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**WHOLESALE TARIFFS IN TRANSPORT AS A TOOL FOR INNOVATION IN THE AREA OF TARIFF AND TICKET INTEGRATION OF RAIL CARRIERS**

**Summary.** The purpose of this article is to identify the possibility of using the concept of wholesale tariffs as a tool for tariff and ticket integration of rail carriers, with a view to improving cost-effectiveness and the reduction of procedural barriers for customers resulting from lack of tariff integration of rail carriers in Poland. This article aims to raise the awareness of the concept of wholesale tariffs, which are successfully used as a tool for tariff integration and competitiveness in the telecommunications market, and to initiate discussions among professionals and researchers in the transport sector. The following test methods were used: synectics, literature review, analysis and synthesis, induction and deduction, and documentation study. The analyses conducted showed the role of market regulators in improving cooperation between rail carriers to develop a better transport offer for rail passenger transport in Poland and, consequently, to increase the share of passenger transport in this transport sector. Similarly, it indicated that the concept of wholesale tariffs may also be a revenue (yield) management tool for rail carriers.

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**Keywords:** transport tariffs, tariff and ticket integration, innovation in services, revenue (yield) management

## 1. INTRODUCTION

The market orientation of rail transport in Poland, which took place following the transition after 1989, led to a number of changes of different nature. One major change is that there are currently 18 carriers in the Polish market for rail passenger transport services. The main objective of these changes was to introduce a competitive mechanism between carriers, which was supposed to result in positive outcomes for consumers/passengers. Unfortunately, negative effects have resulted from the lack of coordination and cooperation between carriers. One of the negative effects in the case of travels using the transport services of different rail carriers is the need to 'break' the tariffs and carry out transport operations using several tickets issued for each carrier separately. The need to return tickets and to purchase new tickets, if necessary to change the carrier, for example, in the event of disruptions to the train traffic, is also relevant in this context. A solution to this problem is the tariff integration between certain carriers, mostly in the area of metropolitan or agglomeration transport.

The share of the abovementioned 18 rail carriers (situation in 2017, in 2018 there were 14 licensed carriers<sup>4</sup>) in the Polish market varies and is illustrated in Tab. 1.

Tab. 1

Shares of licensed rail passenger carriers in the rail passenger market in Poland in terms of number of passengers

Carrier	2015	2016	2017	2018
Przewozy Regionalne	27.4%	27.2%	26.3%	26.2%
Koleje Mazowieckie	22.6%	20.8%	20.4%	19.2%
PKP Intercity	11.1%	13.2%	14.1%	14.9%
PKP SKM	14.0%	14.3%	13.9%	13.6%
SKM Warszawa	9.0%	8.1%	7.6%	6.1%
Koleje Śląskie	5.7%	5.2%	5.2%	5.5%
Koleje Dolnośląskie	1.9%	2.5%	3.1%	3.8%
Koleje Wielkopolskie	2.6%	2.8%	2.7%	3.5%
WKD	2.7%	2.4%	2.6%	2.8%
Koleje Małopolskie	0.6%	1.6%	1.9%	2.1%
ŁKA	0.6%	0.9%	1.3%	1.5%
Arriva RP	1.5%	0.8%	0.80%	0.7%
UBB	0.2%	0.2%	0.2%	0.2%
Others	0.02%	0.03%	0.02%	0.02%

Source: report on the functioning of the rail transport market in 2018. The Office of Rail Transport, Warsaw 2019, p. 26, available at: <https://utk.gov.pl/pl/raporty-i-analizy/analizy-i-monitoring/statystyka-przewozow-pa/13956,Dane-podstawowe.html>

<sup>4</sup> Based on the information of Office of Rail Transport: <https://utk.gov.pl/pl/raporty-i-analizy/analizy-i-monitoring/statystyka-przewozow-pa/14138,Dane-eksploatacyjne-w-2018-r.html>

In addition to competition in the provision of services in the rail passenger segment, which is desirable by consumers, there are also negative effects on the end customer/passenger. One of these is no option (or limited options) to travel based on a single ticket on the route served by several carriers. More so, it is a problem for travellers that tickets of other carriers are not accepted when travelling on the train of a different carrier than originally planned by the traveller, who therefore purchased a train ticket of a specific carrier. This is often the case in the event of disruptions to train traffic as a result of incidents. The proposed concept of wholesale tariffs has its roots in telecommunications services and forms part of organisational and management innovations<sup>5</sup>. The tariff scheme in transport involves billing charges to end-users (passengers) and has the form of retail tariffs. The introduction of mandatory wholesale tariffs for payments between carriers may be one of the tools for the introduction of a single ticket (a number of other activities exist in this area, for example, e-ticket, electronic purses, etc.), as well as a solution to the problems identified above (travel based on a single ticket without the need to “break” the tariff when several carriers are involved, reducing the nuisance of transport disruptions through the possibility to travel based on a ticket issued by a different carrier, etc.). Similarly, the concept of wholesale tariffs for rail passenger services can become a transport policy tool and a management tool for stakeholders in this service segment<sup>6</sup>.

