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RESEARCH ON MODEL APPLICATION TO RESTRUCTURING THE RAILWAY TRANSPORT SECTOR IN LITHUANIA

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Abstract. There is no economic grounding and estimation of costs incurred to the State by the establishment and operation of the railway infrastructure management enterprise. In this regard, the article deals with the evaluation of reforming the railway transport sector in other countries and analyses the comparison of restructuring models according to the experience of the EU member states as well as evaluates the selection of models proposed by foreign theoreticians and from an economic point of view justifies the most relevant model of reforming Lithuanian railway transport sector.

Keywords: restructurisation, railway sector, structural models, establishment of enterprise, management, reform.

1. Introduction

The transport policy of the Government of the Republic of Lithuania has been oriented towards the integration of Lithuanian transport system into the European transport network and the market of transport services (Butkevičius 2007 and 2009; Jonaitis 2007).

The present negative economical situation of European countries and Lithuania also makes a negative impact on Lithuanian railway sector conducting activities in selecting a well-founded structural model.

By the implementation of the provisions of the second stage of Law on the reform of the railway transport sector, i.e. by the separation (establishment) of a State enterprise for public infrastructure management, it is planned to create a structural model of a separate organizational railway system: the railway infrastructure and its management get separated from the services of freight and passenger transportation by rail. There is no economic grounding and estimation of costs incurred to the State by the establishment and operation of the railway infrastructure management enterprise. Therefore, a risk exists that the establishment of this enterprise can have a negative economic impact on Lithuanian economy and the railway transport sector.

In this regard, the article deals with the evaluation of reforming the railway transport sector in other countries, and analyses the comparison of restructuring models according to the experience of the EU member states as well as evaluates the selection of models proposed by foreign theoreticians and from an economic point of view justifies the most relevant model of reforming Lithuanian railway transport sector.

2. Evaluation of Reforming the Railway Transport Sector in Other Countries

2.1. Evaluation of Reforming the Railway Transport Sector in the United Kingdom

2.1.1. *Progress of the Reform*

By J. Ludewig (CER 2005), railway infrastructure along with freight and passenger transportation activities were privatised in the United Kingdom. For this reason, a 'separated' model was used.

British Railways was divided into more than 100 companies by the way of privatisation in 1933:

- *Railtrack* as the only operator of infrastructure,
- 4 freight transportation enterprises,
- 25 separate companies for local passenger transportation,
- 3 rolling-stock companies,
- approximately 60 regional maintenance companies.

The infrastructure company *Railtrack* was a privately owned joint-stock company.

However, this model of railway administration increased maintenance costs and instigated a number of gross accidents.

In 2002, the Government of England transferred the administration of infrastructure to the State-owned company *Network Rail*.

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2.1.2. *Advantages of the Reform*

The main advantage of the reform was the attraction of private capital.

2.1.3. *Shortcomings of the Reform*

- the commercialisation of infrastructure did not serve the purpose;
- a large number of carriers caused confusion in train scheduling;
- the increased financial participation of the State in the activities of the railway transport sector;
- state subsidies to passenger transportation did not decrease;
- the initial infrastructure enterprise went bankrupt, and therefore the amounts of accidents increased;
- traffic safety declined;
- ticket costs increased;
- reliability of railroads dropped;
- trains started falling behind schedule;
- due to the reduction of investment to new passenger rolling-stock, the quality of passenger service declined as the passengers had to use overcrowded train carriages etc.

2.1.4. *Financial Results*

In 2001, *Railtrack* was announced bankrupt. The Government decided to finance the company *Railtrack*. For the 10-year railway renovation programme, 65 billion pounds sterling were allocated from the State budget 33 billion pounds sterling of which were devoted to infrastructure and rolling-stock modernisation.

2.2. Evaluation of Reforming the Railway Transport Sector in Germany

2.2.1. *Progress of the Reform*

In 1990, after the reunion of Germany, the State enterprise *Deutshe Reichsbahn* of Eastern Germany was merged with the State enterprise *Deutshe Bundesbahn* into one company *Deutshe Eisenbahn*.

By Ch. Kirchen (CER 2005), in 1991, after changing the Constitution, the State enterprise was restructured into a joint-stock company by the principle of a holding company – *Deutshe Eisenbahn AG*.

In 1994, legal acts were approved and legalised separate subsidies for separate holding companies:

- Personenfernverkehr (for long-distance passenger transportation),
- Personennahverkehr (for local and regional passenger transportation),
- Guterverkehr (for freight transportation),
- Personenbahnhofe (for passenger railway stations),
- Fahrweg (for the common passenger network).

