




Economic attributes of quality and competitiveness on the market of road freight transport services

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Abstract

Motivation: The basic quality attributes of transport services are safety and timely deliveries and are determined by the clients. Many studies on quality on the transportation markets concern the user perception or certified management systems. Improving service quality is related to organizational changes, involvement of human and capital resources. At the same time, it does not necessarily mean implementing ISO standards. Moreover, an analysis of the literature revealed an informational niche as regards the factors affecting the quality of services from the service providers' perspective.

Aim: The purpose of this article is to identify factors affecting the quality of services. The reference point of that analysis is the market supply and economic activities taken to improve service quality. In addition, an attempt was made to determine the relationship between quality and competitiveness. The analysis includes endogenous (actions taken by carriers and need of investing) and exogenous (regarding transport and economic policy) factors. Taking into consideration the economic aspect of improving service quality and carrier's perspective the article aims at enrichment the information niche.

Results: The results proved that the most important factors in creating quality of road freight services include, among others, educated staff, technical condition of vehicles and ensuring the safety of transportation processes. Unfair competition processes were identified as the factor with the strongest impact on competitiveness of road carriers. In addition, it was pointed about that there is strong and positive correlation between service quality and competitiveness.



Keywords: transport economics; road freight transportation; transportation markets; service quality

JEL: L6; O18; R41

1. Introduction

The market of road freight transport services should be considered a dynamic structure that depends on the processes occurring *inter alia* on the primary (commodity) markets. The subjective structure of hauliers is dominated by enterprises with fewer than 50 employees. In terms of financial resources, these operators are quite poor, yet they account for two-thirds of the sector's revenue. On the other hand, enterprises which employ more than 250 people generate about 10% of revenue. The adjustment of the supply of transport services to the demand requires a relatively long period. It often means an increase in financial outlays mainly gravitating towards the development of hauling capacity.

Over the last two decades, there has been cooperation between small and large transport companies. Smaller operators are 'resources' of the larger transport and logistics operators. Cooperation at the subcontracting level allows small operators to learn about and use strategies for developing quality services. It also contributes to the development of competition instruments. One of the conditions for effective competition for orders is the general quality. The basic attributes of quality in road freight transport include safety and timeliness of delivery. They are determined by factors originating from the external and internal surroundings which, in turn, determine the operators' ability to participate in national and global supply chains (see Cieřlik et al., 2019).

According to the philosophy of quality, it should be defined by the customer; it will then be a source of market success (Gronroos, 1988; Ondra et al., 2018) and contribute to an increase in an enterprise's competitiveness. In the transport and logistics sector, quality can be considered on many levels. The source literature refers, *inter alia*, to the sphere of insurance (see Dalić et al., 2008) and of marketing and logistics related to the creation of purchaser loyalty (see Kandampully, 1998; Saura et al., 2008).

An analysis of the literature revealed an informational niche as regards the factors affecting the quality of services from the service providers' perspective. This provided the motivation to undertake the study. The aim of the article is, therefore, to identify these factors. Attention was focused on economic factors, which should be understood as investments in the development of material and immaterial resources. These factors were also evaluated for their significance in the development of competitiveness. Another aim of the study was to determine the relationships between the quality of services and the hauliers' competitiveness. A hypothesis about the existence of a strong positive correlation between quality and competitiveness was proposed. This means that the measures taken to improve the quality of services will contribute to the improvement in hauliers' competitiveness.

The study was carried out using a survey questionnaire. Respondents included managers and road freight transport company owners and were asked to evaluate 17 factors that potentially affect the quality and competitiveness. In order to interpret the results, descriptive statistics, Pearson's correlation coefficient and a one-way analysis of variance (ANOVA) were used.

The first part of the article presents definitions of quality and competitiveness while taking into account the transport market. The methodological part discusses the collected material and describes the research methods. The next part of the article presents study results concerning the factors determining the quality of services and competitiveness of operators including the relationships between them. The article ends with a synthetic overview of the study and a discussion of the results and indicates the possibilities of further research.