## 2. TRANSPORT TARIFF AS A TOOL FOR PRICE CALCULATION AND COMPETITIVENESS

The transport service, rail inclusive, has a certain value. The concept of value in economic sciences is widely described; there are a number of approaches to its identification, including the determination of the transport service value. On the other hand, prices in transport, fulfil different functions, the essential ones include:

- revenue generating,
- calculation,
- incentive,
- market equilibrium.

In the management theories, the following price functions are identified<sup>7</sup>:

- information
- redistributive
- stimulation (incentive)
- aggregation

There is, in general, no difference between the indicated price functions in economic terms or in management terms, since the definition of the functions in question shows how this function is carried out. An example is an information function, known also as an information and incentive function in literature. The price as a parameter makes it possible to determine sales revenues and encourages specific behaviour of market players/parties. It

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<sup>5</sup> More information: P. Niedzielski, Creativity and innovative processes in the transport services market. Model approach, Polish Economic Society Szczecin branch, Szczecin 2013

<sup>6</sup> More on stakeholder management in transport: P. Niedzielski, Innovation policy in transport, University of Szczecin Scientific Publishing House, Szczecin 2003

<sup>7</sup> Encyclopedia for management; available at: <https://mfiles.pl/pl/index.php>

informs the buyer how its financial capacity will decrease (demand) in the event of purchase, while the seller is informed on how its revenue will increase when the transaction takes place. Thus, the function defined in this way is included in the profit function, and partially in a calculation function. Very often, this function (information and incentive) is associated with the end customer (retail tariff – B2C). In the case of wholesale tariffs, this function will apply to carriers (B2B), and it can be an interesting tool to stimulate the competitiveness of rail passenger services as a whole segment, for example, in comparison with personal motor vehicles. The corresponding wholesale tariffs in telecommunications are a tool for the market play of individual operators, including virtual operators<sup>8</sup>.

Each of the functions is relevant. However, it should be stressed that price shaping in the economy is a mechanism to regulate the development of production and to ensure economic and market equilibrium<sup>9</sup>. The price for a product or service may be determined based on a number of ways, considering a broad range of determinants. The tariff-based price settling method is applied for mass and repetitive acts of purchase and sale<sup>10</sup>. Transport services are mass in nature, as there are both clients (passengers) represented in large numbers on the demand side, as well as transport modes and carriers represented in large numbers on the supply side. The tariff-based prices thus simplify the conclusion of transactions between the service providers (carriers) and the recipients (passengers).

Therefore, the tariff is one of the price shaping tools for transport services. The word “tariff” is derived from Arabic, in which the word “tarif” means an announcement or a notice. The tariff is generally associated with systematically arranged lists of prices for goods and services. The tariff is defined as a price list together with the conditions of use of these prices, made public in a relevant form<sup>11</sup>. The tariff tool is often used to calculate prices for services such as telecommunications, electricity supply, gas supply and a number of other services, including transport services.

Tariff schemes are now often internal in nature because they do not have to be approved by any state authority. The need to approve selected tariffs is, in turn, one of the tools of the country’s economic and social policy. With regard to public transport in cities and agglomerations, shaping the prices for public mass transport services is part of the city’s policy implemented by the relevant authorities.

Thus, the concept of a “transport tariff” has, in practice, a different scope of meaning/interpretation, from very narrow to very broad one. In the narrow sense, transport tariffs are associated with a table of transport service charges<sup>12</sup>. In the broader sense, “(...) the transport tariff is understood as the list of rates (unit prices) for the provision of certain transport services (carriage and forwarding) officially made public, as well as a set of rules defining the conditions for the application of these rates and the way of calculating charges for each transport service based on those rules<sup>13</sup>.” In the broadest sense, transport tariff means not only a table of charges together with the rules for calculating them but also a set of rules and regulations governing the performance of certain transport services (carriage and forwarding). The scope of the tariffs currently in force has been largely influenced by civil

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<sup>8</sup> A virtual telecommunications operator is an operator who provides services and does not own its own telecommunications infrastructure. An analogy may be the purchase of part (or all) of the transport vehicle’s capacity (buses) by operators/distributors of passenger transport services. An example is the e-podróżnik portal.