The State preserved the auditorial stock of shares.

German railways continued to be reformed according to an 'integrated' model – infrastructure management remained in hands of the share holding and transportation operators were separated, so competition started between them inside the holding regarding transportation and access to infrastructure.

For the preservation of vertical relations between the infrastructure company and for keeping passengers, *TH Deutshe Bahn AG* established a regulating institution – Federal Railway Bureau (EBA).

On 1 June 1999, a new stage started in German railways. At this stage, 5 units of the *Deutshe Bahn AG* became legally independent corporations joined into a holding company *Deutshe Bahn* and secondary companies:

- *DB Railon Deutshland* – carries freight,
- *DB Regio* – carries passengers by local routes,
- *DB Fernverkehr* – carries passengers by long-distance routes,
- *DB Netz* – is responsible for German railway network,
- *DB Station Service* – maintains passenger railway stations.

Such organizational changes strictly legally separated infrastructure from transport activities and divided the accounts of the separate types of activities. Furthermore, the rearrangement of subsidies became legally impossible.

2.2.2. *Advantages of the Reform*

The main advantages of the reform were as follows:

- all efficient links of the former system were preserved and transferred to the integrated organizational model of the holding,
- vertical coordination of the railroad network and transportation operations was retained,
- passenger and freight transportation units started working under competitive conditions with other non-holding carriers,
- non-discriminative conditions of access to infrastructure were ensured for all carriers,
- passenger servicing quality improved due to which German railways became more attractive.

2.2.3. *Shortcomings of the Reform*

The main shortcomings of the reform:

- the reform did not reduce the need for subsidies and investment,
- strict qualification requirements defined for carriers have made additional barriers for entering the market, particularly for foreign carriers, therefore the competition in the railway transport sector is still quite a weak.

2.2.4. *Financial Results*

The main financial results of the reform were as follows:

- the amount of workers decreased by 34.6 % (from 390 thousand to 255 thousand),
- due to reforms in the period of 1994–2004, the amount of 90 billion Euro was saved in the Federal Germany's budget portion intended for the railway transport sector (instead of 255 billion Euro that should have been needed, the sum of 165 billion Euro was used).

2.3. Evaluation of Reforming the Railway Transport Sector in Estonia

2.3.1. *Progress of the Reform*

By O. Koppel (2006), until privatisation, Estonian railways were owned by the State. In 1996, Estonian Government approved the investment and reorganization plan of Estonian railways. According to the plan, approximately 300 million dollars have been invested into Estonian railways within the period of ten years.

Estonia as well as the United Kingdom chose the 'separated' model of restructuring.

During the former reform of the railway sector, the single Estonian railway company was privatised and divided into the following enterprises:

- *Eesti Raudtee (EVR)* – the company administering and maintaining railway infrastructure and controlling traffic and carrying freight;
- *Edelraudtee* – the company carrying passengers by diesel trains on local routes;
- *EV Express* – the company carrying passengers by international routes (mainly – to Moscow);
- Elektriraudtee – the company owing the infrastructure of Tallinn trams carrying passengers in Tallinn and its suburbs (100% of the shares are State owned);
- Polevki Raudtee;
- Tootsi Turvas.

2.3.2. *Advantages of the Reform*

The main advantages:

- after privatisation, Eesti Raudtee optimized its activities;
- the financial indices of the company improved;
- the amounts of transit freight increased;
- the wages of staff increased, whereas the amount of working staff was reduced.

2.3.3. *Shortcomings of the Reform*

- privatization did not influence considerably the general flows of goods;
- passenger transportation by local routes suffered from strong recession as due to the discontinuation of State subsidies, *Edelraudtee* closed a certain part of local routes and one of those was the route between Estonia and Lithuania. Later on, after the Estonian Government had revised its decisions, this transport route was partially renewed;
- impossible transit of passengers from Latvia to Estonia;
- while not having the right to prevent transportation by the defined routes, infrastructure managers face problems concerning levying unrepaid charges;
- the privatization of Estonian railways brought more use to Russia than to Estonia (an EU member state);
- favourable conditions emerged for carriers of the third countries to intercept the profitable transportation of international freight by railways.

3. Analysis of Comparing Restructuring Models According to the EU Experience

The experience of the EU member states proved that from the systemic and strategic points of view, the reform of railway transport according to the 'integrated' model in principle ensured the increased efficiency of the activity as well as enabled its rapid development and profitable operation in a short period perspective as well as in the future.

