DEVELOPMENT OF PASSENGER TRANSPORTATION MARKET

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ABSTRACT

The article proposes a methodical approach to assessing the implementation of the target model of the passenger rail long-distance transportation market, particularly in Russia comparing it with global practices, justifies the criterion for choosing model solutions which is a minimum of public expenditures, characterizes the development of passenger long-distance transportation, and analyzes the market profile according to the degree of state regulation.

Keywords: passenger transportation, transport, target market model, public costs, carrier companies, owner of infrastructure.

Background. *Modern society is characterized by intensive communication processes. For every state of the world, the importance of transport is enormous, since it unites various regions of the country into one state. In this regard, transport is one of the leading state-forming factors.*

Traditionally, all modes of transport focus on cargo transportation, passenger transportation was often considered as an unattractive area of transportation. Meanwhile, passenger transportation was and remains the most important part of transport products. Passenger transport meets the diverse needs of the population in mobility. Labor trips (to the places of employment and back) provide the economic needs of society. This type of passenger transportation is dominant. Cultural and everyday life and other trips caused by migration processes are of considerable importance [1].

Objective. *The objective of the authors is to consider development of passenger transportation market, to compare different models and analyze optimal model for Russia.*

Methods. *The authors use general scientific methods, comparative analysis, evaluation and economical approach, scientific description.*

Results.

I.

According to the main provisions of the development strategy of Russian Railways holding, the passenger transportation market in the Russian Federation is currently characterized by [2]:

• low level of population mobility, significantly lagging behind developed countries. At the same time, railway transport satisfies only about 11 % of the total mobility level;

• volume of passenger transportation and passenger turnover of public transport is significantly lower than by the end of the Soviet period. At the same time, the main reduction in passenger turnover occurs in the rail and road transport;

• accelerated pace of motorization of the population of Russia. Over the past ten years, the fleet of private cars has increased by more than 10 million units, the number of passenger cars per 1000 people in the Russian Federation is about 300. At the same time, in Europe – there are 500–600 cars per 1000 people;

• stable lagging behind in the growth rates of public spending on public transport services from the growth rates of aggregate revenues and expenditures on goods and services. According to expert estimates, the passenger turnover of private cars now clearly exceeds the passenger turnover of public transport [3].

In 2017, JSC Russian Railways took up about 24,7 % of the domestic passenger transportation market. The share of aviation accounted for about 52 % of passenger turnover, the share of bus and urban transport – about 23,3 % [4]. Moreover, the steady trend of the last eight years has been an increase in the share of air transport.

This indicates that service users prefer more expensive, but also more comfortable personal cars and air travel. Consumer preferences as wealth increases shift into a segment of quality services. Also, speed and high-speed interregional and suburban, intra-city transportation carried out by railway companies are in high demand. Thus, the number of rapid trains of JSC FPC increased in 2016 by 76,1 % (3442 trips), the transportation of passengers in them increased by 1,8 times. In total, about 12,4 million people were transported by rapid trains (Sapsan, Allegro, Lastochka), which is 35 % more than in 2016 [5].

FPC is the dominant carrier in the railway passenger market. This did not prevent, however, the emergence of competitors, as a result of which the share of FPC in the total volume of long-distance transportation decreased to 94,7 % [6].

Today, the market for long-distance passenger rail transportation in the country is as follows: a deregulated segment – compartment, first-class, luxury cars; regulated segment – transportation in second-class and sitting cars. In the deregulated segment, tariffs for transportation are set by carriers, and in the regulated segment – by the FAS (Federal Antimonopoly Service) of Russia. Regulated tariffs for JSC FPC are lower than the economically justified level. In this regard, to compensate for losses in revenues caused by regulation, the federal budget annually provides for a subsidy to cover the difference between the revenues that should have been received at economically justified levels of tariffs and actually received by JSC FPC based on the number of trips made.

In the regulated segment, transportation is carried out only by JSC FPC (their share is over 65 %, more than 100 routes are non-alternative and objectively unprofitable). In the deregulated segment, in addition to FPC, there are several private carriers on the market that hold a small market share.

These reports indicate that the state provides less subsidies than is required to maintain the volume of transportation in the regulated segment [6]. Such a «promotion of the carrier's efficiency» results in cancellation of trains, decrease in investment in rolling stock modernization and loss of passengers.

Such a situation forces JSC FPC to reduce the number of routes, leaving behind the most unprofitable, where most of them are directions on which trains are the only year-round mode of transport. Their social significance is obvious and is confirmed by the numerous appeals of residents and officials to the Russian government and JSC Russian Railways, accompanying each such cancellation. These problems show an imbalance in the relationship between the state, the carrier and the population, leading to a decrease in availability of long-distance passenger transportation.

II.

