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CHARGING RAILWAY INFRASTRUCTURE MODELS AND THEIR IMPACT TO COMPETITIVENESS OF RAILWAY TRANSPORT

Summary. The paper deals with the impact the charging railway infrastructure access has on the competitiveness of railway transport in the selected European countries. It researched into the development of indicators that indicate the competition in the railways transport market, such as volume of transport, traffic performances, and number of trains of private railway operators compared with national operators. It used the new approach for research of the share of railway transport in the transport market. The research was based on a comparative analysis of models of charging railway infrastructure, subsidies to rail infrastructure, and development of transport performances of all rail operators. The results of research are presented in terms of freight and passenger railway transport.

1. INTRODUCTION

Transport supply in the twenty-first century is, in both physical and financial terms, a major global industry, an employer of large numbers of people, the consumer of vast amount of raw materials, and it takes up a lot of personal time in its use [1].

An important aspect of the European policy is to enhance the role of railway transport. It is necessary to increase competitiveness of railway transport compared with road transport. This can be achieved if rail provide efficient and attractive services, and if we eliminate regulatory and market failures, barriers to entry and burdensome administrative procedures which hamper efficiency and competitiveness [2].

Liberalisation is one of the economy means to increase competitiveness of railway transport in the transport market. On the one hand, the entry of new railway companies into transport market can increase the quality of rail services, technological modernization, and so on; on the other hand, it allows costumer to choose between railway operating companies and hence stimulates relationship between quality and price [3]. Presently, there is no method of rail infrastructure charging that takes into account the behaviour of the transport market.

2. MODELS AND METHODS

In our research we used the basic research methods such as benchmarking, statistical analysis, comparative analysis and synthesis. Our research is based on the analysis of economic model of charging railway infrastructure in the selected European countries and researched the impact of this model to other indicators (such as number of rail operators, non-investment, etc.) and to modal split.

Rail infrastructure charging is based on two economic models – tolls based on marginal costs or based on average costs.

Marginal costs may be highest on lightly used parts of the network, which has implications for the current regulatory process to determine funding and service levels in the future [4]. Charging of railway infrastructure related to its capacity. Capacity and pricing are two key issues for organizations involved with open track access regimes. A train access charging methodology is therefore developed and incorporated into a railway capacity determination model [5].

The context for the reassessment of the infrastructure access charge is very different from one EU member state to another. Excessive access charges mean higher prices for rail companies when using the infrastructure. As infrastructure charges account for a significant part of the cost of a railway operator, the level of the charge is crucial for establishing competition on the rail network [6].

In the European countries are used the following economic models of charging of railway infrastructure [7]:

- marginal costs model MC;
- marginal costs model with additional charge MC+;
- model of costs allocation with discount FC-;
- model of total costs allocations FC.

In the European countries exist different methodologies of the internal construction of rail charging system. Countries used one or two-component tariff models.

3. COMPARATIVE ANALYSIS OF RAIL INFRASTRUCTURE CHARGING MODELS AND MODAL SPLIT

In our research we first realized comparative analysis of rail infrastructure charging models and specific items of charge in Germany, Poland, Austria, Czech Republic and Slovakia. The table 1 shows the results of this analysis.

Table 1

Charging railway infrastructure models

Country	Economic model	Number of component in the model	Separately charging of using railway station	Charging of using other service facilities
Germany	FC-	one-component	✓	✓
Poland	FC-	specific two-components	✓	✓
Austria	MC+	two-components	✓	x
Czech Republic	MC+	two-components	x	x
Slovakia	MC+	two-components	✓	x

Legend: ✓ yes, x no

As can be seen in Table 1, rail infrastructure charges are based on two components in the almost countries. The first component is train km and second is gross tonnes km. Other service facilities (such as platforms, stabling sidings etc.) are charged separately in Germany and Poland, in other countries are included in the Minimum access package.

Directive 2012/34/EU makes it possible to use some specific items in charging of railway infrastructure such as lower rate for passenger than freight railway transport, discount on the basis fee for intermodal train or pick-up goods train, charging takes into account environmental aspect (for example lower rate for new locomotives), different fees for services in the public interest and commercial services in the passenger railway transport, different fees for regular and irregular train (regular train is the train which have a train path in the time table, train path for irregular train is ordered ad-hoc), higher fees in the congested railway, different fees for different train category etc. Table 2 shows the comparative analysis of charging of specific items.