<sup>9</sup> W. Grzywacz, *Transport tariffs*, WKiŁ, Warsaw, 1985, p. 31

<sup>10</sup> *Ibidem*, p. 81

<sup>11</sup> *Ibidem*, p. 99

<sup>12</sup> *Ibidem*, p. 99

<sup>13</sup> *Ibidem*, p. 99

law relations and economic relations as regards the provision of transport services, or in broader terms, transport, logistics and insurance services. Thus, the concept of a “tariff” is often understood in a very narrow and common sense<sup>14</sup> to be associated with the price list itself.

In literature, three types of price calculation methods can be distinguished<sup>15</sup>:

- cost method (service provider-oriented),
- demand method (consumer-oriented),
- imitation method (competitor-oriented).

These approaches can be distinguished to some extent in the tariff development schemes which have been established in Polish literature. In addition, it should be noted that technical and technological developments, in particular in IT and telecommunications, also force/lead developments in the ways of using tariff as a charging tool for services, including for transport services. Therefore, tariffs may be constructed in different ways, depending on the needs and specificities of the particular transport activity, as well as charging/calculation and collecting technologies.

The current market for mass passenger transport, including rail passenger transport, is characterised by a relatively large number of licensed carriers operating in the Polish market,<sup>16</sup> and consequently, a large number of tariff arrangements. The tariff offers of rail passenger carriers have become a marketing tool with the purpose of trying to meet the expectations of many customers as possible in an optimum way and making the offer of a particular carrier more competitive in view of the changes in customers’ needs and requirements, as well as their increasing choice of individual means of transport, or of other competing modes of transport (for example, bus transport – Flixbus and other carriers). This is illustrated in Tab. 2, which shows that taking 2000 as the base year (in the 90s, the decrease in the competitiveness of rail passenger transport was greater than in the 21st century), the drop in number the of passengers reached almost 30% (2010), and the drop in transport output expressed as passenger-kilometre reached the level of 35% (2014).

Tab. 2

## Rail passenger services in Poland

Years	number of passengers in million	Transport output million passenger-km	average distance km	% of passengers Year/year	% of passengers 200 = 100 %	% output year/year	% output 2000 = 100 %
2000	360,7	24 092	66.8	100 %	100 %	100 %	100 %
2001	332,2	22 469	67.6	92.10 %	92.10 %	93.26 %	93.26 %
2002	304,1	20 749	68.2	91.54 %	84.31 %	92.35 %	86.12 %
2003	282,5	19 382	68.6	92.90 %	78.32 %	93.41 %	80.45 %
2004	271,2	18 305	67.5	96.00 %	75.19 %	94.44 %	75.98 %

<sup>14</sup> A. Koźlak, *Transport economy. Theory and business practice*, WUG Gdańsk 2007 p. 329

<sup>15</sup> J. Jackiewicz, P. Czech, J. Barcik, *Tariff and ticket schemes in urban transport – Part 1*, *Zeszyty Naukowe Politechniki Śląskiej*, s. Transport Nr 67, Katowice, 2010, p. 68; as in: Hanna N., Dodge M.R., *Price Evolution. Strategies and procedures*, PWE, Warsaw 1997

<sup>16</sup> According to the information provided by the Rail Transport Office (UTK) in 2017, there were 18 licensed passenger railway carriers operating in the Polish market (<http://www.utk.gov.pl>)

2005	257,6	17 815	69.2	94.99 %	71.42 %	97.32 %	73.95 %
2006	262,6	18 299	69.7	101.94 %	72.80 %	102.72 %	75.95 %
2007	278,8	19 495	69.9	106.17 %	77.29 %	106.54 %	80.92 %
2008	292,7	20 263	69.2	104.99 %	81.15 %	103.94 %	84.11 %
2009	284,1	18 692	65.8	97.06 %	78.76 %	92.25 %	77.59 %
2010	262,3	17 918	68.3	92.33 %	<b>72.72 %</b>	95.86 %	74.37 %
2011	264,5	18 169	68.7	100.84 %	73.33 %	101.40 %	75.42 %
2012	274,4	17 866	65.1	103.74 %	76.07 %	98.33 %	74.16 %
2013	270,4	16 797	62.1	98.54 %	74.97 %	94.02 %	69.72 %
2014	269,1	16 071	59.7	99.52 %	74.60 %	95.68 %	<b>66.71 %</b>
2015	280,3	17 443	62.2	104.16 %	77.71 %	108.54 %	72.40 %
2016	292,6	19 181	65.6	104.39 %	81.12 %	109.96 %	79.62 %
2017	303,6	20 321	66.9	103.76 %	84.17 %	105.94 %	84.35 %