2. Literature review

In the economic terms, quality is determined by the variability of consumption, demand and the needs of the society. It is often defined from the angle of customer's satisfaction. The definitions are not unambiguous. The differences result from the application of both theoretical and practical approaches, the type of industry, or the properties of quality components associated with the specificity of the sector (Alić et al., 2017; Dobrovič et al., 2019; Mira et al., 2018; Ngo & Nguyen, 2016; Rajjani et al., 2018; Wicks & Roethlein, 2009). Various level (dimensions) of quality:

- technical and functional;
- enterprises' resources and skills.

All determine a comprehensive approach to quality while considering the service provider's point of view (Parasuraman, 1985, pp. 42–43).

It is generally accepted that the quality of services should be in line with the customers' expectations, and the final effect should satisfy their requirements. This is a definition proposed in the ISO international quality standards. Quality is assessed based on subjective value judgements. Unfavourable ratings do not indicate a low level of service quality (Edvardsson, 1998, p. 144). On the other hand, the gap between the expected quality and that received by the consumer determines the basis for this assessment.

The basic attributes of quality in road freight transport include safety and timeliness of delivery. This is confirmed *inter alia* by a study by Bienstock et al. (1997). In the transport, shipping and logistics (TSL) sector, the quality of services is most often considered from the marketing angle (Thai, 2013, pp. 114–131). The quality level tailored to the customers' expectations enables transport operators to satisfy the preferences and expectations (Kilibarda et al., 2012, p. 1347). Familiarity with the service quality parameters is the foundation of forming an offer adjusted to the needs of the market and the development of competitive potential (DeOna et al., 2014, p. 76). According to Rudel (2005, p. 53), these parameters include the price, time, punctuality and the prevention

of theft. Coyle et al. (2006, pp. 38–39) refer to them as service components and include the following: transport duration, reliability, availability, transport capacity and safety. The quality parameters in the freight transport are also defined by Gea et al. (2006, p. 354). They group them according to the internal and external sources of occurrence. The first group of parameters included: vehicles at enterprises' disposal, infrastructure, the cargo transported, conditions of an enterprise's operations, and management processes. Congestion and environmental effects of transport operations determined the second group of parameters. Meidute-Kavaliauskiene et al. (2017, p. 515) included the following to the factors affecting the quality of road transport operations: the price of the service, safety, reliability, availability of services, and the time of delivery.

Developing high-quality services should be reflected in hauliers' operating strategies. These measures support the non-price competition processes (see Ganushchak-Efimenko et al., 2018). In the long-term perspective, they determine the ordering parties' loyalty and the maintenance of profitable market deposits. Another significant component of the development of quality is a reduction in operating costs. Quantification of the so-called poor-quality costs affects the effectiveness of business activity. The sum of these costs may amount to 15–30% of total costs. Preventive measures enable a reduction in total costs by a third, also as a result of the minimisation of costs arising from the loss of dissatisfied customers (DeFeo, 2001, p. 30).

In transport economics, service quality attributes are the most frequently analysed attributes based on the value of transport time savings (see Zamparini et al., 2011). Time is inherent in the nature of movement and is an integral part of transport processes. It is assumed that the value of time in road freight transport ranges from 30 to 50 EUR per hour of transport (DeJongm, 2000, pp. 653–654).

It appears that in the case of transport services, timeliness and safety of deliveries have a strong impact on the quality of services and hauliers' competitiveness (see Rucińska & Kędzior-Laskowska, 2015). Žvirblis (2003, pp. 57–58), when indicating the quality attributes, refers to their relationships with competitiveness (and effectiveness of business activity). The basic ones include: the scope of service, duration of transport, reliability, availability, and the safety of road traffic. Lazauska et al. (2012, pp. 141–142) classify the competitiveness factors in terms of market operators. The quality of service and transport safety determines the quality of services from the service providers' perspective. On the other hand, the price and the time of delivery determine the quality attributes declared by ordering parties. Attention was also drawn to the significance of macroeconomic factors in the development of competitiveness.