From the methodological point of view, the main problems that occurred in relation with the reform of the liberalisation of the EU transport market have been determined by the reasons of systemic or strategic character.

The problems of systemic character emerge first of all due to the infringement or interruption of the inner relations with the components of the railway system, thus causing the disability of the system to function normally. Such infringement has been characteristic to the process of the reform according to the 'separated' model.

Another typical systemic reason relevant to reform implementation according to the 'integrated' model is a lack of flexibility in railway systems that have reached the maturity stage of development.

The problems of strategic character emerge when a poorly or wrongly prepared strategy of reforms is being implemented without the evaluation of circumstances or when a divided system is unable to create a general strategy. The problems of strategic character used to emerge during the implementation of the reform according to the 'separate' model but they also used to occur in certain cases when 'integrated' or 'mixed' models were applied.

The experience of the EU member states showed that railway transport market liberalisation reforms implemented according to the 'integrated' model were more successful due to the absence of major disorders and in most cases, the results of activities were gradually improving as the development of the whole system was more consistent. Experience proved that the structure of integrated holding avoided dualities, unnecessary costs of reorganization and establishing. Furthermore, they better correspond to the specific conditions of the national market. The new technologies of infrastructure development and technical maintenance have been better created in the countries using the 'integrated' model.

Scientists and transport experts gave the following evaluation of the vertical separation of railways:

a) More than 97% of the operating global railway network is functioning on the basis of vertically integral railway structure (Amos 2007).

The negative aspects of separation:

- technical, operational, safety and economic interaction between the 'rails' and the 'rolling-stock' requires active management (in designing, investments and routine activities),
- separation also undesirably distances the infrastructure manager from the final users (passengers and freight consignors/consignees).

The positive aspects of separation:
- separation plus rational access charges can add transparency to the use of state budget subsidies;
- separation plus access rights can facilitate conditions for the competition and participation of the private sector in freight transport markets by preserving the State control of the network;
- separation plus terminal concessions can also facilitate the competition and participation of the private sector in the delivery of passenger transport services in railways.

Separation is not essential for competition but can make it 'fairer'.

Separation is a complex, cost-requiring and traffic-safety-risk-related process (however, this risk is successfully managed in Europe) and all this requires considerable capacities of administration and regulation.

In countries with small railway markets, the costs of separation will be unproportionally high if compared with a potential benefit (Asmild *et al.* 2007).

b) Asmild *et al*. (2007) have proved by empirical research that the separation of the accounts of railways in European countries had a positive effect on the level of the expenditures of railway enterprises. However, it was not possible to prove a total (organizational) positive impact of separating railways.

c) The Competition Committee (OECD 2006) of the Organisation for Economic Co-operation and Development (OECD) admits that in vertically integrated railways, difficulties may emerge for new operators entering the market. However, the following shortcomings of regulating the vertically separated railway transport sector have been indicated:
- it may be more difficult for a regulator to define efficient costs to access railway infrastructure while the costs for the infrastructure are defined without the evaluation of costs to services for the final user;
- it may be more difficult to manage congestion and to ensure the efficient use of infrastructure capacities;
- finally, specific national technical standards existing particularly in Europe may considerably reduce the potential benefit of vertical separation and competition.

d) R. Pittman (2007) noted that in Poland and Romania, carriers that newly entered the market had 'creamed off' as they were carrying homogenous freight thus leaving for traditional carriers less profitable transportation of mixed goods.

In railways, a huge difference exists between marginal and average costs: in infrastructure, marginal costs often make less than 25% of the average cost level, thus the large amounts of money can be endangered.

It means that a huge interval between the marginal and average costs of infrastructure determine the fact that a considerable risk exists in determining the proportion of infrastructure charges. The risk exists regarding the fact that a large part of expenses will be not covered and the demand for State subsidies will grow.

To choose the most relevant model, it is necessary to follow the theory analysed by M. Ivaldi and G. McCulluogh.

e) M. Ivaldi and G. McCullough (2008) after empirical research regarding the separation of USA railway structure, presented the following conclusion that the separation of freight transport operator from railway infrastructure determines 20–40% loss of technical efficiency and additionally by 70% lowers operation efficiency when transportation operations are separated.

4. Research on Subadditivity Tests on Network Separation with an Application to Railways

Analysis of Baumol's test on cost subadditivity for multiproduct production.