The main vector of reforming the passenger railway complex in all countries is the policy of attracting private

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capital to reorganization of management of passenger transportation. In recent decades, various models of regulation and management of passenger rail transportation have begun to take shape in the world, solving the task of harmonizing private and public property in different ways.

In most countries, the state provides assistance to companies engaged in passenger transportation, and various support models are applied: covering operational losses; fixed payment for a regulated ticket (compensation for lost income); state order (agreed payment); investment program financing.

Turning to international experience, it is still impossible to find a consensus on the optimal model of structural reform in the railway industry. A single model can never be universal for all, structural transformations of railways are designed to become a pragmatic search for a model that works in specific market conditions, but assumes that the objectives of the railway management are consistent with the goals of the national railway transport policy.

The results of observations clearly demonstrate that practically on all markets for rail transport services a state-owned incumbent company operates, which is an infrastructure operator and carrier, especially if railway passenger transportation is prevailing. Even in Sweden (as the closest country to compare), where liberalization has touched all areas of operation of railways, the state continues to be the main stakeholder in infrastructure and transportation activities of railway transport.

Over the past decades, many countries around the world have already reformed the railway industry and moved from a vertically integrated monopoly to a competitive market. At the same time, various types of competition were introduced into the sector: competition in the market (Sweden, Great Britain, USA, etc.) and competition for the market (Brazil, Argentina, Germany, Sweden, etc.).

As reform is carried out in different countries, it becomes possible to analyze the results of applying certain models of sector restructuring and make recommendations regarding the choice of a model, as well as ways to improve the performance of the naturally monopolistic component where it remains even after implementation of the reform.

International experience shows that the reform of railways takes place in different technical and economic conditions, therefore the final result is different and sometimes not comparable. At the same time, liberalization does not always lead to an increase in efficiency and a reduction in the cost of passenger transportation services.

The «European» model of complete vertical separation or the «American» model, which assumes that vertically integrated companies operate in the market can be considered as the most likely for the Russian railway sector.

In accordance with the Decree of the Government of the Russian Federation of December 29, 2017 No. 2991-r, a target model of the long-distance passenger rail transportation market (TMM) is being formed, which describes the programmed state of the passenger rail transportation market by its individual segments and regulatory mechanisms, including state participation, as well as prospects for innovative development of the technological structure, ensuring a high level of transport services for passengers [7].

III.

TMM assumes achieving a balance of interests of the state, consumers of transport services (passengers) and carriers, ensuring guaranteed availability of transport services for the population and increasing the economic efficiency of carriers.

Depending on implementation of economic mechanisms in the structure of TMM, the following models can be proposed:

  · creation of a «national carrier»;
  · carrier subsidies;
  · regulatory model;
  · infrastructure subsidies;
  · route subsidies;
  · cross-subsidization;
  · targeted subsidies;
  · PPP in passenger transportation.

The proposed models differ in the specifics of implementation of state regulation mechanisms, terms and stages, as well as the main functions of the subjects of the long-distance passenger transportation market: the state, carriers, the dominant carrier, infrastructure owners, station complex, passengers, service companies [8].

For a comprehensive substantiation of management decisions on transformation of the economic mechanism for regulating passenger long-distance transportation, a methodical approach to assessing the economic performance of TMM is needed. In world practice there is a similar research plan [9–14].

The criterion for choosing an effective model for implementing TMM, in our opinion, is determined by minimum public expenditures on functioning of the target model, taking into account the economic interests of market participants:

$$PE_f = SB + EC_{RZD} + EP, \qquad (1)$$
$$EC_{RZD} = EC_{infr} + EC_{loc}, \qquad (2)$$
$$EP = EP_{FPC} + EP_{car}, \qquad (3)$$

where SB – budget subsidies in the course of state regulation of tariffs;

EP – expenses of the passenger when traveling in trains of JSC FPC (EP_{FPC}) or other carriers (EP_{car});

EC_{RZD} – expenses of carrier companies to pay for the services of infrastructure infrastructure owners (EC_{infr}) and locomotive traction (EC_{loc}).

It is proposed to use reporting and forecast data as initial information for estimating the public expenditures on implementation and operation of TMM [15]. For example: the operating costs of the owner of the infrastructure, the current expenses of carriers, the amount of subsidies from the budgets.

In this case, the public expenditures of implementing TMM can be represented as follows:

$$PE_{tmm} = E_{budg} + \Sigma E_{nep\text{-}ки}^i \cdot (1 + R_{car}^i) +$$
$$+ E_{RZD} \cdot (1 + R_{RZD}) \rightarrow min, \qquad (4)$$

where E_{budg} – budget expenditures as a result of state regulation of tariffs;

E_{car}^i – expenses of the i-th carrier;

R_{car}^i – minimum required level of profitability of the i-th carrier;

E_{RZD} – expenses on invoices for payment of services of JSC Russian Railways for provision of infrastructure and locomotive traction;

R_{RZD} – minimum required level of profitability of JSC Russian Railways for provision of infrastructure services and locomotive traction (it is assumed in the calculations that $R_{RZD} = 0$).

