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BALANCE OF THE KEY SECTORAL PARAMETERS AS A METHODOLOGICAL FACTOR IN TRANSPORT TARIFFS FORMATION

Fundamental differences in the "price – cost" ratio for the quantitative parameters of a transport product such as speed and cargo turnover as well their temporal dynamics are identified. Methodological grounds for using the progressive profitability standards during the formation of transport tariffs concerning the speed component and also their inadmissibility as applied to ton-kilometres and passenger-kilometres are discovered.

Keywords: *transport services; speed of cargo delivery; tariff formation.*

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РІВНОВАГА ОСНОВНИХ ГАЛУЗЕВО-ЕКОНОМІЧНИХ ПАРАМЕТРІВ ЯК ЧИННИК МЕТОДОЛОГІЇ ТРАНСПОРТНОГО ТАРИФОУТВОРЕННЯ

У статті визначено принципові відмінності у формуванні співвідношень «ціна – собівартість» для кількісних параметрів транспортного продукту: швидкості та вантажообігу, а також їх часової динаміки. Виявлено методологічні підстави для застосування прогресивних нормативів прибутковості при формуванні транспортних тарифів стосовно швидкісної компоненти та його неприпустимість для тонно- (пасажиро-) кілометрів.

Ключові слова: *транспортна послуга; швидкість доставлення вантажу; формування тарифу.*

Форм. 3. Рис. 3. Літ. 11.

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РАВНОВЕСИЕ ОСНОВНЫХ ОТРАСЛЕВЫХ ЭКОНОМИЧЕСКИХ ПАРАМЕТРОВ КАК ФАКТОР МЕТОДОЛОГИИ ТРАНСПОРТНОГО ТАРИФООБРАЗОВАНИЯ

В статье определены принципиальные различия в формировании соотношений «цена – себестоимость» для количественных параметров транспортного продукта: скорости и грузооборота, а также их временной динамики. Выявлены методологические основания для применения прогрессивных нормативов доходности при формировании транспортных тарифов по скоростной компоненте и его недопустимость для тонно- и пассажирокилометров.

Ключевые слова: *транспортная услуга; скорость доставки груза; формирование тарифа.*

Introduction. The issue of economic valuation of the speed component for transport remains unresolved until the present day. Since the main index of services provided is the cargo or passengers turnover which ignores the speed component, the existing methods of tariffs differentiation based on time duration of delivery basically have no clear expression of balanced scientific principles. Approaches applied in practice tend to focus on the dependence between transportation speed and the added expenses incurred by a carrier to implement acceleration. This produces a dis-revision of extremely significant profitable price component by professional economists. Price often has been put only in proportional dependence with cost. Thus taking into account the customer value of a rapid delivery is performed infrequently and only for

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market balancing purposes. However, both customers and carriers have no guidelines revealing a possible correlation between transport speed and service price.

The use of transport market balance modelling by the group of parameters SPECIFIC TURNOVER – AVERAGE SPEED OF DELIVERY – COST OF SERVICES – TARIFF (Sych and Kyslyi, 2014) reveals some significant cost interdependences which shape the strategy of macroeconomic regulation. Correlation of functions OFFER – DEMAND as a basement of the model has theoretical and rather abstract nature. Not underestimating the general importance of these scientific results, they do not specify the time trends in cost parameters. However, the identified patterns of evolutionary speed changes (Sych and Kyslyi, 2014) require tracking the equilibrium dynamics for transport service costs in the development of this sector. Establishing the mutual dependency of COSTS – TARIFF is not the single main purpose in this case but also the fixation of objective changes in socially important service costs.

Latest research and publications analysis. This study has been made as a continuation of previous publications on modelling the macroeconomic balance of transport production components (Kyslyi, 2014), aimed to expand the boundaries of graphic interpretation of sectoral development. As the basis for calculations was taken the graphical method used by V. Basylevych, K. Basylevych and L. Balastryk (2008) in the interpretation of IS – LM model named after economists J. Hicks and A. Hansen.