In view of the growing competition in the road transport sector in EU Member States, non-price instruments of competition need to be developed. Polish hauliers are a significant component of the transport work structure throughout the Community. Focusing investments on the quality attributes will contribute to the improvement in competitiveness both in the country and worldwide.

3. Methods

An interdisciplinary approach to the issues of quality and competitiveness is in line with the trend for understanding the contemporary economic phenomena and processes. The holistic concept proposed in the article assumes that they are developed by the actions of market operators (demand, supply, the State). It takes into account the involvement of an enterprise's resources and conditions offered by the external surroundings, the impact on safety and timeliness of deliveries and the specificity of the Polish road freight transport market.

The analysis of factors used the classification of quality parameters proposed by Gea et al. (2006), which indicates the direct and indirect impact of the factors on quality and competitiveness. Another reference point for the conducted study was the transport requirements concerning the broadly understood safety and timeliness of deliveries. This approach corresponds to the results of studies by *inter alia* Meidute-Kavaliauskiene et al. (2017), Rudel (2005) and Žvirblis (2003). Moreover, the article attempts to classify economic characteristics of road freight transport services. They were also evaluated for their significance in the development of competitiveness. A hypothesis was proposed of a strong positive correlation between the quality of services and the hauliers' competitiveness, considering their economic perspective. At the same time, attempts were made to formulate a rule that describes this correlation. The micro- and macroeconomic conditions of hauliers' operations also appear to be important to be considered.

The study was carried out in 2013 (February–December) based on a sample of 134 hauliers whose business activity was registered in Warmia and Mazury Voivodeship. The respondents included managers and owners of road freight transport companies. The sampling provided access to reliable knowledge and economic practice. The selection of operators enabled the elimination of those engaged in transport activities only on an occasional basis. The basic method for collecting data was an interview (face-to-face or telephone, carried out by the author) using a structured survey questionnaire.

The structure of the analysed enterprises was similar to the structure of road transport enterprises in Poland. In the vast majority of cases (70%), these activities are carried out by microenterprises (which employ less than 10 people). Moreover, respondents had a maximum of five vehicles at their disposal (49%) and had multi-annual market experience (46% of respondents commenced business activity before 2000).

The study took into account 17 factors which, indirectly or directly, could affect the quality of services and the hauliers' competitiveness. These factors were classified into two groups. The first group was related to costs and the need to invest in order to improve the quality of services. The following were included in the group: well-educated staff, eco-driving (economic and environmentally friendly driving), ordering parties' requirements, certified quality management systems, safety of transport operations at the enterprise level, protection

of transport operations in the transport process, information technologies, setting up new services and the technical condition of vehicles. The market processes and the conditions arising from the transport policy indicated another group of factors determining quality and competitiveness. The following factors were classified in this group: ordering parties' requirements, crime in road transport, EU funds dedicated to business activities, clusters with a transport profile, the condition of road surfaces, charges for the use of roads, costs of carrying out transport operations, unfair competition. The number and arrangement of factors may vary over time, of which the author is aware. The problems of hauliers' operations (e.g. growing costs of carrying out business activities, competitors' prohibited practices, for example too low prices of services) are taken into account. 2013 was a special year in the transport sector. At that time, the topic of discussions was an improvement in the economic situation in the sector following the decrease in demand for transport services due to the global crisis (2007). It appeared important to carry out the study and provide answers to the following questions: (1) under conditions of increased demand for transport services, are investments made by road transport companies aimed at developing the quality of services and competitiveness?; (2) can market changes affect the quality and competitiveness?

The previously indicated factors were subjected to the respondents' evaluation. To this end, the Likert scale, commonly used in opinion polls, was used (Jakubowska & Radzyńska, 2019; Konicny & Stetinova, 2006; Lušňáková et al., 2019). A forced-choice scale was proposed, which resulted from the purposive sampling and the assumption that respondents take a decision as regards the attitude towards a particular statement (without the opportunity to remain in a natural position). It was assumed that neutral scales and forced-choice scales have the same reliability level (Churchill, 2002, pp. 431–432). The following sequence of ratings was proposed: 6 — it is very important, 5 — it is important, 4 — it is rather important, 3 — it is rather not important, 2 — it is not important, 1 — it is completely not important.