Table 2

Charging of specific items

Country	Lower rate	Charging take into account train category	Number of track category	Booking rate	Environmental aspect	Different fees public interest/commercial services	Different fees regular/irregular train	Higher rate in the congested railway
Germany	FT	✓	12	✓	✓	x	✓	✓
Poland	the same	x	8	x	x	x	x	x
Austria	FT	x	4	x	✓	x	✓	✓
Czech Republic	PT	x	3	✓	x	x	✓	x
Slovakia	the same	x	6	x	✓	x	x	x

Legend: PT – passenger transport, FT – freight transport, ✓ yes, x no

Charging models can affect number of railway operators or rail transport performance (for example reduction of fees for intermodal transport in the Czech Republic led to an increases of rail transport performance and share of rail transport in the transport market). The table 3 shows the development of number of railway operators in Germany.

Table 3

Number of railway operators in Germany

Year	2009	2010	2011	2012	2013	2014	2015
DB holding	30	30	28	28	18	16	17
Other railway companies	323	340	357	367	371	385	395
SUM	353	370	385	395	389	401	412

In Germany, the number of railway operators increased, as shown in table 3. The share of railway transport in the transport market increased too. The share of rail passenger transport increased from 7.9% in 2009 to 8.4% in 2013 and the share of rail freight transport in the same years increase from 20.88% to 23.37% [8].

In Poland, the share of private operators increased about 8% in the passenger rail transport and 4.9% in the freight rail transport in the years 2014 compare to 2009. While in Germany development of modal split has been favourable for rail transport, in Poland, the share of rail freight transport decreased about 2.71% and the share of rail passenger transport increased about 0.5% only [9].

The number of operators in the rail transport market increased by 35% between 2009 and 2014 in Austria. There was an increase in the share of rail transport as well in the transport market; there was an increase in rail passenger transport by about 1.2% and in freight by about 2.3% during the same period [9].

4. SITUATION IN THE SLOVAK REPUBLIC

4.1. General access conditions to railway infrastructure in Slovakia

Transport services can be operated on the railway network in Slovakia by a railway undertaking, a legal entity as far as they meet the following conditions [10]:

- the entity is in possession of a valid train operating license issued by a licensing Member State's authority;
- the entity is in possession of a valid safety certificate;

- the entity has concluded insurance liability contract for damages caused by operation of railway transport during the entire period of operation of railway transport;
- the entity has concluded the contract for access to the railway infrastructure with ŽSR;
- the entity has concluded the contract with ŽSR - Railway Power Engineering Centre in case the RU intends to provide transport service using vehicles of dependant traction;
- the entity has concluded the contract with ŽSR on provision of activities regarding refuelling the RUs motive power units in case the RU will operate the transport by motive power units of independent traction;
- the technological procedures for departing and/or terminating trains in respective railway stations has been negotiated with the respective ŽSR Regional Directorates;
- the train path has been allocated or the entity provides transport services for an applicant, to whom the infrastructure capacity has been allocated.

One of the basic documents that the RU needs in order to provide transport services on railroad shall be the license issued by the Member State's Licensing Authority. License in the Slovak Republic shall be issued, withdrawn and controlled by the Transport Authority. In accordance with the Act on the Transport on Railroads, the Authority shall grant a license to the applicant who [11]:

- is an entrepreneur established in the Member State;
- demonstrates the fulfilling the requirement for a good repute of the members of his statutory body and the responsible representative, if he has been established;
- demonstrates professional competence to provide transport service for which a license is applied for;
- demonstrates that on date of the start of provision of transport services he is insured to cover the liability for the damage caused by the provision of transport service in the network.

Moreover, the railway company shall be in possession of a safety certificate not later than on date of the start of provision of transport service on railway infrastructure operated under the licence. Safety certificate is issued by the Transport Authority based on the railway company request. All the basic conditions are described in the Network Statement.

