

THE PRINCIPLES OF COMPETITIVENESS IN THE REFORMED SYSTEM OF THE LITHUANIAN RAILWAYS

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1. Introduction

Economic and technical reforms taking place in various sectors of European economy [1, 2] which are supported by the privatization policy as well as shifting towards the free market system are gaining more and more acceleration nowadays. It is a matter of utmost importance to foresee any kind of possible impediment and to keep in mind that our expectations before privatization usually differ from the actual state of affairs after it has been carried out [3]. Thus, in order to prevent the resultant situation from being too remote from our expectations the governmental role in the privatization process, namely supervision, control and assurance of equal possibilities for everyone involved, becomes extremely important [4, 5].

The European reforms have particularly concerned the sector of railway transport, i.e. big monopolistic railway companies are being re-engineered by separating the management of infrastructure from commercial business activities [6–16]. Thus, when creating requirements of the legal environment of the railway sector's reform, defining directions and a system of legal regulation of railway transport as well as agreeing upon the particularities of certification, it is expedient to be guided by other countries' valuable experience. When reorganizing the Lithuanian railway transport and aiming to prepare it for working under the free market conditions, it is essential to create the appropriate legal environment, to devise an efficient system of certification and licensing. Moreover, having liberalized the railway carriers' sector, it is fundamental to ensure the conditions for their fair competition as well as their impartial and transparent relationship with the manager of the railway infrastructure. The task of providing and supervising the conditions of that fair competition should be undertaken by certain regulatory and controlling institutions. The railway subjects (carriers) themselves are supposed to estimate the market conditions continually and search for

newer ways of reinforcing their competitive strength by employing familiar marketing methods [17, 18].

2. Requirements incumbent on the legal environment of the railway sector's reform

When reforming a certain sector of economy (including the railway sector) besides the substantiation of strategic aims, it is necessary to create a favorable legal environment. This legal environment should be established as a legitimate, coordinating, regulatory and controlling background [19–21]. Requirements intended for the legal environment have to be derived from the common need for the reform as well as from the content of the conceptual aims [22]. The legal environment should provide a certain framework for the reform. This framework should be determined by both internal (country's own) and external (international) regulations and aims. The purpose of the legal environment framework is to make sure that the legal acts, which are still underway, conform to the legal acts of the Republic of Lithuania. As far as the external legal framework of the reform is concerned, it is essential to harmonize the standard legal acts with the requirements laid by the European Community and at the same time to implement the European Community's *acquis communautaire requirements* as well as to ensure the continuity of international commitments.

3. Directions of legal regulation of railway transport

Even when working under the free market conditions regulation and supervision are essential to ensure that the market mechanism is ultimately efficient and honest. This regulation is an indispensable condition of re-engineering the railway transport for its work on the free market basis. Regulation should, however, be understood not as a kind of impediment

but as an assurance of equal opportunities for all participating subjects. The regulatory institution has to be impartial and its activities should be public and transparent. The institution has to create and ensure equal conditions for everyone wishing to obtain a license or enter the market, or for those using the railway infrastructure as well as to encourage competition. Legal regulation has to guarantee quality and safety of the infrastructure services to carriers as well as the quality of the services provided by the carriers to their clients respectively. Also there should be ensured the safety of traffic, work and environment. Hence regulation and control should be concerned with:

- 1) business activities of any railway infrastructure company as a monopolistic one;
- 2) the relationship between that railway infrastructure company and carriers involved in commercial carriage [23, 24];
- 3) the relationship between those private carriers themselves;
- 4) the relationship between the above mentioned carriers with their clients;
- 5) security of all the railway sector's subjects.

