The tariff policy of freight transportation in the context of railway transformation in Uzbekistan

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Abstract. This abstract examines the tariff policy of freight transportation in the context of railway transformation in Uzbekistan. Given the changes taking place in the country's railway sector, particular attention is given to analyzing and assessing the impact of transformation on freight tariffs and transportation conditions. The study explores factors influencing tariff formation, such as changes in railway company structure, infrastructure modernization, reforms in government policy, and private investment attraction. The importance of establishing optimal tariffs and creating competitive conditions for freight transportation in times of transformation is emphasized, and recommendations are provided for improving the tariff policy considering the changes in Uzbekistan's railway sector. This study aims to provide useful information and practical recommendations for railway companies, government authorities, and stakeholders to facilitate the development of an effective tariff policy and contribute to the sustainable development of railway transportation in Uzbekistan.

1 Introduction

The calculation of wagon-load shipments in universal covered wagons of railway transport should be carried out in the context of railway transformation outlined in Decree No. 329 "On Measures for Fundamental Reform of the Railway Transport Sector of the Republic of Uzbekistan" dated October 10, 2023. The transportation of goods should follow the example of Russian railways and be conducted based on tariff scheme No. 8, which involves wagon-load shipments in owned or leased universal covered wagons. These reforms aim to transform the railway infrastructure and improve the efficiency of transportation. It is important to note that the tariff scheme No. 8, inspired by the practices of Russian railways, provides flexibility and convenience for cargo owners, allowing them to transport their goods effectively and reliably. The calculation of wagon-load shipments helps determine optimal tariffs and transportation conditions, considering the changes in Uzbekistan's railway system. This promotes the creation of competitive conditions and stimulates the development of the country's railway industry. As a result, an effective tariff policy and the utilization of universal covered wagons in wagon-load shipments contribute to the development of a sustainable transportation system capable of efficiently meeting the needs of cargo owners and supporting the economic development of Uzbekistan.

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2 Calculation of wagon-load shipments in universal covered wagons for railway transportation

The cost of freight transportation was determined according to Tariff Guide No. 1 (Price List 10-01), Part 2, with an indexing coefficient of 5,3901, as established since November 27, 2012, based on Scheme No. 8 - wagon-load shipments in owned or leased universal covered wagons [2]. The results of the calculations for the cost of 1 ton-kilometer transportation are presented in Table 1. It is worth noting that the use of Tariff Guide No. 1 and Scheme No. 8 in determining the cost of transportation ensures consistency and transparency in tariff policies. The indexing coefficient takes into account the changes in market conditions and allows for adjustments to the tariffs over time.

Table 1. Dependence of the cost of 1 ton-kilometer transportation for piece goods in owned covered wagons on the distance of transportation L and the size of the cargo batch (wagon load) q.

The mass of the cargo batch q	The distance of transportation L						
	200	**500**	**1000**	**2000**	**3000**	**4000**	**5000**
20	4,64	2,80	2,12	1,72	1,53	1,48	1,59
30	3,16	1,93	1,47	1,20	1,07	1,04	1,12
40	2,42	1,50	1,15	0,94	0,84	0,82	0,88

Table 1 illustrates the calculated costs per ton-kilometer for different types of cargo and distances. These calculations provide valuable insights into the pricing structure and help stakeholders understand the cost implications of transporting goods in universal covered wagons. By analyzing the results and trends in the cost calculations, stakeholders can make informed decisions regarding freight transportation. It allows for better cost management, optimization of transportation routes, and identification of opportunities for improving efficiency in the logistics chain.

Furthermore, these calculations serve as a basis for evaluating the competitiveness of the railway sector and comparing it with other modes of transport. It assists in identifying areas for improvement and developing strategies to enhance the attractiveness of railway transportation for shippers and logistics providers. In conclusion, the use of Tariff Guide No. 1 and Scheme No. 8, along with the calculation of transportation costs, provides a comprehensive understanding of the pricing structure and enables stakeholders to make informed decisions. It contributes to the development of an efficient and competitive freight transportation system that supports the sustainable growth of the railway sector in Uzbekistan.