The research objective is to define the character of dependence between the evaluation parameter changes and technological improvement of transport processes naturally caused by market demands, mostly the demand for accelerated delivery of goods and passengers.

The current practice of setting transportation tariffs is based on the payback principles, market parity and direct state regulation because of their overall importance. Limits are not set for a range of transport modes and if it is a certain specialization for cargo types, passenger traffic types etc., some modes which are fundamentally different by speed and delivery capacity act in very specific price niches. These niches are different in pricing for transport services. Meanwhile, the above is also some sort of technological connectedness of all modes forming a single transportation system without substantial impact of these differences on the character of the transportation process. Current widespread use of intermodal transport requires a common methodological approach to pricing which could have the flexibility to take into account the fundamental differences between transport modes. This difference is the speed. Such an approach could also solve the relevant question of motivated differentiation for tariffs by the parameter of delivery time within one mode. However the lack of fundamental theory of quantitative interpretation of speed impact on the value of transport product reduces solving the problem just by traditional empiric palliative measures. The existing suggestions of individual authors concerning economic consideration of transport speed unfortunately so far are confined only to the offers related to intra-firm statistics when calculating the quantitative physical volume of services is provided in value terms relied on the proportion OFFER – DEMAND (Potthoff, 1975; Jaworski, 1968; Kaplick, 1958; Koroljowa, 1952; Yelovoi, 2003).

This paper is an attempt to identify the interrelation between the return parameter of a transport product and its speed feature.

Key research findings. As the input interrelationships for constructing the desired patterns, the revealed objective dependence is taken (Sych and Kyslyi, 2014) between time as the basic measurement unit for any development process and the maximum attainable velocity of a vehicle as the key consume feature of transport service (first) and between particular feature and the related market tariff as the valuation of service (second).

Quadrant I (Figure 1) was arbitrary selected to display the first dependence, where the key configuration of submitted curve shows the acceleration as compared to temporal progression increase of transport speed. We note that particular location is not important here; the same also applies to the rest of the three quadrants. Quantitative mathematical interpretation is not interesting the same way, although it is known that the qualitative form of that function is parabola (Sych and Kyslyi, 2014).