4. Certification of the railway transport activities

A very important role in the railway transport in terms of safety provision is performed by the process of certification. The certification of the railway sector's activities is obligatory in accordance with the directives 95/19/EC and 95/18/EC acknowledged by the European Community. Certification is the principal means of regulation and control over the transport sector, the aim of which is to find out whether the railway subjects:

- 1) carry out technical regulations of railway exploitation;
- 2) follow the railway traffic regulation;
- 3) keep to the railway signaling rules;
- 4) adhere to the specialists' rules of certification;
- 5) have all the requisite work organizing system and personnel;
- 6) employ equipment, machinery, technologies and other means of production, which possess valid certificates of value issued by the manufacturers.

If the above-mentioned certification requirements are satisfactory, a railway transport subject in question should be given a valid certificate of safety. This document will witness then that a given economic subject conforms to the safety requirements put

forward by the railway sector and has a legitimate right to be engaged in railway transportation activities as well as the right to obtain a licence.

5. Licensing of the railway transport activities/business

The purpose of licensing is to ensure that an economic subject wishing to get engaged in any type of the railway transport business has a valid certificate of safety, sufficient technical and organizational means as well as financial resources to provide a high quality service, and in case of need to compensate for the losses incurred or damage inflicted. Licensing has to guarantee the provision of identical, non-discriminatory conditions for all the railway transport subjects as well as to ensure that there exists a regulated natural monopoly (infrastructure management and selling of its forces). However, a licence should not be regarded as direct permission to start a particular type of business activity. A licence is only a right allowing to sign an agreement in order to take up that particular railway transport activity. Apart from PLC "Lithuanian Railway" there are four more companies that have licences to get involved into commercialized railway transport activities, i.e. provision of carriage services. However, they transport neither goods nor passengers due to the absence of any written agreements with them which would allow carrying out this type of business activities. Those agreements have not been signed and verified because of the shortage of technical and commercial confirmations as well as "Lithuanian Railways" company's unwillingness to have solid competitors.

6. Institutions engaged in the regulation of the railway sector

The infrastructure of the railway transport is monopolistic by nature within the European Community itself as much as it is in Lithuania. Lithuania's railway transport has been and still is a natural monopoly whose distinguishing feature is that it has never grounded its activities on the principles dictated by the free market system. In other words, it has never exploited its "monopolistic power". However, as PLC "Lithuanian railways" is being restructured and the infrastructural forces are being separated from commercial activities, an unrestricted "monopoly power" could have a very negative effect on the railway transport as much

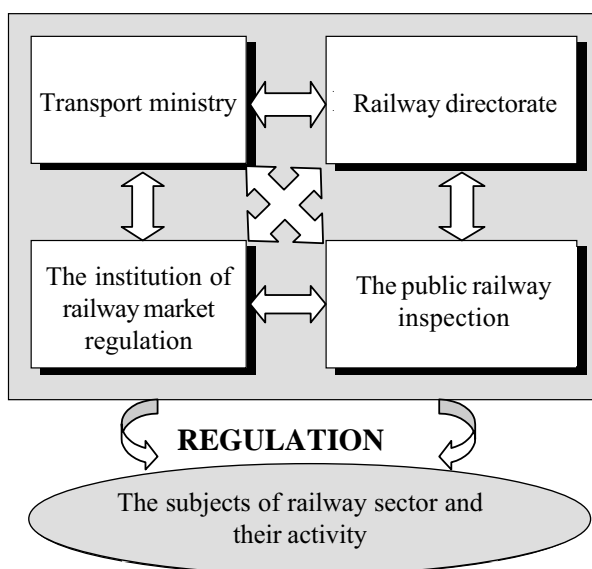
as on the whole transport system. Therefore the activities of any natural monopoly should be controlled and regulated. In this respect there emerges an immediate need for an institution that might serve as the market regulator. This regulator is not supposed to hinder any market developments but to create identical conditions for all market members so that they can work efficiently and safely.

The market regulatory institutions are expected to collaborate and work systematically as shown in Fig.

The Ministry of Communication is obliged to develop the government policy and strategy in the railway sector, coordinate the activities of the railway transport with other means of transport in order to ensure equal competition opportunities as well as to foresee possible means for the development of the railway transport in our country.