Source: authors' study based on UTK data available at: <https://utk.gov.pl/pl/raporty-i-analzy/analzy-i-monitoring/statystyka-przewozow-pa/13956,Dane-podstawowe.html>

An important determinant to stop and reverse a negative trend for the rail transport to lose its competitiveness in passenger services was to invest in suprastructure (purchase of modern rolling stock) and in infrastructure (paradoxically, during modernisation, the quality of service is decreasing due to limitations and longer travelling time).

New emerging tariff arrangements are intended to allow different tariff rates to be applied depending on the segment of customers, the length of the journey, the choice of the distribution channel and a number of other factors. The implementation of the identified arrangements is currently facilitated mainly due to the highly developed ICT system<sup>17</sup>, which makes it significantly easier to manage the ticket tariffs in a dynamic way, by the user as well<sup>18</sup>.

### 3. PUBLIC MASS TRANSPORT TARIFF SCHEMES AS A REVENUE (YIELD) MANAGEMENT TOOL

It should be noted that prices for transport services in the passenger transport sector are subject to partial regulation in view of the state's social and economic policy, for example, by means of discounts and accessibility arrangements. Therefore, tariff schemes continue to constitute a general way of setting prices and presenting them to users. This phenomenon affects directly not only transport carriers, but usually, transport organisers, that is, local government authorities, and in particular, the municipalities. The municipalities, which are responsible for the organisation and financing of public mass transport, which increasingly have the possibility to use the tariff scheme understood as a price list for services provided to

<sup>17</sup> This is influenced by development of telecommunications wire infrastructure, including fibre, as well as radio/wireless infrastructure, for example, GSM (Global System for Mobile Communications), UMTS (Universal Mobile Telecommunications System), LTE, LTE +, LTE Advanced (Long Term Evolution), etc. An important element is the widespread use of Bluetooth, Wi-Fi or GPS (Global Positioning System), or QR codes, barcodes, RFID (Radio-frequency identification), etc.

<sup>18</sup> An example in transport may be dynamic tariffs that come from the air transport as a result of the launch of low-cost carriers. Algorithmic dynamic tariffs are also successfully applied by bus carriers. More information: P. Niedzielski, K. Leszczyński, K. Dyl, Tariff as an area and tool of innovation, *Zeszyty Naukowe Uniwersytetu Gdańskiego, Ekonomia Transportu i Logistyka* nr 74, Gdańsk, 2017, p. 315-330

improve the pricing system for services rendered to their customers, in particular residents and visitors/tourists, taking into account the objectives of municipal policy in different areas, can be a good example. It is in these schemes that the issue of tariff and ticket integration is most advanced. The tariff scheme has become a tool to improve the sales and distribution process of the services provided. It should also be pointed out that an important tool for shaping competitiveness in transport is to maximise the economies of scale and network effects by transport carriers<sup>19</sup>. Economies of scale occur when the increase in the volume of transport output is accompanied by a decrease in the average cost of production. There are several types of economies of scale in transport<sup>20</sup>:

- resulting from the size/capacity of the transport vehicle (*economies of vehicle size*),
- resulting from the size of the transport carrier, measured by the size of the fleet (transport fleet) at the disposal of the carrier (*economies of fleet size*),
- resulting from the size of the carrier's transport network (*economies of network size*),
- resulting from the extension and modernisation of transport infrastructure.

Tariff and ticket integration of rail passenger transport using the concept of wholesale tariffs forms part of economies of scale resulting from the size of the carrier's transport network (*economies of network size*), while stressing that it is necessary to increase coordination of timetables between carriers<sup>21</sup>.

Technological developments, including in IT and telecommunications, which allow the processing of significant amounts of data and the automation of customer service at the stage of contracting and billing, make it possible to observe the use of tariffs for transport services:

- as an important marketing tool,
- to shape competitiveness,
- to make the offer of a particular carrier more attractive,
- to make public transport more appealing;
- as a policy component of sustainable development.

In constructing the billing systems, including for transport services, an approach based on revenue (yield) management (management of income, management of profits) is increasingly used – maximising revenues from the sales of services offered (for example, ticket sales, hotel sales), by making optimal use of the resources available, at the highest possible unit price of the service, by determining an optimal price for the transport service that the customer is able to pay, using the transport vehicle's capacity to a maximum extent<sup>22</sup>.