An analysis of data was conducted based on the location and variability measures. The arithmetic average (\bar{x}) and the dominant (D) provided a basis for the determination of quality and competitiveness attributes. The study was extended to include the analysis of variability (standard deviation — SD , range — R , variability coefficient — V), which provided information on the sample variation. The correlations between quality and competitiveness were determined based on the Pearson's correlation coefficient. The analysis of average ratings of quality and competitiveness used a one-way analysis of variance (ANOVA) (see Spitsin et al., 2018).

4. Results

The quality of transport services determines a demanding area of research. The ordering party assesses the final effect of transport processes. Measures taken

to improve quality by hauliers are not subject to assessment by the ordering parties. Their effect may determine enterprises' competitiveness. The analysis of the factors affecting the quality of services and hauliers' competitiveness applied the broad approach.

Based on $\bar{x} \geq 4$, the quality attributes (significant in developing quality and competitiveness) were determined. The average values are presented in chart 1. The study results proved that more than half of the proposed factors were of significance in the development of quality (9 out of 17) and competitiveness (11 out of 17). The highest-rated quality attribute was the well-educated management staff ($\bar{x} = 5.55$). In the vast majority of responses (69%), respondents gave the highest ratings ($D=6$) and showed the highest consensus ($V=13\%$, $R=3$) compared to other factors (descriptive statistics are presented in table 1). The information that investments in the management staff were perceived as important in developing the quality of transport services needs to be positively verified.

Unfair competition processes were identified as the factor with the strongest impact on road freight transport companies ($\bar{x} = 4.98$). However, respondents believed that they had no effect on the quality of services provided ($\bar{x} = 3.52$). What is noteworthy is the wide variety of ratings ($V=37\%$ and $V=26\%$, respectively). A manifestation of unauthorised practices was, *inter alia*, lowered (sometimes dumping) prices for transport services. Under the demanding operating conditions, respondents appeared not to underestimate the significance of quality in favour of price-based competition.

Modernisation of the fleet and its technical condition determined the quality of services, measured by timeliness and the safety of deliveries. With the variation of ratings ($V=21\%$, $R=3$), this factor was most frequently recognised as significant in developing quality of services ($D=5$). In the respondents' opinions, the competitiveness attribute ($\bar{x} = 4.25$) was the technical condition of the fleet.

Criminal activities in road transport lead to the loss of cargo or vehicles or their temporary exclusion from transport activities. Thefts and robberies cause problems with timely and safe delivery of cargo and thus determine the quality of a particular service. Almost half of respondents regarded crime as an attribute of service quality ($D=5$), with divisibility of opinions ($V=24\%$, $R=4$). At the same time, it had no impact on competitiveness, despite the fact that most of the respondents (30%) gave it high ratings ($D=5$).

More than a quarter of respondents considered that awareness-raising and the need to comply with safety rules in transport processes were important to the quality of services ($\bar{x} = 4.53$, $D=5$) and hauliers' competitiveness ($\bar{x} = 4.26$, $D=5$). Training in the field of safety, *inter alia* concerning cargo handling, awareness of thorough verification of contracting parties (subcontractors, shipping agents and ordering parties) is preventive in nature. These actions determine the timeliness and safety of deliveries, which are subject to the ordering parties' assessment.

The majority of respondents (42%) considered that protection in road transport is the determinant of service quality ($\bar{x}=4.05$, $D=4$). This is reflected in efficient communication between drivers and dispatchers, i.e. transport supervisors. In an emergency, it allows rapid assistance to be provided. With a high diversity of ratings ($V=41\%$, $R=5$), the protection of transport operations at the enterprise level was of no importance to hauliers' competitiveness ($\bar{x}=3.46$).