4.2. Railway freight transport

Railway freight transport has an important part in the European transport sector. However, the modal share of rail has remained modest, partly due to suitability issues (for example rail is not practical for many short distance urban journeys such as trips to the supermarket) but also because of obstacles to market entry hampering competition and innovation [2]. In the Slovak Republic is a similar situation. The problems can be summarized as following [12]:

- low flexibility compared with road freight transport;
- product portfolio is not adequate to consumer requirements;
- modernization of railway infrastructure on the one hand and outdated railway infrastructure on the other hand inductive of late period delivery;
- building some logistic centres without railway network connection;
- inadequate the regulation of particular transport mode and so on.

4.2.1. Comparative analyses of transport of goods and other indicators

The competition in the rail transport market can be researched by different point of view. We aimed to analyse transport of goods and other indicators ZSSK CARGO (the founder and 100% shareholder is the Slovak Republic. Rights of the shareholder – the Slovak Republic – are executed by the Ministry of Transport and Construction of the Slovak Republic) compared with other operators of railway freight transport.

The following table shows development of transport goods in the companies with the rail haul more than 300 thousand tonnes [13 - 16].

Table 4

Comparison of transport of goods in selected companies

Rail cargo operator	Transport goods in thousand tonnes		
	2010	2012	2014
AWT Rail SK, a.s.	0	325	336
CENTRAL RAILWAYS, a.s.	0	876	1 212
Express Rail, s. r. o. / Express Group (from 2014)	1 239	1 602	1 283
Hornonitriansk bane zamestnanecká, a.s.	0	0	1 907
IDS CARGO a.s.	0	251	785
LOKO RAIL, a. s.	1 135	726	603
LTE Slovakia /LTE Logistik a Transport Slovakia s. r. o.	378	436	582
METRANS /Danubia/, a.s.	0	1 670	2 859
Petrolspeed Slovakia s.r.o.	0	0	417
Prvá Slovenská železničná	13	1 221	1 085
Trat'ová strojná spoločnosť, a. s.	489	0	242
U. S. Steel Košice, s.r. o.	400	433	632
Železničná spoločnosť Cargo Slovakia, a. s.	38 609	35 284	36 023

Currently, 48 railway companies have a valid license but only 19 of them realize traffic in the Slovak railway network. Figure 1 presents comparison of the development of share ZSSK CARGO and other operators calculated from goods of transport in tonnes.

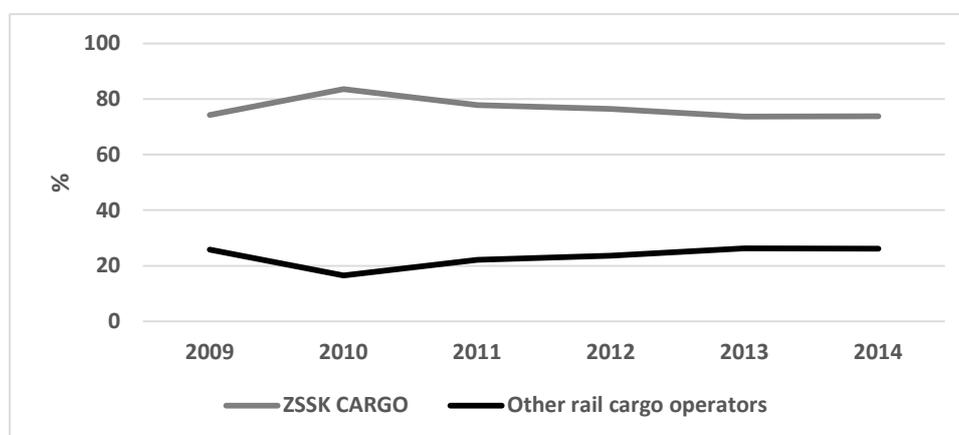


Fig. 1. Share of transport goods of rail private cargo operators compare with ZSSK CARGO

Development of transport goods has a slightly increasing tendency. It was transported 45 million tonnes of goods by railway transport in 2009 and almost 49 million tonnes in 2014. As can be seen in Fig. 1, the volume of goods transport increase and the share of other rail cargo operators grows too. It is positive factor of competition of railway transport market.

Beside transport goods, we analysed traffic performance and number of train in Slovak railway network. Fig. 2 and 3 show the results these analyses.