From Table 1, it can be observed that as the transportation distance and wagon load increase, the cost of transporting 1 ton of cargo decreases. This fact is understandable and does not require further explanation. However, it is important to be cautious when drawing the conclusion that transporting cargo without using pallets (bulk cargo) is more advantageous solely based on the decrease in cost with increased wagon load.

It is crucial to consider that the use of pallets in cargo transportation provides certain advantages, such as ease of loading and unloading, protection of the cargo from damage, and efficient utilization of wagon space. Transporting cargo without pallets may have limitations and risks, especially for certain types of goods or in conditions where cargo preservation and safety requirements are necessary.

Therefore, when making a decision on the choice of transportation method (with or without pallets), various factors need to be taken into account, including the characteristics of the cargo, customer requirements, availability of loading and unloading equipment, as well

as cost considerations. Each case requires an individual approach and careful analysis to make an optimal decision that considers all factors and ensures safe and efficient cargo transportation.

3 Determination of the cost of loading (or unloading) cargo from wagons.

When determining the total cost of delivering goods, the loading and unloading expenses were assumed to be the same, meaning that the cost calculated by the formula is doubled. The calculation results for loading and unloading operations in various delivery options are presented in Table 2.

The data in Table 2 demonstrates that the cost of loading and unloading operations for delivering goods on pallets or in packaged form is 3.5 to 4 times lower compared to the cost of these operations for bulk cargo transportation without pallets and manual handling. It is important to consider these findings when evaluating the overall cost of delivering goods. The use of pallets or packaged form not only reduces the risk of damage to the goods but also significantly decreases the expenses associated with loading and unloading. These savings can contribute to cost optimization and improve the efficiency of the logistics process. Furthermore, the adoption of mechanized or automated loading and unloading processes can further enhance efficiency and reduce costs. Investing in equipment and technologies that facilitate efficient handling of goods can lead to significant long-term savings and improve overall logistical operations. By carefully analyzing the data presented in Table 2, stakeholders can make informed decisions regarding the choice of delivery method, taking into account the associated costs and operational considerations. This enables the selection of the most cost-effective and efficient approach for delivering goods while ensuring the preservation and safety of the cargo throughout the transportation process.

Table 2. Expenses for loading and unloading cargo from the wagon per ton and for the entire cargo batch

Technology	The mass of the cargo batch (wagon load), t	The cost of loading and unloading	
		The total number of wagons	The cost of 1 ton of cargo
Forklifts loading and unloading	20	4837	242
	30	6427	214
	40	8018	200
Manual loading and unloading	20	26353	1255
	30	38702	1229
	40	51051	1215

From the table, it can be seen that in all cases - for both short and long-distance transportation, with an increase in wagon load by 5-10%, and with manual unloading and partial use of pallets and forklifts - the total cost of delivering 1 ton of cargo is lower when using packaged cargo transportation compared to bulk transportation without pallets. This is clearly illustrated in the graphs (Figure 1) based on the data from Table 3.

Table 3. Cost of internal transportation of 1 ton of cargo, including loading and unloading operations, for packaged cargo transportation and transportation without pallets

Transportation conditions	Operations	Wagon load, t	Cost of delivering 1 ton, in rubles, at transportation distances, in kilometers						
			200	500	1000	2000	3000	4000	5000
Transportation in packages, on pallets	Transportation	20	927	1400	2118	3432	4575	5932	7966
		30	632	966	1472	2399	3207	4164	5599
		40	484	749	1149	1883	2522	3280	4416
	Loading and unloading	20	242	242	242	242	242	242	242
		30	214	214	214	214	214	214	214
		40	200	200	200	200	200	200	200
	Total:	20	1169	1642	2359	3674	4817	6173	8208
		30	846	1180	1686	2614	3421	4378	5813
		40	685	949	1350	2084	2723	3480	4617
Manual loading and unloading	Transportation	20	885	1338	2025	3284	4380	5679	7628
		30	604	926	1413	2307	3084	4005	5388
		40	463	718	1103	1810	2424	3153	4247
	Loading and unloading	20	1255	1255	1255	1255	1255	1255	1255
		30	1229	1229	1229	1229	1229	1229	1229
		40	1215	1215	1215	1215	1215	1215	1215
	Total:	20	2140	2593	3280	4539	5635	6934	8883
		30	1833	2155	2642	3535	4312	5234	6616
		40	1679	1933	2319	3025	3640	4369	5463