The concept of YM (Yield Management) can also be defined as actions taken to control prices and capabilities in providing services to increase revenues. This is done by differentiating the prices for the same services for different customer segments with different price sensitivity and different profitability. In addition, it is important to stress the lack of possibility to produce services for stock as well as the simultaneity of production and

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<sup>19</sup> More on that: D. Bernacki, Network effects in production of transport services, *Zeszyty Naukowe Uniwersytetu Szczecińskiego* (Nr 813), *Problemy transportu i logistyki* nr 25, Szczecin 2014, p. 7-20

<sup>20</sup> D. Bernacki, Network effects in production of transport services, *Zeszyty Naukowe Uniwersytetu Szczecińskiego* (Nr 813), *Problemy transportu i logistyki* nr 25, Szczecin 2014, p. 9

<sup>21</sup> The authors' position is that, in practice, the idea of wholesale tariffs in passenger rail transport can also have a positive impact on the coordination of timetables. The possibility to sell tickets for the trains of different carriers based on one's own fare and the wholesale payments between carriers may limit the launch of trains by different carriers on the same (overlapping) route in almost identical 'time slots'.

<sup>22</sup> This is done using algorithmic dynamic pricing

consumption of the services, which requires maintaining a certain high capacity that ensures that services can be provided at peak demand period. Thus, YM, due to price elasticity, allows to adapt, by means of the price, the demand to the actual capacity for providing services (market function) and to maximise the use of the service capacity (rationalisation function), including to customers with less financial potential. It should be noted that the application of YM requires certain conditions to be fulfilled, that is<sup>23</sup>:

- market segmentation of customers with different price elasticity,
- no option to resell or transfer the service between the customers in the same segment or in different segments
- the presence of a market failure mechanism (for example, asymmetry of information).

This concept was originally designed and implemented in air transport<sup>24</sup> and, due to positive financial effects achieved<sup>25</sup>, it was quickly adopted in other areas, such as hotel services, car rental, etc. Revenue (yield) management, owing to technological developments in the area of telecommunications, the internet, Big Data, and the growing importance of marketing, including building customer loyalty, is rapidly developing. Important to observe is the service sectors that implement the concept for price settling to improve the level of efficiency of the resources held. The concept of yield management and, as a result, the maximisation of revenue, is implemented based on managing two key components, that is, the price (price strategy) and the control of the availability of resources (for example, the occupation of seats in vehicles, hotels, etc.).

Passenger rail carriers use to a certain, though limited degree, YM experiences from other service sectors. It should be noted that the classic approach in the service sector in this regard was the “last minute” rule, namely the sale of “goods” (seats in a transport vehicle by the carrier, slots on a tour by the tour operator, rooms in a hotel). This approach led potential customers to put off their purchase until the last minute, which in turn resulted in losses for the service provider and some dissatisfaction with customers who bought the service earlier at the “full cost”. This approach was caused by the rationality of the service providers, based on the principle of “perishable goods” (empty seats in a transport vehicle or empty rooms in a hotel on the date of travel are “perished goods”; the closer the time of departure the more perishable the good). Taking efficiency in the use of available resources as a guiding principle, which manifests in 100% of the seats sold on a given vehicle or 100% of rooms booked in a hotel, carriers were ready to sell seats on the same day for any amount. Such a strategy (“last minute”) at the beginning had a certain financial impact on service providers, but later on became counter-productive in terms of attitudes of customers, who increasingly abstained from early purchases, making it necessary to sell an increasing number of “spare seats”, which in turn encouraged customers (new customers) to plan their purchase at the “last minute”. Now the “first minute” rule is in place, with more discounts offered to those

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<sup>23</sup> A. Panasiuk (editor), *Tourism and recreation Economics*, Wydawnictwo Naukowe PWN, Warszawa 2011, p. 250-251

<sup>24</sup> <http://tts.com/blog/yield-management-airline-industry>

<sup>25</sup> The US airlines were the first to implement revenue yield management based on the maximisation of occupancy of the seats on the plane, thanks to this new approach obtained an increase in revenue of around USD 500 million per year. Delta airline, using these sales and pricing systems, increased its revenues by almost USD 300 million per year. The Marriott hotel chain has reached an additional level of revenue of approximately 100 million dollars per year, using the approach indicated. Source: <http://tts.com/blog/yield-management-airline-industry>

who buy the service in advance<sup>26</sup>. As the pool of services is decreasing, the discounts are decreasing (prices are increasing) and, for example, last seats in a transport vehicle are sold at high prices, as they are likely to have a higher usage value for the customers than for the rest who have made their transactions earlier at lower prices. This (“first minute”) strategy makes it possible to optimise the revenue from the sales of services using service capacity, for example, the level of occupancy of the transport vehicle.