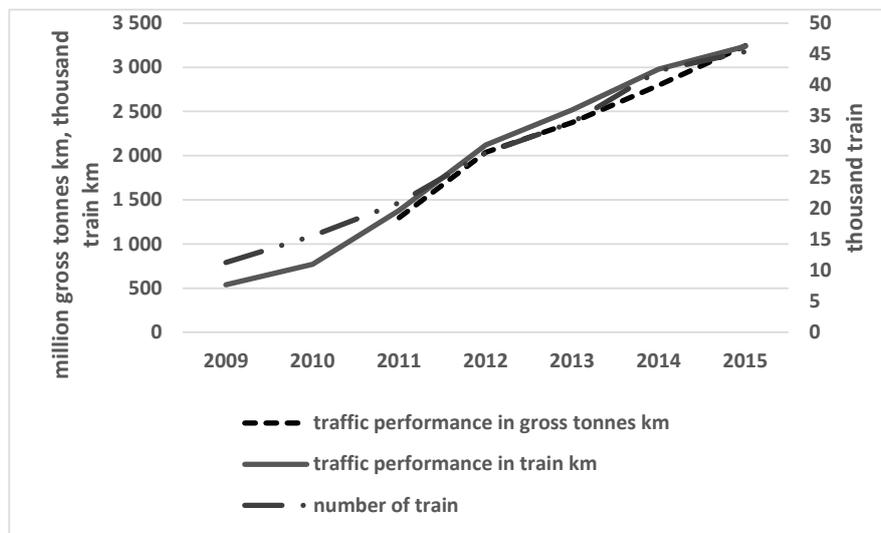


Fig. 2. Traffic performances of private rail cargo operators

Every analysed indicator has a constantly growing trend from 2009, which has been associated with a higher amount of goods transported [17]. Traffic performance in gross tonnes kilometres was not available before 2011 because Rail Infrastructure Manager started to analyse this indicator after change of the railway infrastructure charging system (from 01.01.2011).

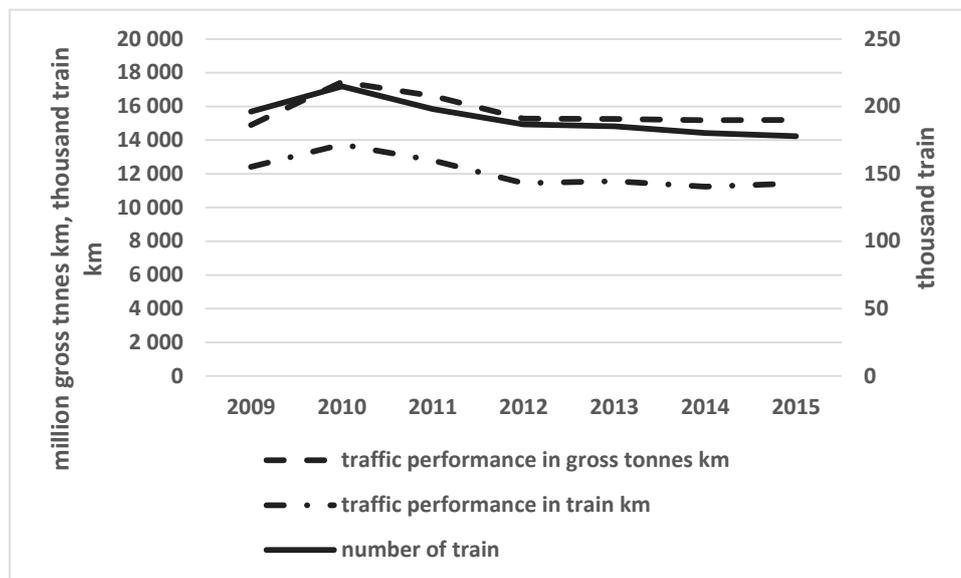


Fig. 3. Traffic performances of ZSSK CARGO

Freight traffic performance has a constantly decreasing trend. While in 2009 the traffic performance was 12 416 train km, in 2015 it was 11 436 train km [18]. Slight growth gross tonnes km in 2015 compared with 2014 was caused by worse ratio of operating and traffic performance.

4.2.2. Modal split of freight transport

Modal split depends mainly on supply and demand for transport services and legal framework which define economic business conditions in the transport market [19]. Carriers choose the modes of transport according to the following criteria:

- delivery time;
- price;
- quality of transport;
- safety;
- other criteria.