These findings highlight the advantages of packaged cargo transportation and the use of pallets and forklifts. Packaged transportation allows for more efficient utilization of wagon space, simplifies the loading and unloading process, and reduces the risk of cargo damage. The use of pallets and forklifts also enhances the efficiency and speed of cargo handling, thereby reducing loading and unloading costs. However, when choosing the transportation method, specific conditions, requirements, and cargo characteristics need to be taken into account. In certain cases, such as transporting oversized or non-standard goods, bulk transportation may be more suitable. Therefore, it is recommended to conduct a detailed analysis and comparison of different transportation options to select the optimal approach that meets the cargo requirements and provides the best balance of price and delivery quality.

4 Discussion of the results

The graphs (Figure 1) clearly illustrate that the cost savings when opting out of packaged cargo transportation decrease as the transportation distance exceeds 1000 km, ranging from 50-70% to 15-28%. However, these savings, although reduced, remain significant when calculated per ton of transported cargo. The data suggests that for shorter distances, the cost advantages of packaged cargo transportation are more pronounced, with potential savings of 50-70% compared to transportation without pallets. As the transportation distance increases, the cost savings gradually decrease, but they still amount to 15-28% when calculated per ton of cargo. It is important to note that even though the cost savings decrease with longer distances, the overall cost of transportation per ton of cargo remains significantly lower when using packaged cargo transportation. This highlights the efficiency and cost-effectiveness of utilizing pallets and packaged transportation methods.

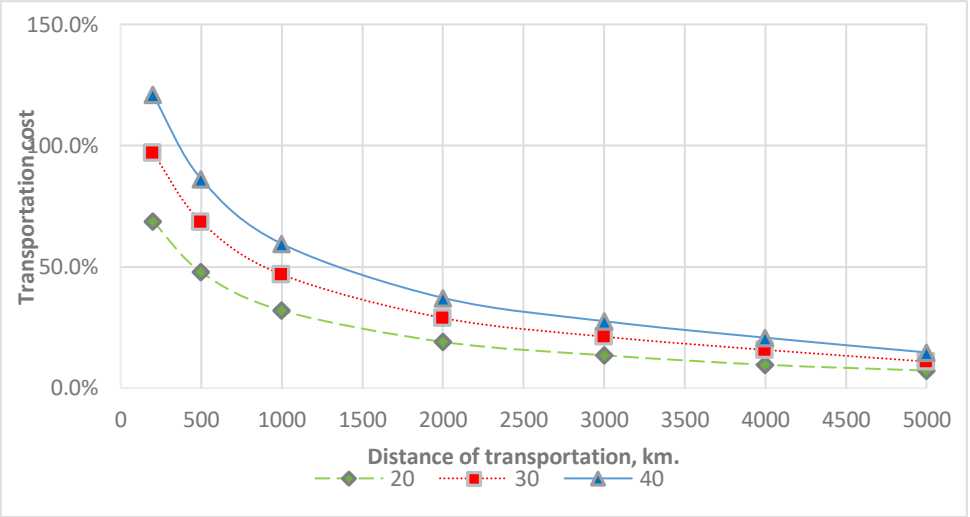

Fig. 1. Dependencies of cost savings Δc in percentage from the cost of delivering 1 ton of cargo on the distance of transportation L, in kilometers, and the cargo batch size q (wagon load), in tons, when opting out of packaged cargo transportation.