#### 4. AN OVERVIEW OF THE WHOLESALE TARIFFS CONCEPT – THEORETICAL CASE STUDY

The concept of wholesale tariffs is linked to the wholesale market and most often associated with commodity exchanges, for example, in agriculture. In this context, the wholesale market is “the market for the purchase of large lots of goods from manufacturers, changes in the volume of the lots sold and the assortment of goods (sorting, packaging, composing the assortment of goods) followed by resale to retail stores”<sup>27</sup>. In considerations of the wholesale transport tariffs, the corresponding arrangements in the telecommunications services market are taken as a reference point (benchmark). The “wholesale market (or wholesale capacity) in the telecommunications sector can be defined as the market where the purchase and sale of telecommunications resources (such as line capacity, bandwidth, lease of infrastructure, the PSTN and IP rental) take place in wholesale volumes. The buyer purchases the services in question to further resell them to the final recipients (telecommunications operator, an enterprise) or to create new value-added services. Today, looking at the wholesale telecommunications markets around the world, the following main institutional arrangements can be distinguished:

- carriers’ carrier,
- online exchange, minutes/bandwidth exchanges,
- clearing house.<sup>28</sup>

The concept of wholesale tariffs in telecommunications is linked to the function of a “clearing house” and serves as the basis for reciprocal billing between the operators for calls made by their subscribers. This is shown in Fig. 1.

Due to the fact that there are many telecommunications operators and different ownership situations of the telecommunications infrastructure used for connecting the subscribers, there may be many combinations. This is illustrated in the subsequent illustrative figures.

In the above situation, Subscriber A pays the blue (host) operator for the service. The blue operator does not pay the wholesale charge as it owns the whole infrastructure.

Another version of a potential call between subscribers is shown in Fig. 3.

In this situation, Subscriber A pays the blue (host) operator for the service. The blue operator pays the green operator for the use of the infrastructure based on the wholesale price list.

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<sup>26</sup> An example could be the solution by IC with discounts for early purchase of tickets

<sup>27</sup> Available at: <https://pl.glosbe.com/pl/pl/rynek%20hurtowy>

<sup>28</sup> W. Borucki, K. Sarzec, New structure of the telecommunications market – new entrants, new behaviour

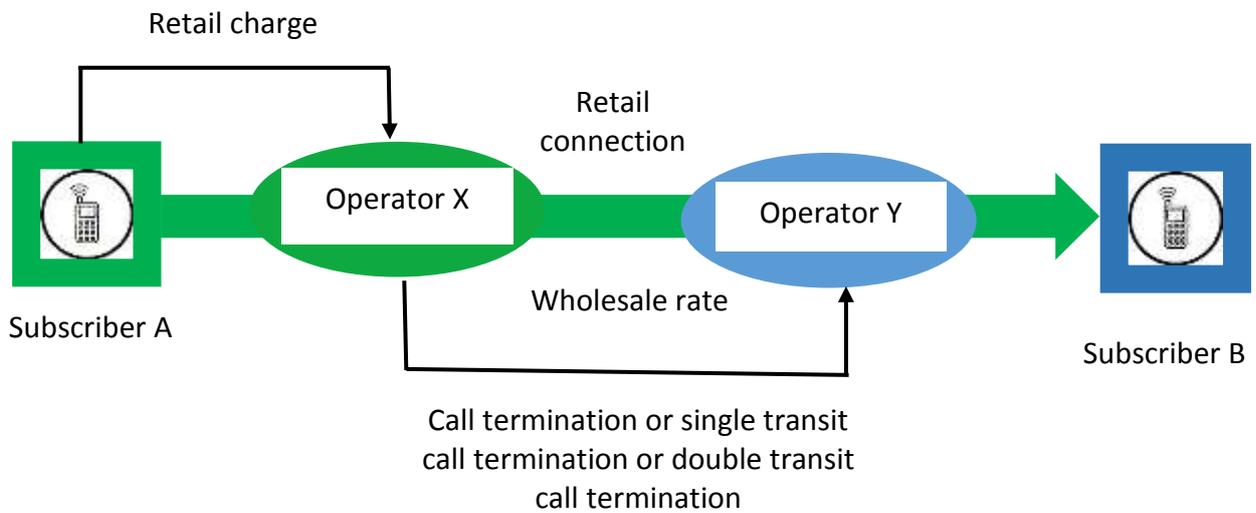


Fig. 1. Wholesale rate as a function of a “clearing house”  
Source: authors’ study