The condition of road surfaces was the attribute of quality and competitiveness, with a significant sample diversity ($V=28\%$, $R=4$ and $V=36\%$, $R=4$, respectively). It is noteworthy that in both cases, the majority of respondents (31% on average) gave the highest ratings ($D=6$).

Information technologies and setting up new services also had an effect on the quality of services and hauliers' competitiveness. The highest consensus among the respondents was noted in opinions concerning setting up new services ($V=18\%$, $V=19\%$, respectively). A half of the respondents (51%) regarded certified management systems as an important component of the development of services ($D=5$) which, however, has no impact on competitiveness ($\bar{x}=3.41$).

A further analysis of average ratings of factors affecting the quality and competitiveness used the one-way analysis of variance (ANOVA). The analysis results enabled the indication of groups of homogeneous (a particular factor had the same impact on quality and competitiveness) and non-homogeneous averages (a particular factor has a different impact on quality and competitiveness). A (statistical) null hypothesis (H_0) was formulated, which stated: the lack of the factor's impact on average ratings of the quality of services and hauliers' competitiveness. In relation to an alternative (H_1) which stated: the existence of the factor's impact on average ratings of the quality of services and hauliers' competitiveness, with an assumed significance level of $\alpha=0,05$. Positive verification of the null hypothesis enabled the determination of average ratings of quality and competitiveness as a group of homogeneous averages (which do not differ statistically significantly). The rejection of the null hypothesis implied the adoption of an alternative hypothesis on the impact of a particular factor on average ratings of quality and competitiveness (which means that a statistically significant difference occurred in the average ratings).

The following were included in the group of homogeneous averages:

- drivers' behaviour ($p=0.3752$) which had no impact on quality and competitiveness;
- safety of transport operations at the enterprise level ($p=0.0811$) and information technologies ($p=0.6427$) which were rated as the attributes of quality and competitiveness.

The other factors established statistically significant differences in average ratings. Attention was drawn to the relatively great difference in ratings of the impact of unfair competition on the quality of services and hauliers' competitiveness. The importance of this factor in developing competitiveness was rated significantly higher ($p=0.0000$). Certified management systems (ISO)

were of significantly greater importance in developing the quality of services ($p=0.0000$) while having no impact on building competitive potential. An analogous result was obtained in the analysis of the average ratings of crime in road transport ($p=0.0005$).

The importance of well-educated staff was rated significantly higher in developing quality, even though it was also the competitiveness attribute ($p=0.0000$). Setting up new services in developing competitiveness was rated significantly higher ($p=0.0000$). This measure was recognised as important in developing the quality of services.

In respondents' opinions, the technical condition of the fleet and roads were of greater importance in developing quality ($p=0.0213$ and $p=0.0018$, respectively), which also determined the competitiveness of enterprises.

The costs of transport operations and charges for access to roads were rated significantly higher for competitiveness but had no impact on the quality of services ($p=0.0000$ in both average groups). Similar results were observed in the ratings of the impact of costs of transport operations, eco-driving, and EU funds dedicated to entrepreneurs ($p=0.0000$).

The analysis of the relationships between the quality and competitiveness variables used Pearson's correlation coefficient. The source literature provides different expressions to define the degree of variable relationships (Góralski, 1974; Guilford & Wojtyniak, 1964; Sobczyk, 1998). This study adopted the following expressions concerning the strength of the correlation between variables: below 0.20: poor; 0.20–0.40: low; 0.40–0.70: moderate (average); 0.70–0.90: high (clear); above 0.90: very high.

The strongest positive correlation between quality and competitiveness was established by protection in road transport at the enterprise level (table 2). The fit of the model appears to be high because quality explained 60% of competitiveness variability ($R^2=60$).

The ordering parties' requirements were the only factor which, in respondents' opinions, did not affect the quality and competitiveness but established a strong positive correlation of variables ($r=0.69$).

Crime in road transport, information technologies and the condition of road surfaces also affected the relatively great impact of quality on hauliers' competitiveness, measured with the determination coefficient (43, 45 and 41%, respectively).