Furthermore, the results indicate that opting for packaged cargo transportation can lead to substantial cost reductions, especially for larger cargo batches. The economies of scale come into play, as the cost savings per ton increase with higher wagon loads.

These findings emphasize the importance of considering the specific transportation requirements, distances, and cargo characteristics when making decisions about the most suitable transportation method. While cost savings may decrease for longer distances, the overall advantages of packaged cargo transportation, such as improved cargo handling, reduced risk of damage, and better space utilization, make it a compelling option for many transportation scenarios.

5 Conclusion

Further analysis of the presented research allows us to highlight the following key findings:

Increasing the distance of transportation leads to a reduction in the impact of loading and unloading costs on the overall transportation expenses. This can be attributed to the increased proportion of transportation costs itself, making the transport component more significant. Thus, for long-distance transportation, the costs of loading and unloading constitute a smaller share of the total cost.

For short transportation distances up to 600 km, the graph depicting the cost savings when opting out of packaged cargo transportation shows a steeper gradient. This means that as the transportation distance increases, there is a more significant reduction in costs when using packaged cargo transportation. However, as the distance exceeds 600 km, the gradient decreases, indicating a more gradual decrease in cost savings when opting out of packaged cargo transportation.

When considering short transportation distances (up to 600 km), the graph depicting the cost savings when opting out of packaged cargo transportation shows a steeper decline as the distance increases, with a gradient of approximately 0.3-0.4. However, for longer transportation distances exceeding 1000 km, the gradient is approximately 0.1-0.15.

These findings indicate that for short distances, the cost savings decrease more rapidly with each additional kilometer when choosing not to use packaged cargo transportation. On the other hand, for longer distances, the reduction in costs when opting out of packaged cargo transportation becomes less pronounced. In other words, the cost savings gradually decrease with each additional kilometer of transportation.

These insights highlight that for distances up to 600 km, there can be significant economic benefits to forgoing packaged cargo transportation. However, for longer distances exceeding 1000 km, the cost savings decrease at a more moderate rate.

References

1. Aidana Donenbaykyzy Kassymzhanova, Marat Kenesovich Ibatov, Oyum Temirgalievich Balabayev, Bakytzhan Serikovich Donenbaev, Daurenbek Ikhtiyarovich Ilessaliyev. Experimental Study of Maximum Stresses in the Stationary Hoist Design in the Ansys Software Environment. Communications - Scientific Letters of the University of Zilina, **24(4)**, B310-B318 (2022) DOI: 10.26552/com
2. K.R. Gue, G. Ivanovich, R.D. Meller, A warehouse with a single loading with several receiving and depositing points and non-traditional passages. Transport research. Part E, **48**, 795-806 (2012)
3. K.R. Gyu, R.D. Meller, Configurations of aisles for warehouses with a single load. Transactions IIE, 3, 171-182 (2009)
4. D. Ilesaliev, J. Kobulov, R. Tursunkhodjaeva, M. Tashmatova, Research and Selection of Rational Parameters of a Refrigerated Container Terminal. Lecture Notes in Networks and Systems, **510**, 829–840 (2023)
5. I.I. Ilesaliev, S.G. Makhmatkulov, S.R. Abduvakhitov, Peculiarities of container terminal functioning in delivery chains. IOP Conference Series: Materials Science and Engineering, **918(1)**, 012043 (2020)
6. O. Ozturkoglu, K.R. Gue, R.D. Meller, Optimal warehouse solutions with a single load for operations with one team. Transactions IIE, **44**, 459-475 (2012)
7. L.M. Paul, R.D. Meller, K.R. Gyu, Optimization of passages for fish bones for operations with two teams in the warehouse. Naval Research Logistics, **56**, 389-403 (2009)
8. M. Shakhobiddin, I. Daurenbek, Stage of development of the railway section. International Journal of Innovative Technology and Exploring Engineering, **9(1)**, 3239–3245 (2019)