The Railway Board (next to the Ministry of Communication) has to carry out the management of the railway infrastructure, estimate the assets of the railway infrastructure and prepare further programmes of its development. The Railway Board by means of leasing and utilizing has to transfer the management of the railway infrastructure to a certain railway infrastructural company and to sign a mutual agreement of transference with which it would confirm the company's right to exploit that infrastructure.

The regulatory institution supervising the subordinate railway sector's market should be referred to as a committee subordinate to the Ministry of Communication. This Committee would be supposed to carry out the regulatory policy of the railway sector's market and provide the railway subjects with



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equal opportunities to enter the market as well as to ensure the presence of identical conditions for the exploitation of the railway infrastructure and promote fair competition. The principal Committee's means of action has to be licensing and the confirmation of the mechanism of infrastructure taxes.

The State Railway Inspection is obliged to supervise the observation railway rule safety regulations by making even higher demands which should be met by all railway transport subjects. All these regulatory institutions have to be impartial, state-sponsored organizations.

7. A mathematical method of competitiveness brought in by the reformed railway transport

Competitiveness in the railway transport is understood as a specific property of the railway transport service satisfying a customer's needs at a certain period of time and at a reasonable service cost [25–27]. The key railway transport services are associated with rail freightage and passengers' conveyance as well as with some secondary activities which are concerned with freight and passengers' adaptation (e.g. storage of the passengers' luggage, loading of goods and their storage, etc.). Formerly it was long thought that the competitiveness of the railway transport could be estimated in terms of the competition between the national railway system and other countries' systems as well as the competition between the country's own railway system and automobile transport. A lot of various models and methods used devised and based on this assumption. However, there was no need to look into the inside of the national railway system since it used to be a monopolistic one. Nowadays having reformed and liberalized the market of the railway carriers, the railway system has become diversified. There has been observed a shift from the monopoly towards the market economy within the railway sector. To promote and consolidate these changes fair competition between the carriers should be ensured. The principal guarantee to maintain that competition has to be the free market mechanism. One of the essential success securing guarantees for new carriers should be competitiveness of their services. Therefore new methods to define parameters determining competitiveness are needed. In other words we need a qualitative assessment (mathematical method) of the carriers' competitiveness [28, 29].

Everything being equal, there will be sold only those

railway services, which offer better consumer-orientated properties [2]. Another factor that will determine a demand for a particular service will be its cost (how much we charge for it). It is namely the ratio between the consumer- orientated properties of a service and the charge payable that define the essence of the competitiveness model.

Let us say that a total of all the needs that can be satisfied is G , then the opportunities of a particular i-career (or a particular supplier of a railway service) is Z_{ki} whereas the total supply of these services in order to satisfy the above- mentioned needs can be expressed as a total of $\sum_{i=1}^N Z_i$ (N being the number of analogical carriers-competitors). When the time factor is taken into consideration the total can be expressed through the following formula $\sum_{i=1}^N Z^{(t)}_i$. Then we can write:

$$G = G_j + G_i, \quad (1)$$

where G_j is part of the demand for a particular service used to satisfy the needs of the local transportation and G_i is part of the overall demand to satisfy the needs of the international transportation.

If we denote the quality level of a certain i-carrier's railway service as K_i , then in terms of mathematics it can be expressed as:

$$K_i = \sum_{i=1}^N \alpha_i \times \frac{B_i}{B_i^{\mu}}, \quad (2)$$

where α_i – a coefficient corresponding the i- carrier's provided services; B_i – the usefulness coefficient of the carrier's services, which is obtained due to the actual performance of a certain service; B_i^{μ} – the valuable effect of the provided services which can be obtained only in the case of the ideal performance of a service in question. Therefore the following mathematical model (3) can be employed in order to prognosticate the demand for the satisfaction of transporting needs:

$$G = \sum_{i=1}^N K_i \times g_i, \quad (3)$$

Moreover, when attempting to foresee the demand for a certain carrier's service at a given period of time the following mathematical model can be devised:

$$G^{(t)} = \lim_{i=1}^N K_i^{(t)} \times g_i^{(t)}. \quad (4)$$

When one aims to estimate the consumer-orientated properties of the railway carrier's services, it is expedient to introduce an integral indicator Z_i of the service quality provided by a certain i- railway carrier, the former being expressed through the service charge P_i which is offered by the i- carrier. This charge should include the transportation charge P_{iv} and the provision of additional services P_{ip} (loading, storage and others):

$$P_i = P_{iv} + P_{ip}. \quad (5)$$

Thus, the integral indicator of the quality of the services provided by the railway service suppliers / carriers will be as follows:

$$Z_i = \frac{K_i}{P_i}. \quad (6)$$

The integral indicator may be regarded as an objective indicator of the competitive strength of a particular service if a coefficient reflecting the total conjuncture of the services provided by the i- carrier has been estimated. This coefficient can be marked as λ_i . By means of the coefficient there may be expressed all additional factors which may affect a service competitive capacity:

$$\lambda_i = \lambda_{i1} \times \lambda_{i2} \times \lambda_{i3} \times \dots \times \lambda_{im}, \quad (7)$$

where λ_{i1} – a coefficient evaluating the correspondence of the legal technical standards; λ_{i2} – a coefficient evaluating the correspondence of the legal standards; λ_{i3} – a coefficient evaluating an informal relationship with the service users as well as other possible coefficients. It should be borne in mind that the meanings of those coefficients have to fluctuate from 0 up to 1. Thus we can write a mathematical expression of the competitiveness indicator Z_{ki} :

$$Z_{ki} = \frac{\lambda_i \times K_i}{P_i}. \quad (8)$$

This indicator Z_{ki} is such an indicator, which determines the market distribution among the carriers. The carrier having a higher indicator will be more competitive than the one having a lower indicator. There emerges the concept of the i- carrier's competitiveness index. This index η_i can be understood as the relationship between the competitiveness indicator Z_{ki} of the services provided by a certain carrier and the analogical competitiveness indicator Z_f of the services offered by any other competitor-carrier

$$\eta_i = \frac{Z_{ki}}{Z_f}. \quad (9)$$

If:

1) $\eta_i > 1$ Then the services of the *i*- carrier are more competitive than the ones provided by the competitor-carrier;

2) $\eta_i = 1$ Then the services of the *i*- carrier are the same as the competitor's in terms of competitiveness;

3) $\eta_i < 1$ Then the services of the *i*- carrier are less competitive than those provided by the competitor- carrier.

The estimation of the competitiveness index is essential in each railway carrier's activities when working under the free market conditions. The index has to be regularly reviewed and in case of need it should be modified across all the factors affecting the competitiveness index. This index should be evaluated by comparing a certain carrier's competitiveness in respect of other competitor-carriers' competitiveness. Carriers having the lowest competitiveness index are most likely to forfeit their freight and passengers, on the other hand one should secure one's prospective customers from the carriers characterized by the highest competitiveness index.

Thus having passed from the integral indicator of the service quality to the competitiveness indicator we can rearrange the mathematical model intended for the demand prognosis. What we come up with here is:

$$G^{(t)} = \lim \sum_{i=1}^N Z_i^{(t)} \times H_i^{(t)}, \quad (10)$$

$$H_i = P_i \times g_i, \quad (11)$$

The value of the total volume of all possible services will be then:

$$H^{(t)} = H_v + H_p, \quad (12)$$

where H_v – is the total value of all transportation services provided to customers; H_p – the total value of all additional services (e.g. loading, storage and others).