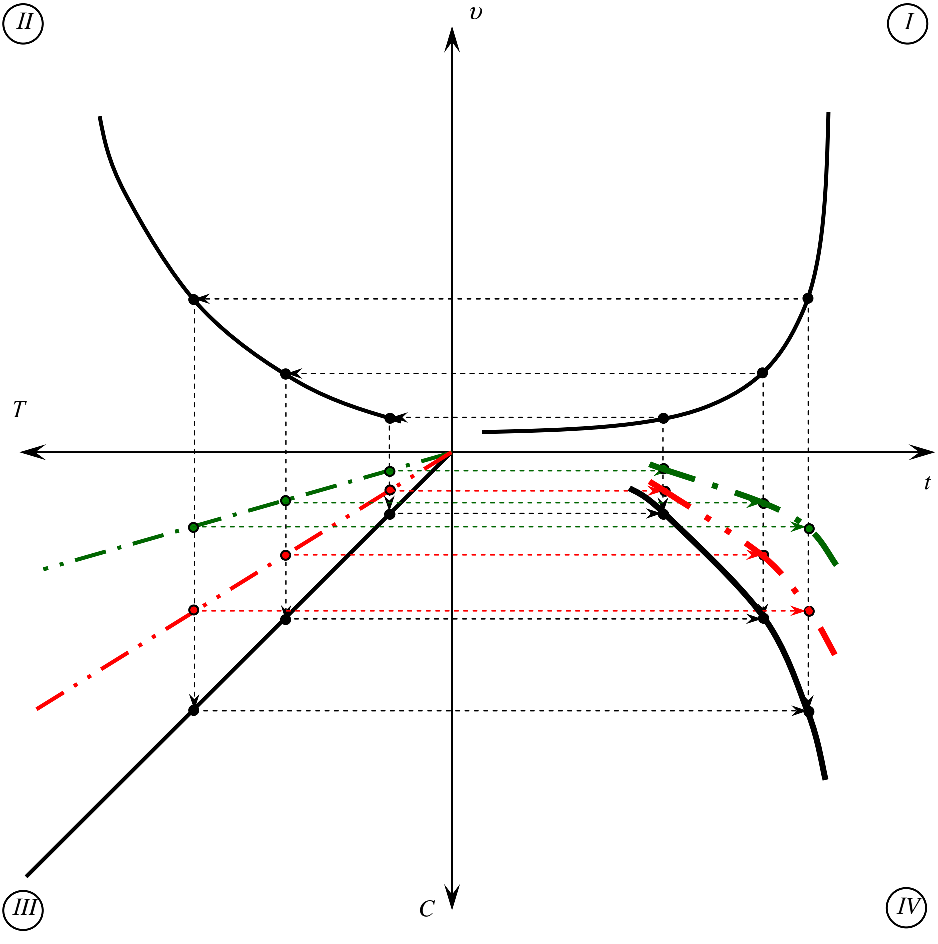

Figure 1. **The model of temporal dynamics of accelerated transport services,** *author's*

The phenomenon of accelerated growth of transport speed is spread not only in the time dimension but also in the financial one. This dependence is shown in the next quadrant.

Reverse look at the dynamics of acceleration in monetary terms (Sych and Kyslyi, 2014) demonstrates price increase which is relatively slower as compared to the speed result. The reason for this should be seen in the opposite sense of speed factor in the dialectical pairs TIME – SPEED and TARIFF – SPEED. While for the first case the correlation determines the speed as a result factor to be achieved by using the time resource, for the other one it is a cause factor increasing the consume utility of transport service, what ultimately creates the conditions for increasing the tariff by a carrier. Reducing the marginal return of resource produces the slowdown of economic result increase.

Thus the schedules of adjacent quadrants I and II in direct correlation show two relatively separate aspects of one phenomenon. The first of them is caused by ACCELERATED GROWTH OF TRANSPORT VELOCITIES LAW (Sych and Kyslyi, 2014), while the second one expresses the matter of the LAW OF DIMINISHING RESOURCE RETURN. With this transport accelerating finds inside the two interrelated dimensions its both technological and economic interpretations. While the economic need for transport acceleration (Sych and Kyslyi, 2014) stimulates more and more intensive implementation of innovative technologies in cargo & passengers delivery, taken with them accelerated growth of speed lets bring marginally less and less financial funds for paying the obtained result.

The next two quadrants (III and IV) are built on the additional axis of costs. Its presence is caused by the need to track the objective regularity of transport production expenditure component changes depending on time parameter. The reason for linking the four relevant parameters (time – speed – tariff – cost) is the need for direct equilibration between the cost transport product component and the time feature of acceleration which is an inherent attribute of the present stage of science and technology progress (Sych and Kyslyi, 2014).

For achieving this goal we need to construct new lines by making the mutual projection of the known dependences onto the coordinate axes (Sych and Kyslyi, 2014), which would let us determine the equilibrium trend according to macroeconomic realities.

Quadrant III plays the transitional role in constructing the final graph. The graph of tariff function with the cost argument located here is growing and is directly proportional. The starting position for using this type of linear dependence is the need to respect the principle of economic return, which implies the existence of a progressive relationship between spent on transportation cost and price. Price itself is the sum of costs and profit required for expanded reproduction. The slope of tariff function over the cost axis is defined by the ratio of return that conventionally can be taken as the fixed relative magnitude. Generally, any market or fixed by law variations in the method of establishing profit margins can edit the linear character of particular function to the arbitrary one but principle in that issue matter of progressive dependence between tariff and costs remains the same.

In the fourth quadrant are built the equilibrium values of the total transport costs which being non-functional represent the total set of all possible parameter combinations of the group TIME – SPEED – TARIFF.

Raising the cost of transport services in time demonstrated by the resulting graph is quite obvious and predictable due to the presence of progressive input dependencies. However, according to the research goals the interest primarily is not this fact but the nature of dependence. With a more intensive comparably to the cost tariff growth (with greater rate of return) cost growth in time should take the opposite way, it should be less rapid. Conversely, more acceleration should meet less normal return.

