test.

		Economic Competition	Traffic Congestion and Accidents	Global Business Opportunities	Transport Improvement
N		384	384	384	384
Normal parameters[a,b]	Mean	3.372768	3.2663	3.338170	3.485491
	Std. Deviation	0.9241324	0.93151	9304482	0.9077454
Most extreme differences	Absolute	0.076	0.074	0.090	0.080
	Positive	0.042	0.061	0.038	0.043
	Negative	-0.076	-0.074	-0.090	-0.080
Kolmogorov-Smirnov Z		1.072	1.041	1.269	1.125
Asymp. Sig. (2-tailed)		0.200	0.229	0.080	0.087

a. Test distribution is Norma. b. Calculated from data.

Based on *Table 1*, the Kolmogorov-Smirnov test, conducted to assess the normality of data distribution, indicates that all examined variables-economic competitiveness, traffic congestion and accidents, global business opportunities, and transportation improvement—follow a normal distribution, as their significance levels exceed 0.05 (0.200, 0.229, 0.080, and 0.087, respectively). The mean scores of customer opinions for all variables are above the average threshold of 3, reflecting a positive perception of the role of rail transport in these areas. The highest mean score corresponds to transportation improvement (3.48), while the lowest pertains to traffic congestion and accidents (3.26), suggesting that customers perceive the greatest impact of rail transport in enhancing Iran's transportation system.

Table 2. One-Sample Statistics.

	N	Mean	Std. Deviation	Std. Error Mean
Economic competition	384	3.372768	0.9241324	0.0471594
Traffic congestion and accidents	384	3.2663	0.93151	0.04754
Global business opportunities	384	3.338170	0.9304482	0.0474817
Transport improvement	384	3.485491	0.9077454	0.0463232

Table 2 presents the descriptive statistics related to customer evaluations of the impact of rail transport across four different domains. Analyzing the data reveals that among the 384 respondents, the highest mean score belongs to the transportation improvement variable (3.48), indicating that customers perceive the most

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significant positive impact in this area. This is followed by economic competitiveness with a mean of 3.37, global business opportunities with 3.33, and traffic congestion and accidents with 3.26. The relatively similar standard deviation for all variables (approximately 0.9) suggests a consistent distribution of responses. Additionally, the low standard error of the mean (around 0.047) across all variables indicates a high level of accuracy in estimating the means. Overall, mean scores above 3 for all variables suggest that, from the customers' perspective, rail transport positively contributes to Iran's economic development across all examined dimensions.

Table 3. One-sample test.

	Test Value = 3				95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Economic competition	7.904	383	0.000	0.3727679	0.280044	0.465492
Traffic congestion and accidents	5.602	383	0.000	0.26628	0.1728	0.3597
Global business opportunities	7.122	383	0.000	0.3381696	0.244812	0.431527
Transport improvement	10.481	383	0.000	0.4854911	0.394411	0.576571

Table 3 presents the results of the one-sample t-test with a test value of 3, representing the neutral benchmark. The results indicate that for all variables, the significance level (Sig) is 0.0001, which is below 0.05, confirming a significant difference between the observed means and the test value.

The positive t-values and mean differences suggest that the mean scores for all variables are significantly above the neutral benchmark. The highest mean difference is observed for the "Transportation improvement" variable (0.485) with the highest t-value (10.481), indicating that this variable has the strongest positive impact. The 95% confidence intervals for all variables are positive, further confirming that the actual population means for all variables are significantly above 3. These findings reinforce the conclusion that, from customers' perspectives, rail transport has a significant and positive impact on Iran's economic development across all examined dimensions.

4 | Conclusion

The results of this study indicate that rail transport plays a crucial role in the economic development of Iran. The findings show that rail transport is not only effective in reducing transportation costs, but it can also enhance economic growth in Iran by reducing traffic congestion, increasing economic competition, and attracting global business opportunities. Regarding transportation improvement (with the highest mean of 3.48), the findings of Chesnov et al. [9] support this conclusion, showing that improving rail infrastructure and upgrading service levels leads to increased demand. This alignment suggests that the quality of rail transport services is a key factor in the development of this sector. In terms of economic competition (with a mean of 3.37), the results align with the findings of Aliyeva [11], who demonstrated that rail transport enhances global competitiveness, although it requires more investment compared to road transport.

Concerning global business opportunities (with a mean of 3.33), the results align with the study of Soretire et al. [8], which showed that rail transport has a significant impact on local economic development and can accelerate economic growth. In the context of traffic congestion and accidents (with a mean of 3.26), the findings of Bagheri Pormehr et al. [10] complement this result, showing that although investment in the transportation sector positively impacts economic growth, this effect depends on development strategies and efficient management.

Based on the results, rail transport can strengthen Iran's economic growth and development by accelerating infrastructure and construction activities. Additionally, by utilizing Iran's resources and potential talents, the relative advantages of the economy can be actualized in the international economic sphere.

At the national level, the development of rail transport can have positive effects on Iran's economy through reduced transportation costs, increased passenger safety, and optimized energy consumption. Moreover, the development of international rail lines could improve Iran's global economic position [17]. These results indicate that long-term planning for the development of rail networks and optimizing services in this sector is essential [18].

The government should encourage private sector participation in the development of rail transport by providing appropriate financial resources and investment incentives. This can reduce transportation costs, increase productivity, and enhance the country's competitiveness in the international arena. Furthermore, the use of modern technologies in rail transport management, monitoring train performance, optimizing routes, and improving customer service quality can enhance the efficiency of this sector. The adoption of intelligent systems, fleet monitoring, and the digitalization of transportation processes can lead to improved performance and reduced operational costs.

One limitation of this study was its focus solely on customer perspectives, without considering other stakeholders, such as government officials and transportation companies. Additionally, the research data were limited to a specific time period, which may influence the results. Future research could examine and compare the impact of rail, road, maritime, and air transport on Iran's economic growth to identify the best strategies for transportation infrastructure development. Moreover, investigating the impact of digital technologies and smart systems on improving rail transport efficiency could pave the way for the faster and more efficient development of this sector.

In conclusion, rail transport plays a key role in Iran's economic development, and improving this system can contribute to economic competition and reduce urban issues such as traffic congestion and accidents.

Authors Contributions

Salahi Kojour and Yazdani jointly contributed to the conceptualization, methodology, analysis, and writing of this paper. Both authors reviewed and approved the final manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper. No personal, financial, or institutional influences have affected the objectivity and integrity of the research.

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Data Availability

StatementThe data used in this study are derived from publicly available sources and have been appropriately cited. Any additional data supporting the findings of this study can be made available upon request from the corresponding author.

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