EU funds supporting economic activity, an offer of new services, costs of carrying out transport operations and unfair competition resulted in the lack of correlation between quality and competitiveness. The lack of relationships arising from the certification of management systems in line with ISO standards appeared to be particularly interesting. In respondents' opinions, it was the determinant of quality and was not important in the development of hauliers' competitiveness. It was significant that an increase in the significance of ISO certificates to the development of quality will not affect their significance in building competitive advantage. The lack of relationships between

quality and competitiveness, determined by the factor ‘education background of the management staff’ was an equally surprising result of the analysis. It should be noted that this is a factor recognised as having an impact on quality ($\bar{x}=5.55$) and competitiveness ($\bar{x}=4.88$).

The economic factors determined statistically significant differences in the average ratings of quality and competitiveness (table 3). Their importance in the development of enterprises’ competitiveness was rated significantly higher ($\bar{x}=4.16$) than that in developing the quality of services ($\bar{x}=3.97$). Opinions on this issue were divided (variability of competitive ratings $V=14\%$, and of quality ratings $V=12\%$).

The average ratings of economic factors determined a strong positive correlation between the quality of services and the hauliers’ competitiveness (chart 2).

An increase in the significance of economic factors in developing quality will also determine a significant increase in their significance in developing competitiveness. At the same time, quality accounted for 41% of the competitiveness variability, which can be regarded as a relatively high fit of the model.

5. Conclusion

Hauliers’ opinions as regards the quality and competitiveness attributes enable the provision of good practice examples. They prove that human capital is of the utmost importance to quality. The respondents’ awareness in this regard needed to be verified positively. It should be noted that pro-quality development requires that investments be made in the staff at all organisational levels. Equally important for the development of quality are, *inter alia*, modern and fully operational means of transport, and the development of forms of internal traffic supported by information systems.

In respondents’ opinions, unfair market practices were of the greatest importance in developing competitiveness. It should be stressed that price dumping was not a common practice during an unfavourable economic situation, but it determined the market behaviour of competitors. In view of the relatively high ratings given by respondents, the following questions arise:

- will the practice of applying lowered rates for transport services accompany the deteriorating economic situation in Poland?;
- whether, and which, instruments will allow hauliers to prepare for specific competitive conditions (reduced freight accompanying the reduced demand for transport services).

The study results proved that the factors that had a significant impact on the increase in competitive potential included well-educated management staff, costs of operations, drivers’ driving skills and ensuring safety in transport processes.

The recommended measure contributing to an improvement in quality and competitiveness is the development of a comprehensive range of services.

This opportunity was noted by the respondents. The extension of the offer could be a response to changes, e.g. in the structure of consumption or resulting from the offer of niche services (e.g. special transport conditions).

In view of the highly probable consolidation of the road transport sector in Poland, the measures contributing to quality and competitiveness include the establishment of purchasing groups, the process of competition, and the commencement of cooperation within transport clusters. The latter were not appreciated by the respondents.

The results of the conducted study enabled the confirmation of the hypothesis about the existence of a strong positive correlation between the quality of services and hauliers' competitiveness in the economic aspect ($r=0.64$). The positive correlation between variables means that an increase in the value of one variable (quality) results in an increase in the value of another variable (competitiveness). Investments in material and intellectual resources have an effect on the development of service quality and contribute to the development of competitive potential of road freight transport companies. This result needs to be considered positively. It can be generally concluded that the development of service quality will be accompanied by the development of enterprises' competitive potential.

The study was conducted on a particular market in one of voivodeships in Poland. Structural consistency of the sample and hauliers in the country (the dominance of micro-enterprises) does not permit one to generalise the results on the entire population. It would be beneficial to obtain information from a more representative sample that takes into account e.g. the type of services provided. It appears equally important to extend the research to include other areas of transport activities arising *inter alia* from a transport policy or increasingly demanding conditions of inter-branch competition. These areas determine the competitiveness and quality of the services they provide.