The competitiveness index of a particular service can also be expressed through:

$$\frac{Z_{k1}^{(t)}}{Z_k^{(t)}} = \frac{\lambda_1 \times K_1}{P_{1v} + P_{1p}} \times \frac{P_{iv} + P_{ip}}{\lambda_i \times K_i} \geq 1. \quad (13)$$

When considering (13) expression it is not difficult to derive the expression of the charge payable for a service. A mathematical model intended for the determination of the railway charge when estimating

the satisfactory competitiveness (the index has to be more or equal to 1) can be expressed as follows:

$$P'_{sk} = \frac{\lambda_1 \times K_1}{\lambda_i \times K_i} \times (P_{iv} + P_{ip} - P_{1p}). \quad (14)$$

If additional services are not provided then the mathematical model for fixing the charge payable will be simplified into:

$$P'_{sk} = \frac{\lambda_1 \times K_1}{\lambda_i \times K_i} \times P_{iv}. \quad (15)$$

It is a matter of utmost importance to achieve the harmonization of interests between a service supplier and a customer. A deficit of need satisfaction can be marked as *D*. Then mathematically its minimization can be expressed as:

$$D_i = G - \sum_{i=1}^N Z_i^{(t)} \times H_i^{(t)} \rightarrow \min. \quad (16)$$

Hence it follows that:

$$\sum_{i=1}^N Z_i^{(t)} \times H_i^{(t)} \rightarrow \max. \quad (17)$$

The condition for the achievement of correspondence between the volume of railway services and customers' needs is as follows:

$$\max \{ Z_1^{(t)} \times H_1^{(t)} + Z_2^{(t)} \times H_2^{(t)} + \dots + Z_n^{(t)} \times H_n^{(t)} \}, \quad (18)$$

Having estimated the total supply provided by all the railway carriers at a given time ($\sum_{i=1}^N V_i^{(t)}$) it is possible to write down the above- mentioned condition expression and possible expenses of all customers using these services ($H^{(t)}$).

(18) condition can be implemented when $Z_1, Z_2, \dots, Z_n \rightarrow \max$ and finally $Z_i \rightarrow \max$. Hence it may be assumed that the principal condition for the satisfaction of the railway transportation needs is the improvement of transportation conditions, or in other words the maximization if the integral indicator of the service quality. This assumption is first of all useful for the consumer of transportation services. Then there arises a question how the above-mentioned conditions conform to the service providers' or carriers' interests. Let us consider the expression of profit (U_i) gained by the carrier:

$$U_i = (P_i - C_i) \times g_i, \quad (19)$$

where C_i stands for the unit cost of the service provided.

A profit maximizing can be derived from expression (19):

$$(P_i - C_i) \times g_i \rightarrow \max. \quad (20)$$

When attempting to implement the profit maximizing condition it should be known what effect fixing of the service charge (P_i) has. This charge is defined in accordance with the relation between the consumer-orientated properties of a service and the level (K_p) of these qualities in the service prototype as well as proportion to the costs of the service prototype (P_p). Mathematically it can be expressed as:

$$P_i = \frac{K_i}{K} \times P_f. \quad (21)$$

Having introduced a number of changes in expression (19) the following conditions can be achieved:

$$U_i = \left(\frac{K_i}{K_f} \times P_f - C_i \right) \times g_i \rightarrow \max. \quad (22)$$

From expression (22) it follows that:

$$U_i = \left(\frac{P_f}{K_f} \times \frac{K_i}{C_i} - 1 \right) \times g_i \rightarrow \max. \quad (23)$$

If the costs of the service prototype and the level of its consumer-orientated properties are known and they are $P_f = \text{const}$ and $K_f = \text{const}$, and the enhancement of the volume of transportation services is restricted by the forces of the railway infrastructure, then condition (23) can be achieved if:

$$\frac{K_i}{C_i} \rightarrow \max. \quad (24)$$

This shows that in order to maximize profits it is necessary to increase the quality of the transportation services and diminish their costs.

8. Conclusions

The legal environment has to constitute a particular framework of the requirements for the railway transport reform in Lithuania. This framework should be based on both internal (country's own) and external (international) regulations and aims.

1. When attempting to ensure the proper work of the free market mechanism in the railway transport sector a very important role is attached to regulatory institutions such as: the Ministry of Communication, the Railway Board; the Institution involved in the regulation of the railway sector's market as well as to the State Railway Inspection.