Figure 4 shows freight transport modal split in year 2010 and 2015 [20, 21].

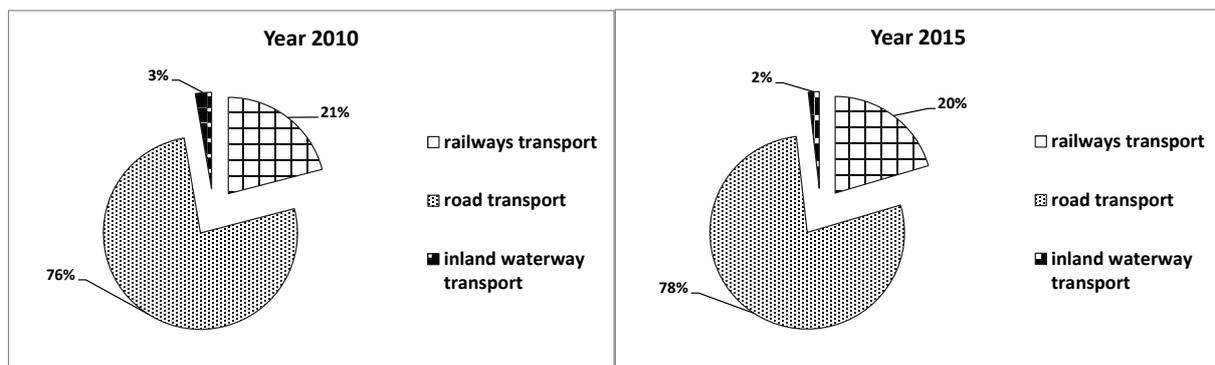


Fig. 4. Comparison the modal split of freight transport in Slovakia

Modal split in the Slovak Republic is comparable to modal split in the EU. In spite of the goods of transport (in tonnes and in traffic performance too) has a slightly growing trend the share of railway transport decreases.

4.3. Railway passenger transport

European Union's approach to urban, suburban and regional transport is clear - to support the role of railway transport, because its benefits should be seen in economic development and employment, reduction in congestion, lower energy consumption, less environmental problems in terms of emissions and noise reducing, reducing social barriers and increasing the quality of life [22]. However, passengers always decide about the use or non-use of railway transport [23]. Therefore, it is needed to railway companies provide competitiveness railway services.

4.3.1. Comparative analyses of number of passengers

Nowadays it is only three rail passenger operators in the Slovak Republic which realized periodical passenger transport: Železničná spoločnosť Slovensko (ZSSK), a.s. RegioJet, a.s. and Leo Express, a.s. (from 2015). ZSSK is a joint-stock company and mainly operator in the rail passenger market. Its founder and a 100-percent shareholder is the Slovak Republic, represented by the Ministry of Transport and Construction of the Slovak Republic. ZSSK settles its needs and costs from income obtained from its business activities, as well as from foreign resources. Table 5 shows the number of passenger of companies which realized railway passenger transport [13 - 16].

Nowadays only ZSSK and RegioJet, a.s. provide the passenger transport as a public service. RegioJet, a.s. operates this service in the track Bratislava - Komárno. ZSSK provides this service to all other track. In this year started the process of public tender for providing a public railway passenger service to next relation Bratislava - Banská Bystrica. In view of fact that the share of private railway passenger operators in the rail transport market is low, we didn't analyse other indicators.

Table 5

Comparison of railway passenger transport in Slovakia

Company	Traffic performance in passenger km		
	2010	2012	2014
ZSSK	2 427 980 000	2 413 490 000	2 503 130 271
RegioJet, a.s.	-	274 537 611	448 626 879
Rail Cargo Carrier – Slovakia, s.r.o.	-	575	-
Leo Express, a.s.	-	-	417 536
YOSARIA TRANS, a.s.	-	-	412
VIALTE s r.o.	-	-	666

4.3.2. Modal split of passenger transport

Passengers decide what means of transport used for travel so they decide about the modal split. Figure 5 presents modal split of passenger transport in the Slovak Republic in the year of 2010 and 2015 [20], [21].