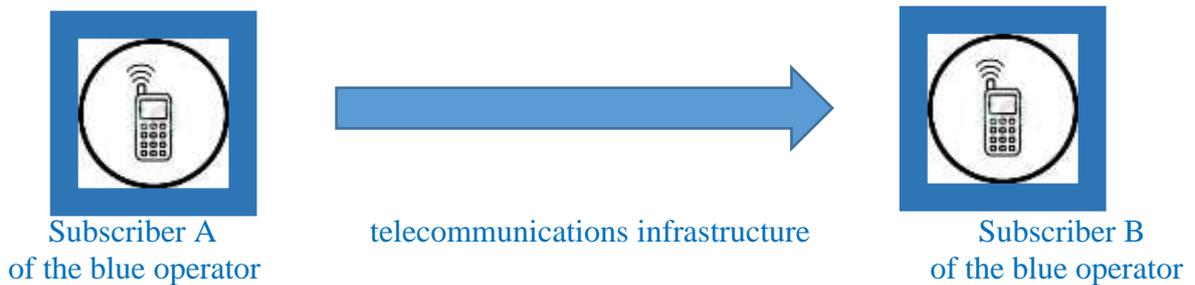


Fig. 2. Telephone call between two subscribers of the blue operator, made using the blue operator’s infrastructure  
Source: authors’ study



Fig. 3. Telephone call between two subscribers of the blue and the green operator using the green operator’s infrastructure  
Source: authors’ study

Another version of a potential call between subscribers.

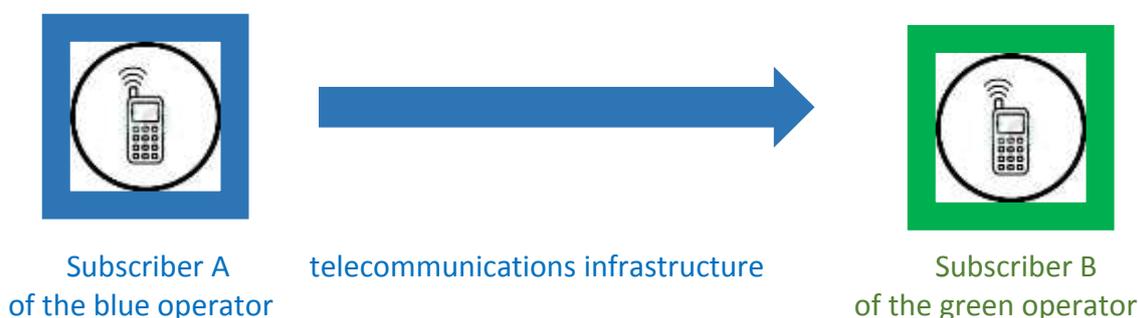


Fig. 4. Telephone call from subscriber A of the blue operator who makes the call to subscriber B of the green operator, using the blue operator's infrastructure  
Source: authors' study

In the above situation, Subscriber A pays the blue (host) operator for the service. The blue operator does not pay the wholesale charge as it owns the whole infrastructure.

Another version of a potential call between subscribers is shown in the following Figure.

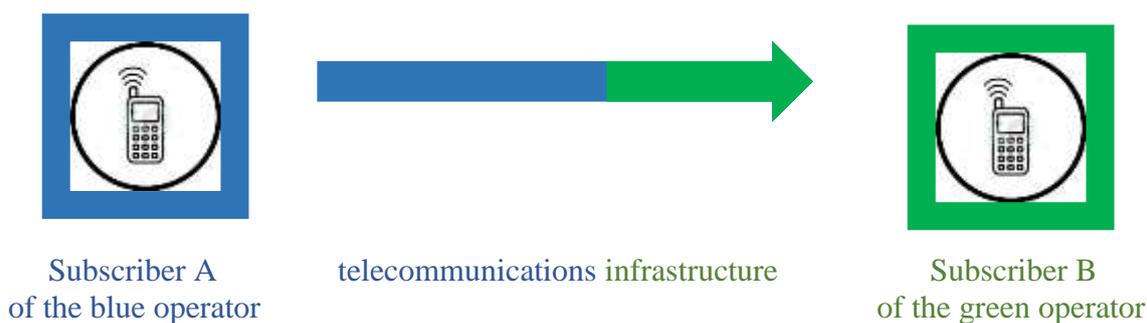


Fig. 5. Telephone call from subscriber A of the blue operator who makes the call to subscriber B of the green operator, in part using the green operator's infrastructure and the blue operator's infrastructure (host to subscriber A)  
Source: authors study

In this situation, Subscriber A pays the blue (host) operator for the service and the blue operator pays the green operator for the infrastructure used.