2. The principal means of the regulation of the railway transport activities are certification and

licensing. These means should guarantee traffic safety, service quality and fair competition.

3. Competitiveness in respect of the railway transport is understood as a property of railway transport service, which satisfies certain consumer's needs at a certain time in terms of certain quality parameters and at a reasonable cost.

4. The main factor determining railway carriers' competitive capacity (competitiveness) is the relation between the consumer-orientated properties of the services provided by them and the charge payable for that.

Railway carriers have to improve the quality of their services and diminish the cost of those services in order to maximize their profit margins.

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KONKURENCINGUMO PRINCIPAI REFORMUOTOJE LIETUVOS GELEŽINKELIŲ SISTEMOJE

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S a n t r a u k a

Analizuojami Lietuvos geležinkelių reformos teisiniai reikalavimai ir konkurencingumo principai bei jo reguliavimo kryptys po reformos.

Siekiant reformuoti kokią nors ūkio šaką (taip pat ir geležinkelių transportą) šalia strateginių tikslų pagrindimo reikia

sukurti palankią teisinę aplinką. Ji turi būti sukurta kaip įstatyminė koordinuojanti, reguliuojanti ir kontroliuojanti bazė. Reikalavimai teisei aplinkai turi išplaukti iš bendrojo reformos poreikio ir koncepcinių tikslų konteksto. Teisinė aplinka turi sudaryti savotišką reikalavimų rėmą reformai. Šis rėmas turi būti pagrįstas tiek vidiniais (šalies), tiek ir išoriniais (tarptautiniais) reglamentais ir tikslais. Vidiniai teisinės aplinkos kūrimo rėmai – visų pirma yra suderinti rengiamus teisės aktus su galiojančiais Lietuvos Respublikos teisės aktais. Iš išorinių teisinių reformos rėmų svarbiausia yra suderinti norminius teisės aktus su Europos Sąjungos reikalavimais, kartu įgyvendinant Europos Sąjungos *acquis communautaire* reikalavimus bei užtikrinti tarptautinių įsipareigojimų nenutrūkstumą.

Net ir dirbant laisvosios rinkos pagrindais yra reikalingas reguliavimas ir priežiūra, kad laisvosios rinkos mechanizmas veiktų optimaliai efektyviai. Pertvarkant geležinkelių transportą darbu laisvosios rinkos pagrindais toks reguliavimas yra būtinas. Geležinkelių sektorių kompleksiskai turėtų reguliuoti šios institucijos: Susisiekimo ministerija, Geležinkelių direkcija (prie Susisiekimo ministerijos), geležinkelių sektoriaus rinką reguliuojanti institucija (prie Susisiekimo ministerijos sudaryta komisija), Valstybinė geležinkelių inspekcija.

Reformavus geležinkelių transportą ir liberalizavus vežėjų geležinkeliai rinką geležinkelių sistema tampa nebevienalytė. Iš monopolijos pereinama į rinkos ekonomiką geležinkelių sektoriaus viduje. Būtina užtikrinti sąžiningą konkurenciją tarp vežėjų geležinkeliais. Konkurencijos užtikrinimo pagrindinis garantas turi būti laisvosios rinkos mechanizmas. Vienas pagrindinių naujų vežėjų geležinkeliais sėkmingo darbo garantų turėtų būti jų teikiamų (parduodamų) paslaugų konkurencingumas.

Šiame straipsnyje pateiktas autoriaus sukurtas konkurencingumo matematinis modelis, kuriame įvertintos i-tojo vežėjo geležinkeliais konkurencinės galimybės, atsižvelgiant į specifinius veiksnius – paslaugos kainą, kokybę, asortimentą, teisinius, techninius atitikimus standartams, neformalius ryšius su paslaugų pirkėjais. Numatytos prielaidos gerinti pagrindinius konkurencingumo rodiklius – konkurencingumo integralinį rodiklį bei konkurencingumo indeksą.

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