To enhance the visibility of demonstration in Figure 1 three principal types of situations are identified: continuous straight line for equivalent to costs tariff growth (zero profit margin); dash-dotted one for significantly accelerated growth (higher rate of return); two-dashed one for less rapid growth (lower rate). When drawing the basic formula is used:

$$T = C + P \Rightarrow [P = C \times k] \Rightarrow T = C + C \times k \Rightarrow T = C \times (1 + k), \quad (1)$$

with T – transport tariff, money units; C – manufacturing cost, money units; P – the absolute value of profit, money units; k – the rate of return, share units.

It is the second version from the mentioned ones which causes the optimum relation. This relation is meaningful for economy reasons as that which helps avoid the overspending of resource in a certain time period. Thus, for all macroeconomic risks, relatively increased transport tariff serves as a guarantee of caused by a factor restraint (factor is considered as the speed component of a sectoral product) for objective gradual increase of transport expenses. This is caused by the need to ensure general transport acceleration but on condition of setting the market-reasoned (i.e. received as a result of supply – demand interaction) increased ("speed") tariff.

Taking into account the known relationship between the price level of services and their costs the proposed model could be reformatted in relative positions of its components. It is about mutual replacement of T and C axes (Figure 1).

Thus, in the resulting quadrant IV we obtain the inverse relationship in which the most rapid tariff in comparison with the costs growth produces in the same way its most acceleration in time (Figure 2). From elementary logic considerations such result is expected because cost and price are the inversely proportional values (formula (1)). Meanwhile, as the extremely significant one should be considered the role of the increased "speed" tariff, which is potentially able to provide the slowed expenditure of economic resources. In other words, the increase of transportation speed provided together with margin rate is economically reasoned, logical and objectively preconditioned. It does not only set the economic interest of the carrier to reduce the time of delivery it also underlies the resource savings, at which the biggest consumed speed result must match the lowest it costs spent.

The growth of tariff in this case is an objective phenomenon regulated through the DEMAND – OFFER LAW; increase of cost should be seen as a secondary phenomenon. The best in macroeconomic terms course of transport costs increase can be provided only by growing the rate of return k (1). On conditions of low profit as the interest has only direct growth of costs can encourage a transport carrier company to opt for new speed technology which are more expensive but also more attractive.

Another fundamental purpose of this research is to define the similar essential subsequences of proportionally same as already considered time changes but only relatively to another significant parameter of transport product which is turnover.

Identification of existing differences will allow making fuller conclusions on tariff regulation.