Scale and scope are standard measures to describe production economies. A relevant technological measure from a policy perspective is the subadditivity of the cost function that finally determines whether output vector $\boldsymbol{y}$ can be produced more cheaply by a single firm rather than by any group of firms.

Baumol's (1977) test on cost subadditivity for multiproduct production is defined as the cost subadditivity test which means that when underlying a policy of 'on-the-market' competition, however, there are two important technological assumptions that can also be evaluated using the subadditivity criterion.

Baumol's test on cost subadditivity for multiproduct production is also described as the infrastructure separation test and is a subset of Baumol's test. If the test shows there are vertical economies of scope between operations and infrastructure, there should be a loss of technical efficiency if infrastructure and operations are separated. Partial disintegration in which the infrastructure provider is also one of the on-market competitors is another competitive solution.

Baumol's test on cost subadditivity for multiproduct production can be characterized as the operational separation test identifying whether there are horizontal economies of joint production among operational activities. Thus, there may be a need for optimal regulation of operating entities after operations are separated from infrastructure.

Explaining the implementation process using the Generalized McFadden.

M. Ivaldi and G. McCullough (2008) tests for subadditivity using a modification of the Generalized McFadden cost function introduced by W. E. Diewert and T. J. Wales (1987) and derived from D. McFadden (1978). The primary advantage of this function is that the domain of approximation is set along with the estimation of parameters. S. C. Kumbhakar (1994) proposed an extension to the multiple-output case and our function further generalizes his form. Let w be an n-dimensional vector of input prices, t – a q-dimensional vector of quasi-fixed technological factors and y – an r-dimensional vector of outputs. Define z as m-dimensional vector ($m = q + r$) that includes y and t. Considering the Generalized McFadden, the cost function is:

$$C = \alpha' w + 0.5\frac{w'\Delta w}{\theta' w}(\beta' y)^2 + w'\Lambda z + 0.5(\theta' w)z'\Gamma z, \quad (1)$$

where α – an unconstrained n-dimensional parameter vector; Δ – an $n \times n$ symmetric parameter matrix; Λ – an $n \times m$ parameter matrix of nonnegative elements; Γ – an $m \times m$ symmetric parameter matrix; θ – an $n \times l$ vector of the fixed parameters.

M. Ivaldi and G. McCullough (2008) to estimate C use the vector of n factor demands derived by applying Shephard's lemma.

To evaluate subadditivities, M. Ivaldi and G. McCullough (2008) start from using the estimated parameters from:

$$X = \alpha + \left[\frac{\Delta w}{\theta' w} - 0.5\frac{(w'\Delta w)\theta}{(\theta' w)^2}\right](\beta' y)^2 + \Lambda z + 0.5\theta(z'\Gamma z) \quad (2)$$

to identify the fixed costs that would be incurred at zero output levels.

Following M. Ivaldi and G. McCullough (2008), projected fixed costs are:

$$\hat{C}^F = w'\left(\hat{\alpha} + \hat{\Lambda}_t' t + 0.5\theta t'\hat{\Gamma}_t t\right), \quad (3)$$

where the term in parentheses is the vector of projected factor demands in (2) but includes only the technological components (and not the output-related components) of Λ, Γ, and z.

Projected conditional costs for output vector y^* are:

$$\hat{C}^C = w'\left\{\left[\frac{\hat{\Delta} w}{\hat{\theta}' w} - 0.5\frac{(w'\hat{\Delta} w)\hat{\theta}}{(\hat{\theta}' w)^2}\right](\hat{\beta}' y^*)^2 + \hat{\Lambda}_{z^*}' z^* + 0.5\theta\left(z^{*\prime}\hat{\Gamma}_{z^*} z^*\right)\right\}, \quad (4)$$

where the term in braces is the vector of projected factor demands but with those elements of y that do not belong to y^* set to zero and with the elements of t entering only to the extent that they interact with y^* elements. The projected stand-alone costs of producing y^* are $\hat{C} = \hat{C}^F + \hat{C}^C$.