Currently, there are signs suggesting an economic slowdown in Poland and other EU Member States. Moreover, the outcome of negotiations concerning the conditions of the United Kingdom's exit from the EU or the arrangements in the so-called new Mobility Package may be of considerable importance to the road transport market. They set new and demanding conditions for the provision of transport services on an international scale, and undoubtedly contribute to an increase in the costs of transport services. Carrying out analogous studies during an unfavourable economic situation and market changes will contribute to the deepening of knowledge about the factors determining the quality of services and hauliers' competitiveness, although it should be noted that the study results may vary. The added value will be a comparative analysis concerning the perception of quality and competitiveness during both an increase and a decrease in demand for freight transport.

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Appendix

Table 1.
Descriptive statistics for factors of quality (Q) and competitiveness (C) development

Factors		\bar{x}	Median	D	Mode size	Min.	Max.	R	SD	V (in %)
well-educated management staff	Q	5.55	6	6	92	3	6	3	0.7415	13.3557
	C	4.88	5	6	56	2	6	4	1.1955	24.4952
eco-driving	Q	3.28	3	multiple	40	1	6	5	1.3185	40.1553
	C	4.43	5	5	54	1	6	5	1.2532	28.2720
driver's behaviour	Q	3.09	3	3	40	1	5	4	1.1728	37.9591
	C	3.24	4	4	46	1	6	5	1.5520	47.9189
ordering parties' requirements	Q	3.97	4	4	36	2	6	4	1.2259	30.8782
	C	3.66	4	4	46	1	6	5	1.2084	33.0459
certified management systems	Q	4.24	5	5	68	2	6	4	0.9670	22.8122
	C	3.42	3	3	40	1	6	5	1.3998	40.9542
safety of transport operations at the enterprise level	Q	4.54	5	5	50	1	6	5	1.2782	28.1721
	C	4.27	4	5	54	1	6	5	1.2334	28.8942
protection in road transport at the enterprise level	Q	4.06	4	4	56	2	6	4	1.0388	25.5882
	C	3.46	3	multiple	42	1	6	5	1.4229	41.0951
crime in road transport	Q	4.46	5	5	62	2	6	4	1.0876	24.3703
	C	3.92	4	5	40	2	6	4	1.3799	35.1537
EU funds dedicated to entrepreneurs	Q	3.57	3	multiple	46	1	5	4	1.2290	34.4537
	C	4.64	5	6	50	2	6	4	1.4374	30.9672
clusters in the field of transport	Q	3.07	3	3	60	1	5	4	0.8006	26.0399
	C	3.64	3	3	60	2	5	3	0.8792	24.1417
information technologies	Q	4.28	4	4	54	3	6	3	0.9145	21.3484
	C	4.22	4	3	38	2	6	4	1.1739	27.7923
setting up new services	Q	4.18	4	4	68	2	6	4	0.7741	18.5235
	C	4.73	5	5	68	3	6	3	0.9108	19.2501
technical condition of the fleet	Q	4.57	5	5	56	3	6	3	0.9690	21.2178
	C	4.25	5	5	58	2	6	4	1.2305	28.9271
condition of road surfaces	Q	4.54	5	6	42	2	6	4	1.2664	27.9116
	C	4.01	4	3	44	2	6	4	1.4352	35.7477
charges for access to national roads and motorways	Q	3.16	3	2	40	1	6	5	1.5951	50.4105
	C	4.25	5	5	54	2	6	4	1.3802	32.4477
costs of carrying out transport operations	Q	3.48	4	4	48	1	6	5	1.3912	40.0060
	C	4.66	6	6	70	1	6	5	1.6593	35.6335
unfair competition	Q	3.52	3	3	50	1	6	5	1.3019	36.9612
	C	4.98	5	6	58	2	6	4	1.2802	25.6804

Notes:

$N=134$; \bar{x} — arithmetic average; D — mode; R — range; SD — standard deviation; V — coefficient of variability.

Source: Own preparation.