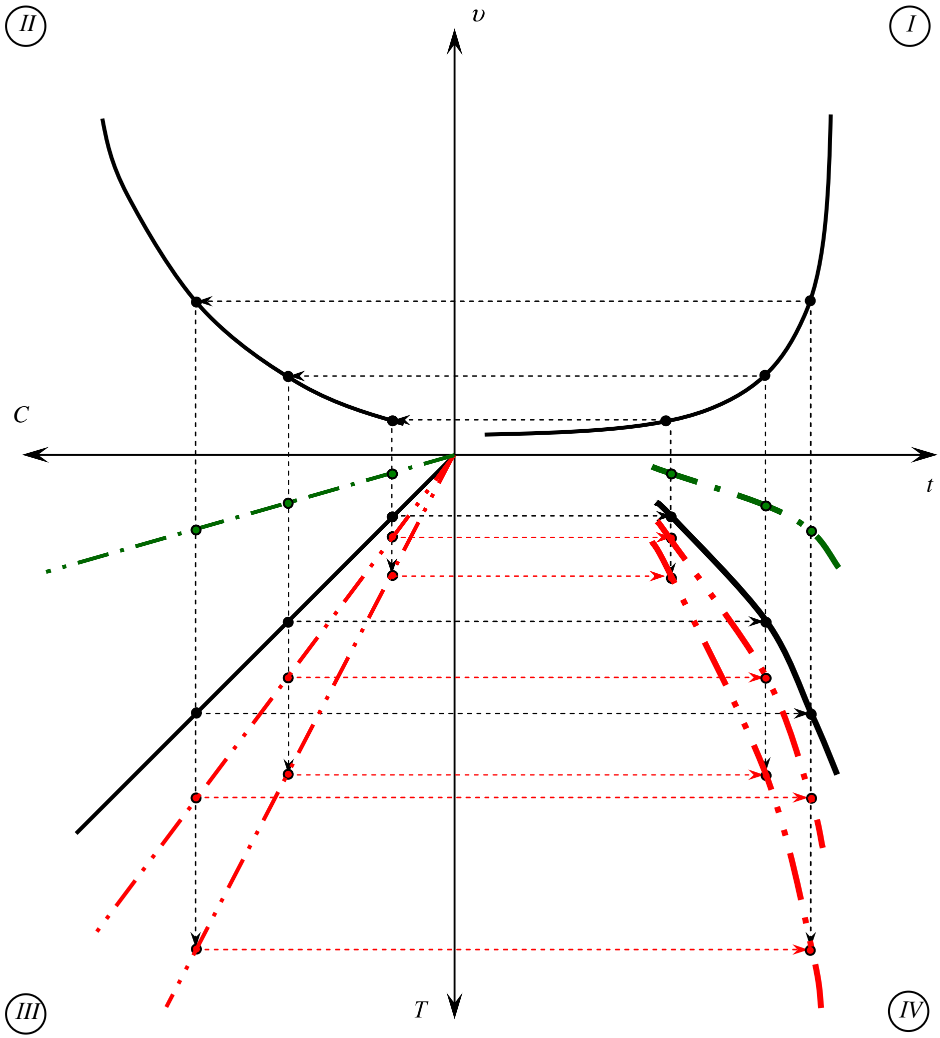

Figure 2. **Inverted model of time dynamics of accelerated transport services costs,** *author's*

With that purpose abscissa ν of the graph in Figure 1 is replaced by Σpl (Figure 3) which is the axis of general cargo turnover of a transport system. For drawing the first quadrant curve we use the time dynamics of Ukrainian transport productive activities from 2000 to 2012.

Dependence of the second quadrant is replaced with the according to cargo turnover parameter one which is diminutive, reverse and proportionate. It reflects the generally known pattern of reduction in the rate of return with the growth in values of production because of operating leverage. Increased Σpl leads to an overall reduction of production costs which in turn causes, under competitive market conditions, a proportional reduction of the transport service price (tariff). Continuing other conditions of the model produce a similar to the one above result (Figure 1) with the same findings: increased tariff is the factor of slower economic growth in costs as the objective condition of technological transport development. However, the descending character of dependence $T = f(\Sigma pl)$ in Figure 3 causes certain essential features of forming the equilibrium cost C in time trends. The first of them is a feedback between the volumes of cargo turnover and the cost of services which is opposite to a similar dependence of cost and speed shown in Figure 1.