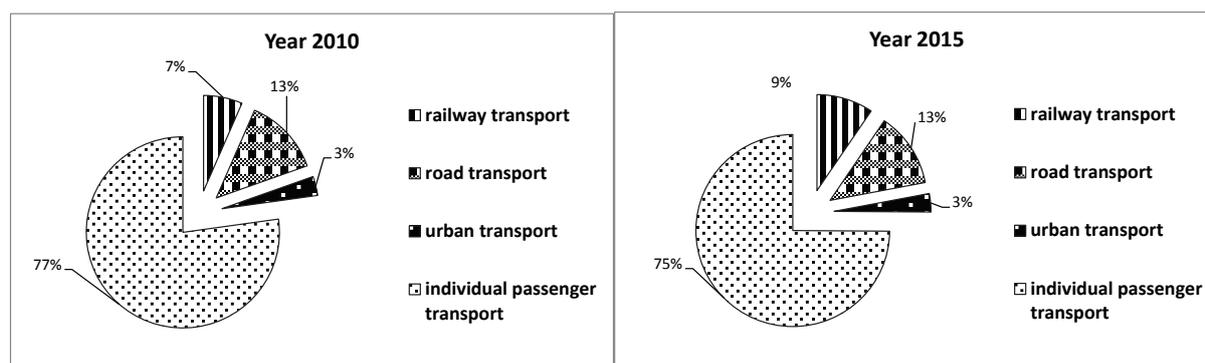


Fig. 5. Comparison the modal split of passenger transport in Slovakia

As can we see in Figure 5, the share of railway passenger transport in the transport market increased in 2015 compared with 2010. The growth of rail passenger transport has caused mainly by zero - fare rail transport for students and pensioners from November 2014.

5. RESULTS AND DISCUSSION

Mobility of people cannot be governed effectively on the basis of market principles. The consequence would be an enormously increasing passenger car transport and ultimately the collapse of road traffic and transport system as a whole [24]. Regulation of public passenger transport is the consequence of the need to finance companies providing this service through subsidies. Financing of public transport is also an important factor in ensuring the mobility. It is therefore important to find the method when this funding is effective not only from economic point of view, but especially from the point of view of society. In public transport the best solution is an integrated passenger transport system.

European countries used different systems of rail infrastructure charging. Our research shows different charging of specific items. Charging of rail infrastructure in Germany and Austria has the most common items with the Directive 2002/34/EU.

The essence of the research was to determine the impact on competitiveness of railway transport. The following table shows the results of our research.

Table 6

Comparative analysis of selected indicators

Country	Change of charging system	Changes to fees (approximately)	Traffic performance	Growth		Decrease of subsidies	Modal split (share of rail transport)	
				Rail operators	Revenues		Freight transport	Passenger transport
Germany	2001	-22%	↑	✓	✓	✓	↑	↑
Poland	2014	-15%	↓	✓	x	x	↓	↑
Austria	2012	-22%	↑	✓	✓	x	↑	↑
Czech Republic	2009	-20%	↓	✓	x	x	↓	↑
Slovakia	2011	-1 until -60%	↑	✓	✓	✓	↑	↑

Legend: ↑ increase, ↓ decrease, ✓ yes, x no

We researched the change every indicator after the change of charging system. As can be seen in Table 6, the number of rail operators and share of rail transport on transport market increased in all countries. In view of the fact that using charging of specific items (described in Table 2) increase attractiveness of railway transport, we suggested new model for rail infrastructure charging in the Slovak Republic. Figure 6 shows framework of this model. Our draft of model is based on two degree of rail infrastructure charging. First degree has to create charges of the use of track. These charges should reimburse variable costs of rail infrastructure manager. The charges of second degree should be designed to use of specific items of rail infrastructure charging with aim to increase rail traffic performance and share of rail transport in the transport market.

6. CONCLUSION

Competition in the rail transport market is different in the freight and passenger transport in the Slovak Republic. The number of rail freight operator were 19 in 2015 while rail passenger operators were 3 in the same year. Overall passenger-kilometres increased by 12% between 2005 and 2014 (between 2010 and 2015 passenger-kilometres increased by 47%, but this growth was caused by free ticket for students and pensioners from November 2014). In contrast, overall tonne-kilometres decreased by 11% over the same period. The modal share of rail passenger has increased from 5,5% to 9,1% since 2005.