The expenses for payment of invoices of JSC Russian Railways for provision of infrastructure services are determined according to the formula:

$$E_{inf\,r} = E_{condi-perm} \cdot I_{condi-perm}^{inf} +$$
$$+ N \cdot I_N \cdot I_N^{inf} \cdot R_1 + \qquad (5)$$
$$+ nS \cdot I_{ns} \cdot I_{nS}^{inf} \cdot R_2 + n \cdot I_n \cdot I_n^{inf} \cdot R_3,$$

where N – number of train departures on the route over the accounting period, units;

nS – car-kilometer work of passenger cars in the train, car-km;

n – number of cars sent in the train during the accounting period, cars;

R_1, R_2, R_3 *– base rates of tariff schemes 23, 24, 25 per 1 train and per 1 car on the whole route along the range belts, depending on the type of traction and the category of train;*

I_N, I_{nS}, I_n *– coefficient taking into account the change in traffic volume on the railway network of the Russian Federation;*

$I_{condi-perm}^{\inf}$, $I_N^{\inf}$, $I_{nS}^{\inf}$, $I_n^{\inf}$ *– forecast deflator indices for the accounting period.*

In determining the costs of paying invoices for provision of locomotive traction services, we need meters that reflect the operational work of a locomotive:

$$E_{locom} = E_{condi-perm} \cdot I_{condi-perm}^{\inf} +$$
$$+ e^{rent} \cdot I_{MT} \cdot I_T^{\inf} \cdot MT +$$
$$+ e^{brig} \cdot I_{Mh} \cdot I^{\inf} \cdot Mh +$$
$$+ e^{fuel} \cdot I_{Pl} \cdot I_{Pl}^{\inf} \cdot PL +$$
$$+ e^{heat} \cdot I_{nt} \cdot I_{nt}^{\inf} \cdot nt_{mot}, \tag{6}$$

where e^{rent} – expenditure rates for payment of services under a lease agreement for passenger locomotives with the crew (locomotive crews) for rent (including repairs);

e^{brig} – expenditure rates for payment of services under a lease agreement for passenger locomotives with the crew (locomotive crews) for managing leased locomotives (locomotive crews) of the lessor;

e^{fuel} – expenditure rates for payment of services under a lease agreement for passenger locomotives with the crew (locomotive crews) for provision of diesel fuel;

e^{heat} – expenditure rates for payment of services under a lease agreement for passenger locomotives with the crew (locomotive crews) for heating passenger cars;

MT – locomotive day of the fleet of locomotives in operation, loc.-day;

Mh – team hours of locomotive team depending on the type of traction;

Pl – ton-kilometers gross;

I_{MT}, I_{Mh}, I_{Pl}, I_{nt} –coefficient taking into account the change in the volume of traffic on the railway network of the Russian Federation;

$I_{condi-perm}^{\inf}$, $I_{MT}^{\inf}$, $I_{Mh}^{\inf}$, $I_{Pl}^{\inf}$, $I_{nt}^{\inf}$ – forecast deflator indices for the accounting period;

nt_{mot} – locomotive hours in motion.

Determination of the costs associated with the production activities of the shipping companies on their own:

$$E_{car} = E_{condi-perm} \cdot I_{condi-perm}^{\inf} +$$
$$+ e_{nt} \cdot I_{nt} \cdot I_{nt}^{\inf} \cdot nt^{train} +$$
$$+ e_{nS} \cdot I_{nS} \cdot I_{nS}^{\inf} \cdot nS^{train} +$$
$$+ e_{ntmot}^{pass\_car-hour} \cdot I_{ntmot_a} \cdot I_{ntmot_a}^{\inf} \cdot nt_{mot}^{pass\_car-hour} +$$
$$+ e_{ntmot}^{bagg} \cdot I_{ntmot_b} \cdot I_{ntmot_b}^{\inf} \cdot nt_{mot}^{bagg\_car-hour} + \tag{7}$$
$$+ e_{n\_depar}^{bagg} \cdot I_{n_{depar}} \cdot I_{ndepar}^{\inf} \cdot n_{depar}^{bagg\_car-hour} +$$
$$+ e_{Pdepar} \cdot I_P \cdot I_P^{\inf} \cdot P_{depar}^{pass\_train} +$$
$$+ e_n \cdot I_{n_n} \cdot I_{n_n}^{\inf} \cdot n^{train},$$

where e_{nt} – unit expenditure rate on the car-hour of the passenger car of the inventory fleet, rub./car-hour;

nt^{train} – car hours of a passenger car as part of a train, car-hour;

e_{nS} – unit expenditure rate per car-km of a passenger car, rub./car-km;

nS^{train} – car-kilometer train operation, car-km;