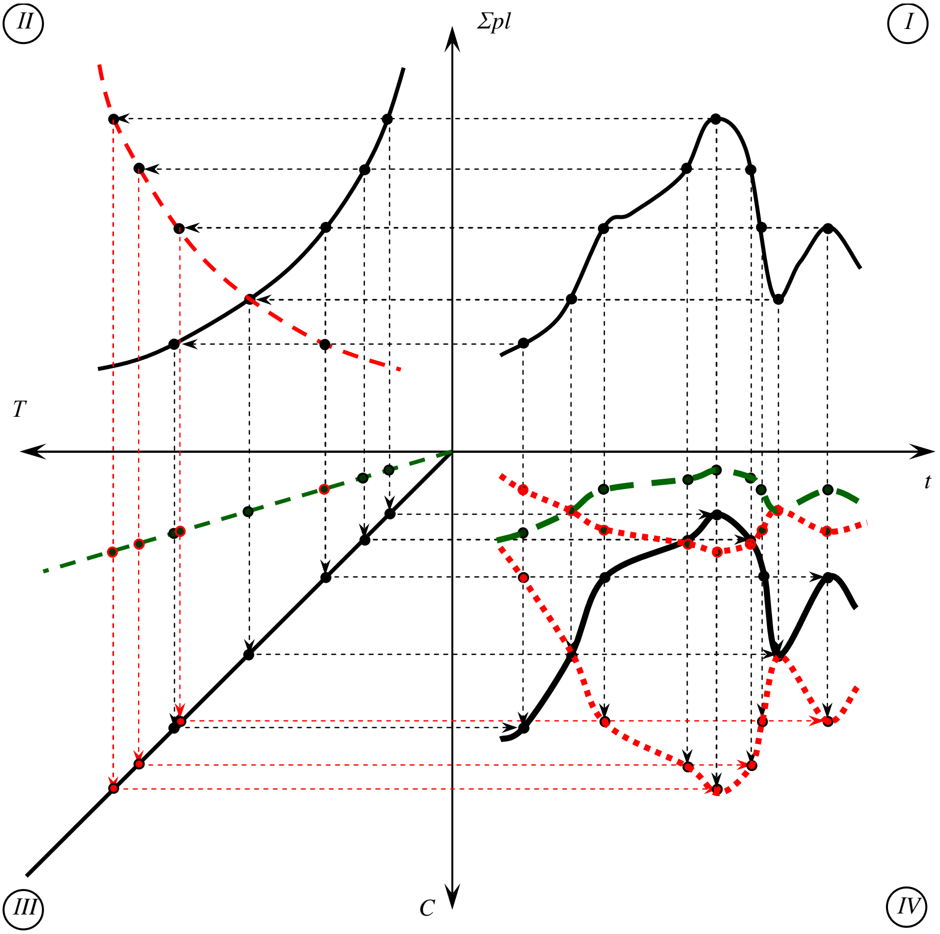

Figure 3. **Equilibrium cost-time dynamics caused by changes in transport turnover,** *author's*

The reason for this is already noted for the operating leverage effect which is quantitatively related to the model parameter T as follows:

$$T = C \times (1+k) = \left[C = C_v + C_c;\ L = \frac{C_c}{C_v} \right] = C_v \times (1+L) \times (1+k), \qquad (2)$$

where C_v, C_c – variable and constant parts of cost, respectively; L – operating leverage.

Given the increase of turnover with simultaneous decline trends for tariff the cost reduction takes place because of constant expense component of costs by reducing L:

$$\left[\sum pl\uparrow; T\downarrow\right] \Rightarrow T\uparrow = C_v \times \left(1+L\downarrow\right) \times \left(1+k\uparrow\right). \quad (3)$$

This tendency is clearly negative for the transport carrier therefore a positive macroeconomic effect comes into direct conflict with negative microeconomic effects, what is not observed for the speed component of the product.

In order to visualize this conflict in the second sector of Figure 3 hypothetical dashed curve of increasing tariff is added. It aims to demonstrate the effect of reducing transport tariff as a result of operating leverage. It is obvious that the absolute cost reduction relatively to the same value of tariff with higher rate of return is decisively bigger (quadrant III). So, for the carrier who uses progressive tariff the operating leverage is objectively less than its value for the average tariff uniformly depends on costs.

Conclusions. The conducted research using the graphic-analytical method of modelling the market balance with interaction of key transport economy parameters let us summarize as follows.

From the macroeconomic point of view on the services of accelerated transportation of goods and passengers the progressive method of calculations stands not only as acceptable but also reasonable for tariff settings. Its effective promotion would encourage carriers accelerate the delivery methods under minimal economic costs. This saves the overall costs of transport system while maximizing the speed result; providing at the same time very competitive conditions for transport market functioning. This is a significant factor for the "upper" limit of tariff values as the parameters for economic evaluation of effective demand.

On the contrary, understated "speed" tariff provokes rapid costs increase in a relatively short time under commonly used transportation technology.

All mentioned above, however, does not concern the possibility for progressive tariffs use to the parameters which form cargo or passengers turnover: the weight of freight (number of passengers) and transportation distance. The reason for this is tearing down natural economic incentives for business development through operating leverage of transport services.

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Стаття надійшла до редакції 28.07.2015.