Analysis of an empirical application to freight railways

The specification used by M. Ivaldi and G. McCullough (2008) differs from other rail cost functions as they accept the infrastructure-related activities of the firm as a variable output that imposes costs directly and interacts with other outputs. The M. Ivaldi and G. McCullough (2008) model assumes a vertical production process in which quasi-fixed land and other inputs are first transformed into infrastructure outputs and then into differentiated car-kilometres. The cost model is:

$$C = C(y_B, y_E, y_I, w_L, w_E, w_F, w_M;\ T, U, \theta), \quad (5)$$

where C – fixed and conditional opportunity costs, y_B – car-kilometres of bulk traffic, y_E – car-kilometres of general traffic, y_I – replacement ties installed in a given year, w_L – the index of labour prices, w_E – the index of equipment prices, w_F – the index of fuel prices, w_M – the index of material prices and other input prices, T – counter for years, U – the percentage of car-kilometres moving in unit trains, θ – a vector of fixed effect parameters.

The estimated cost model is globally concave in w and the full parameter set is consistent with the results of the earlier rail cost models such as W. W. Wilson (1997), J. D. Bitzan (1999) and M. Ivaldi and G. McCullough (2008). The general regression results are presented in Table 1.

Table 1. The general regression results

Equation	SSE	Root MSE	Durbin Watson	R-Square
X_L	440 296	663.5	0.9528	0.9802
X_F	49 014	221.4	1.4552	0.9921
X_E	1 086 831	1 042.5	1.5354	0.9320
X_M	67 263.1	259.4	1.1419	0.9574
log (y_B)	0.0970	0.3115	0.5418	0.9347
log (y_E)	0.2016	0.4490	0.2402	0.8510
log (y_I)	0.1342	0.3663	1.1259	0.8783

The second-order output-related parameter estimates shown in Table 2 are particularly interesting. The higher capabilities railways developed for controlling operations become available as 'public inputs' to infrastructure activities. M. Ivaldi and G. McCullough (2008) find no evidence of own-cost complementarities suggesting that railways have exhausted direct cost efficiencies associated with the movement of bulk and general freight traffic.

Table 2. The Second-Order cross cost parameter

Parameter	Estimate	T value	Parameter	Estimate	T value
w_L	–48.3201	–0.11	$w_E * y_E$	0.005984	4.58
w_F	440.0777	2.98	$w_E * y_I$	0.026104	0.03
w_E	461.0521	0.73	$w_M * y_B$	0.001764	3.78
w_M	–260.7760	–1.69	$w_M * y_E$	0.000780	2.48
$w_L * y_B$	0.003626	2.90	$w_M * y_I$	–0.103770	–0.47
$w_L * y_E$	0.004406	5.18	$y_B * y_B$	3.80E-13	6.93
$w_L * y_I$	0.812610	1.38	$y_E * y_E$	2.78E-13	8.74
$w_F * y_B$	0.000165	0.34	$y_I * y_I$	7.09E-08	3.23
$w_F * y_E$	0.000914	2.48	$y_B * y_E$	–2.98E-13	–8.35
$w_F * y_I$	–0.111160	–0.52	$y_B * y_I$	6.56E-11	–2.46
$w_E * y_B$	–0.000320	–0.17	$y_E * y_I$	–2.95E-11	–1.37

For infrastructure separation, M. Ivaldi and G. McCullough (2008) evaluate:

$$C(y_B, y_E, y_I) \le \delta$$
$$C^U + C^C(y_B, y_E, 0) + C^C(0, 0, y_I), \quad (6)$$

using the sample values of w, y, t and θ for each of 297 observations. For the two-firm scenarios on the right-hand side of (6), M. Ivaldi and G. McCullough (2008) allow the duplication of the fixed costs to be proportional to the single-firm fixed costs by the factor δ taking values 1.0, 1.33, 1.66 and 2.0.

For operational separation, M. Ivaldi and G. McCullough (2008) evaluate:

$$C(y_B, y_E, 0) \le \delta C^U + C^C(\alpha y_B, \beta y_E, 0) + C^C\left((1-\alpha)y_B, (1-\beta)y_E, 0\right), \quad (7)$$

where parameters α and β take values 0, 0.33, 0.66, and 1 and where δ varies as in the first test.

The results of infrastructure separation confirm that there are complementarities between infrastructure-related activities and train operations. The degree of the fixed cost duplication plays a relatively small role in determining subadditivity. The results of operational separation suggest that there are also complementarities between the types of freight service. Operational costs are subadditive for 93.7% of the cases even when there is no duplication of the fixed costs.

The projections suggest that the fully integrated firm would have a 20–40% cost advantage over a vertically separated system where the operating company provided bulk and general freight services. Even greater losses of efficiency might occur if bulk and general freight operations were unbundled. The projections indicate that a firm that combined the movement of bulk and general freight would have a 70% cost advantage over two separate firms one of which moved only bulk and the other only general freight.