$e_{ntmot}^{pass\_car-hour}$ – unit expenditure rate per car-hour in motion, rub./car-hour;

$nt_{mot}^{pass\_car-hour}$ – car-hours transportation of passengers, car-hour in motion;

e_{ntmot}^{bagg} – unit expenditure rate per car-hour of a baggage car, rub./car-hour in motion;

$nt_{mot}^{bagg\_car-hour}$ – car-hours of baggage cars in train motion, car-hour;

e_{Pdepar} – unit expenditure rate for sale of tickets for a departed passenger, rub./depar. pass.;

$P_{depar}^{pass\_train}$ – number of departed passengers in a train, dep. pass.;

$e_{n\_depar}^{bagg}$ – unit expenditure rate per departed baggage car, rub./dep. car;

$n_{depar}^{bagg\_car-hour}$ – number of departed baggage cars, dep. cars;

e^n – unit expenditure rate per departed passenger car, rub./dep. car;

I_{nt}, I_{nS}, I_{ntmot_c}, I_{ntmot_b}, I_{n_depar}, I_P, I_{n_n} – coefficient taking into account the change in traffic volume on the railway network of the Russian Federation;

$I_{condi-perm}^{\inf}$, $I_{nt}^{\inf}$, $I_{nS}^{\inf}$, $I_{ntmot_a}^{\inf}$, $I_{ntmot_b}^{\inf}$, $I_{n_{depar}}^{\inf}$, $I_P^{\inf}$, $I_n^{\inf}$ – forecast deflator indices for the accounting period;

n^{train} – number of departed passenger cars in a train, cars.

Table 1 shows a brief description of the models of economic mechanisms in the structure of TMM and the totals of the sum of social costs on the basis of the presented methodology for operation of each model for the period up to 2025.

According to the table it is clear that «creation of a national carrier» model is characterized by the lowest total public costs. In this case, the estimated costs in 2020 will amount to 227,0 billion rubles, and in 2025 to about 230,7 billion rubles.

It should be noted that the models used in economically developed countries are more costly for the budget. In the conditions of a tight fiscal policy, implementation of models with increased budget subsidies is practically impossible. Although for other market participants and in general for development of passenger transportation, it may look more attractive.

The development strategy of the «national carrier» is fully aligned with the long-term development program of JSC Russian Railways, which allows for an optimal balance between the interests of the carrier and the infrastructure owner, to ensure maximum efficiency in the use of assets [16].

Conclusions.

1. Passenger railway transport remains a key element of the transport system of the Russian Federation, meeting the needs of the population and the state in transportation, contributing to creation of conditions for economic development and ensuring the unity of economic space throughout the country.

2. For transformation of the mechanism of regulation of passenger transportation in the long-distance, economic justification is necessary. In this regard, a methodical approach to evaluating the efficiency of TMM functioning on the basis of a minimum of public expenditures is proposed, taking into account the economic interests of the participants in the target market model and contributing to substantiation of

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Table 1

Characteristics of models of economic mechanisms in the structure of TMM and the total values of the amount of social costs for its operation

No.	Models of economic mechanisms in the structure of TMM	Brief characteristics of TMM model	Amount of public expenditures for functioning, bln		
			2017	2020	2025
1.	Creation of a national carrier	The key subject in TMM is the dominant carrier in the market, which determines the minimum parameters of passenger mobility in the Russian Federation, efficiency and financial stability, customer focus and sustainable development of various customer segments and regions of the Russian Federation.	228,7	227,0	230,7
2.	Subsidizing carriers	Full payment of the costs of infrastructure services and locomotive traction, with the drop in revenues offset by specific carriers.	–	234,0	235,9
3.	Regulatory model	All government functions, including the setting of tariffs, are preserved and consolidated in the industry executive authority in the field of transport. The organizer forms the lots and formulates the conditions of the tenders, coordinates with the owner of the infrastructure the parameters of the transport order for organization of passenger transportation.	–	243,2	247,0
4.	Infrastructure subsidies	Direct infrastructure financial support	–	244,8	342,6
5.	Route subsidies	Direct carrier subsidies for route formation	–	236,8	303,2
6.	Cross-subsidization	Cross-financing through other profitable activities	–	282,3	398,7
7.	Targeted subsidies	Subsidies for specific categories of citizens when traveling long-distance	–	245,8	316,9
8.	PPP in passenger transportation	Involvement of public and private capital in development of passenger rolling stock, including traction.	–	279,4	361,9

management decisions on development of the passenger complex.

3. Estimation of public expenditures indicates the priority implementation of «creation of a national carrier» model. In this variant, the predicted public expenditures for functioning of TMM look quite moderate. A positive aspect of the model is alignment of development priorities of the national carrier with the benchmarks of the long-term development program of JSC Russian Railways.

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