Appropriate capacity-allocation schemes for rail infrastructure coupled with competitive operators will result in a better balance of transport between modes [2]. Our research has shown that using different charges and specific items in rail infrastructure charging model can increase number of rail operators, rail traffic performance and mainly modal share of rail transport can increase. Therefore, we suggested new model of rail infrastructure charging in the Slovak Republic.

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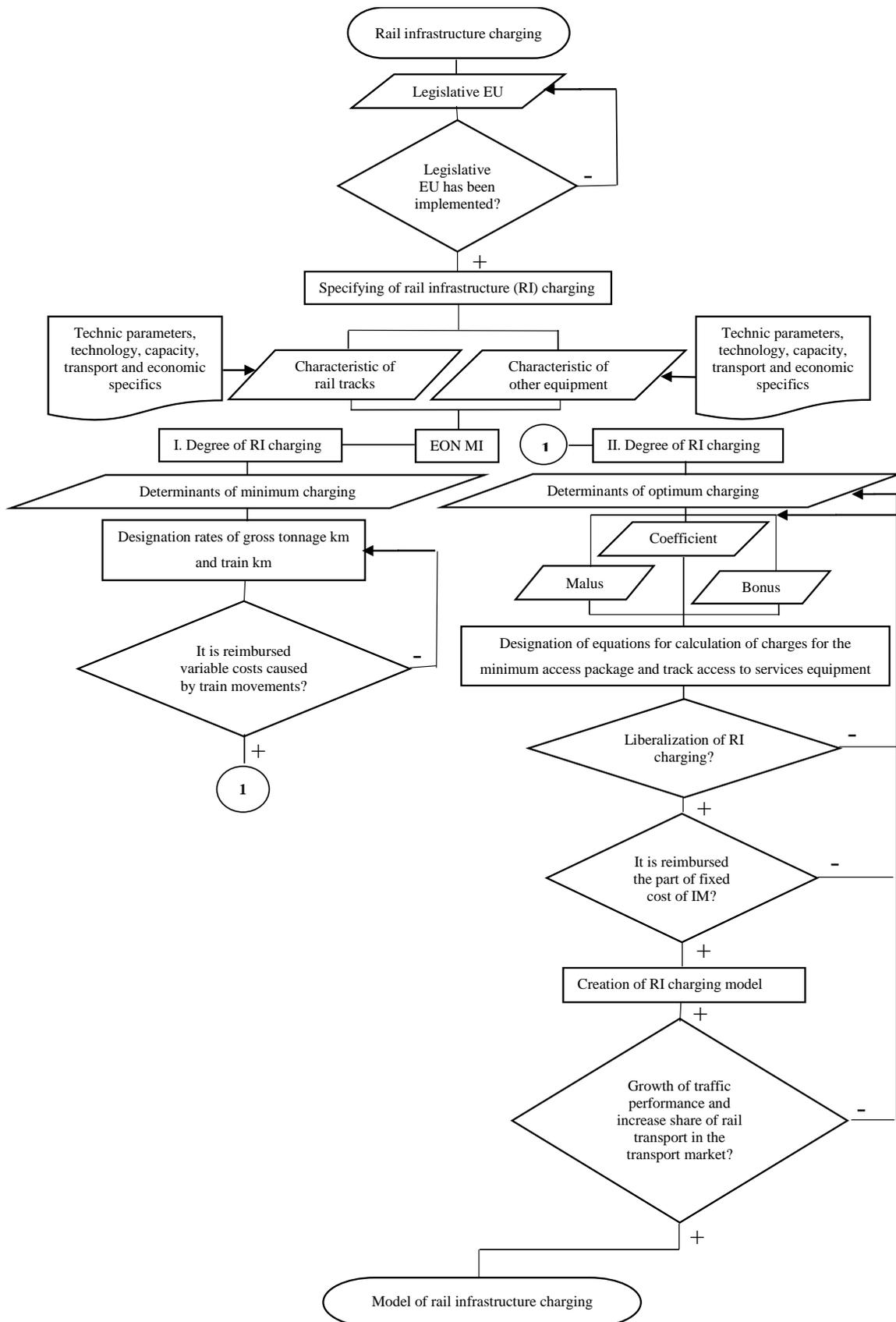


Fig. 6. Draft of model of rail infrastructure charging

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