Table 2.
Correlation and determination coefficients

Factors of the development of quality and competitiveness	Pearson's correlation coefficient	Determination coefficient R^2 (in %)
well-educated management staff	0.19	4
eco-driving	0.29	8
driver's behaviour	0.50	25
ordering parties' requirements	0.69	48
certified management systems	0.02	0
safety of transport operations at the enterprise level	0.51	26
protection in road transport at the enterprise level	0.77	60
crime in road transport	0.65	43
EU funds dedicated to entrepreneurs	0.07	0
clusters in the field of transport	0.55	30
information technologies	0.67	45
setting up new services	0.11	1
technical condition of the fleet	0.45	20
condition of road surfaces	0.64	41
charges for access to national roads and motorways	-0.39	16
costs of carrying out transport operations	-0.12	1
unfair competition	0.15	2

Source: Own preparation.

Table 3.
Results of one-way analysis of variance of the quality and competitiveness ratings

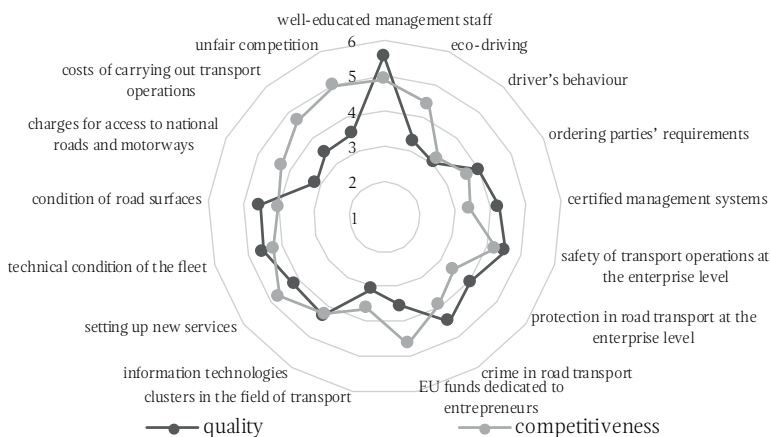
Source of variance	SS	df	MS	F	p-value	F-test
between groups	2.2559	1	2.2559	7.9051	0.0053	3.8767
within groups	75.9091	266	0.2853	–	–	–
total	78.1650	267	–	–	–	–

Notes:

If the p -value < 0.05000 , there was a statistically significant difference in average ratings of variables.

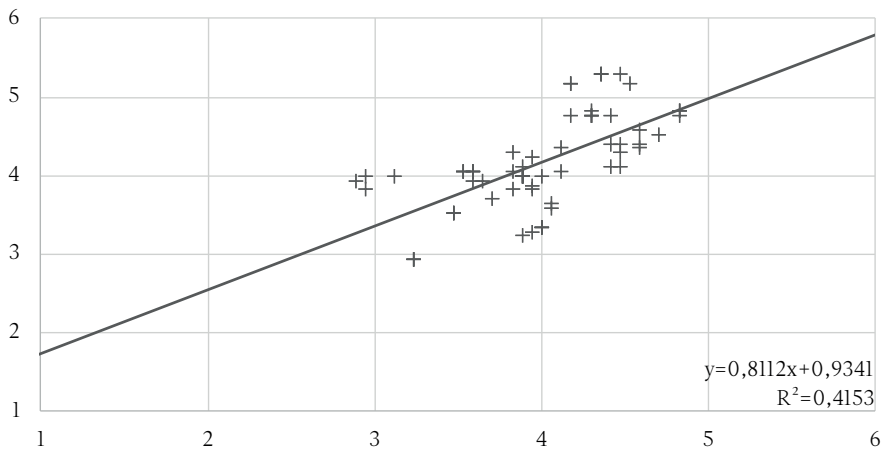
Source: Own preparation.

Chart 1.
Average ratings of factors determining the quality of services and competitiveness of hauliers



Source: Own preparation.

Chart 2.
Correlation between the quality of services and the hauliers' competitiveness



Source: Own preparation.