5. Evaluation of Applying the 'Integrated' Model in the Process of Restructuring Lithuanian Railway Transport Sector

The advantages and shortcomings of 'separated' and 'integrated' models are presented in Table 3.

The general evaluation of the results of this study allows us to declare that the 'integrated' model of the reform of the railway transport sector is the most fitting model of the reform for Lithuania.

At the first stage of reformation, the functions of the bureau regulating the access to infrastructure could be performed by the Competition Council. Therefore, it is reasonable to introduce amending provisions to the Railway Transport Code of the Republic of Lithuania in line with the reform of the railway transport sector correspondingly defining that disputes with railway enterprises at the first stage of the reform should be analysed by the Competition service or a collegial public institution.

The market regulator should be independent from the administrator of public railway infrastructure, the organisation collecting fee for using public railway infrastructure and the organisation or railway enterprise (carrier) appointing public railway infrastructure capacities.

Table 3. Advantages and shortcomings of 'separated' and 'integrated' models

'Separated' model	'Integrated' model
ADVANTAGES	*SHORTCOMINGS*
– private investments are attracted to the development of carriers' activities; – equal competition conditions of using the mechanism of access to roads and stations are made for all operators; – better conditions for competing in the field of service delivery.	– comparatively inconsiderable perspectives of attracting private investments; – possible discrimination of other carriers as being interested in the preservation of the largest portion of the market, the national carrier may influence the access of other carriers to infrastructure; – lack of inner competition.
SHORTCOMINGS	*ADVANTAGES*
– objectives of infrastructure administrators and carriers vary, thus causing loss-suffering for transportation efficiency; – additional resources are necessary to the State for establishing the infrastructure enterprise; – loss of common carrier and road owner's interest for improving transportation quality and increasing quantity at the same time ensuring the economy and efficiency of activities.	– coordination of the actions of the main carrier and the road owner is preserved in planning train traffic, speed, capacities, safety and in organising operative activities; – additional resources are not needed for establishing the State infrastructure enterprise; – it is simpler to coordinate the requirements of carriers for quality and efficiency.

Those dissatisfied with regulator's decisions should have the right to appeal in line with the settled order of the legal acts of the Republic of Lithuania.

At present, public railway infrastructure consists of the stock assets of JSC *Lithuanian Railways* (AB „Lietuvos geležinkeliai") all proprietary rights of which should belong to the State. Thus, in this case, it should be advisable that the property of public infrastructure should be transferred to the public infrastructure administrator by the assets trust law.

5.1. General Costs of Implementing the 'Separated' Restructuring Model

According to Jarašūnienė A., summarising the impact of the separation of JSC *Lithuanian Railways* (AB „Lietuvos geležinkeliai") on the infrastructure enterprise and the carrier's company (i. e. implementing the 'separate' restructuring model), it is evident that even with a very optimistic scenario, financial losses (increased costs and missing revenues) will make approximately LTL 272.5 million yearly which is almost 20% of the present costs of JSC *Lithuanian Railways*. At a later stage, financial losses will grow even more considerably.

Furthermore, the lump sum of establishment expenses should make additional LTL 13 million.

Blocking investment, increasing loan portfolio etc. are the possible various scenarios of loss compensation.

However, in the long run, such measures lead to bankruptcy. Thus, upon the drop of the efficiency of activities performed by JSC *Lithuanian Railway s*(AB „Lietuvos geležinkeliai"), sooner or later, the State will be forced to considerably increase funding Lithuanian railway transport sector.

6. Conclusions

1. Nowadays, a negative situation in the transport sector of Lithuania also makes a negative impact on activities in the railway sector selecting a well-founded structural model.
2. Research on the pair of subaddivity tests shows they can be used to evaluate the technological feasibility of separating vertically integrated network monopoly into a common infrastructure component and competing operating components.
3. The analysis of foreign theoreticians indicates that the projections suggest that the fully integrated firm would have up to 40% cost advantage over vertically separated systems.
4. The analysis reveals that when implementing the 'separate' restructuring model, it becomes evident that even with a very optimistic scenario, the increased costs and missing revenues will make approximately LTL 272.5 million yearly which is almost 20% of the present costs of JSC *Lithuanian Railways* (AB „Lietuvos geležinkeliai").
5. The general evaluation of the results of this study allows us to declare that the 'integrated' model of the reform of the railway transport sector is the most fitting model of the reform in Lithuania.

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