The above figures in a simple and clear manner, present the idea of wholesale tariffs in telecommunications. The concept of wholesale tariffs in telecommunications is designed to facilitate payments between operators.

The idea of wholesale tariffs for rail passenger carriers will also be applied in a simplified manner. It should be stated that access to rail infrastructure is necessary in the rail services market (purchase of train routes from an infrastructure operator, for example, PKP PLK). There are specific rules in this area and access for both passenger and freight rail carriers is likewise charged based on the tariff system<sup>29</sup>. The following considerations do not apply to

<sup>29</sup> The rail market regulator in Poland is the Office of Rail Transport (UTK), which has the responsibility to approve the prices for access to rail infrastructure. By Decision No DRKK-WKL.730.7.2018.AO of 22 August 2018, the President of the Office of Rail Transport approved the draft price list in its part relating to the method of fixing the basic and shunting rates for the 2018/2019 timetable. The currently applicable rates for the use of

the provision of rail infrastructure, but to the billing system for passenger transport services provided by different operators based on a single ticket<sup>30</sup>.

As an assumption/simplification, it can be adopted that trains launched or planned to be launched have a specific capacity (for example, number of seats), and the purpose of the carrier is to sell the maximum number of tickets so as to reach 100% occupancy<sup>31</sup>. The level of occupancy does not affect the costs incurred by the carrier (the carrier is required to operate the scheduled train whether or not it has sold the tickets for that train). Each ticket sold reduces the total costs of launching the train and the ticket price does not have to correspond to the unit cost of the seat on the train.

For the sake of simplification, the following assumptions will be made: there are 3 rail carriers: **the red carrier**, **the blue carrier** and **the green carrier**. These carriers offer their services using part of the common rail network, directly competing for customers, as well as have “exclusive” rights to provide services on the part of the network (a natural monopoly can be assumed with other carriers on these rail routes/sections of routes not being interested in providing services or not having the capacity to provide transport services on these sections of the rail network). Each of them offers tickets for their services and can also sell tickets for services of another carrier, for example, acting as an agent (which receives a commission on each ticket sold; this is an established practice since a number of carriers have their points of sale offering tickets of other rail carriers).

At present, the lack of wholesale tariffs allows the carrier dealing with the travellers at the point of departure to sell them two tickets for the journey between the departure station and the terminal station, that is, the ticket for the blue carrier’s train and the ticket for the red carrier’s train.

This is shown in Fig. 6 below.

When the passenger is travelling by two trains of two different carriers (blue and red) based on two tickets (blue and red), the blue carrier collects the fee for the blue ticket based on the blue carrier’s fare and that fee fully remains at the blue carrier’s disposal. The blue carrier collects the fee for the transport service provided by the red carrier based on the red carrier’s fare and transmits it to the red carrier, charging it a commission fee for intermediation at the time of sale. The customer purchasing two tickets has to accept the fact that the distance is “broken” into smaller sections (with no price reduction obtained due to the length of the route as in the case of a kilometre-based degressive tariff). In the event of a larger number of carriers, three in this instance, the passenger receives three tickets and the tariff is “broken”. This, to a certain extent, increases the costs of rail transport and reduces its competitiveness over other modes of transport alternative to travel the distance between the departure place/station and the destination/terminal station.

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rail infrastructure with 1,435 mm track gauge managed by PKP Polskie Linie Kolejowe S.A. have been in force since 9 December 2018 and are set out in Annex 15 to the 2018/2019 Network Regulations. The rules for setting the unit rates of the basic fee and of the shunting fee in force since 9 December 2018 are set out in Annex 11 of the 2018/2019 Network Regulations. More on: <https://www.plk-sa.pl/dla-klientow-i-kontrahentow/cennik/>

<sup>30</sup> As already pointed out, examples of the ticket and tariff integration can be identified for certain carriers, implemented on the basis of bilateral agreements which specify (in short) the distribution of the fee collected for the common ticket between the carriers which are parties to that agreement

<sup>31</sup> As previously indicated, this is an element of revenue yield management – maximising the revenue from the connection/train launched

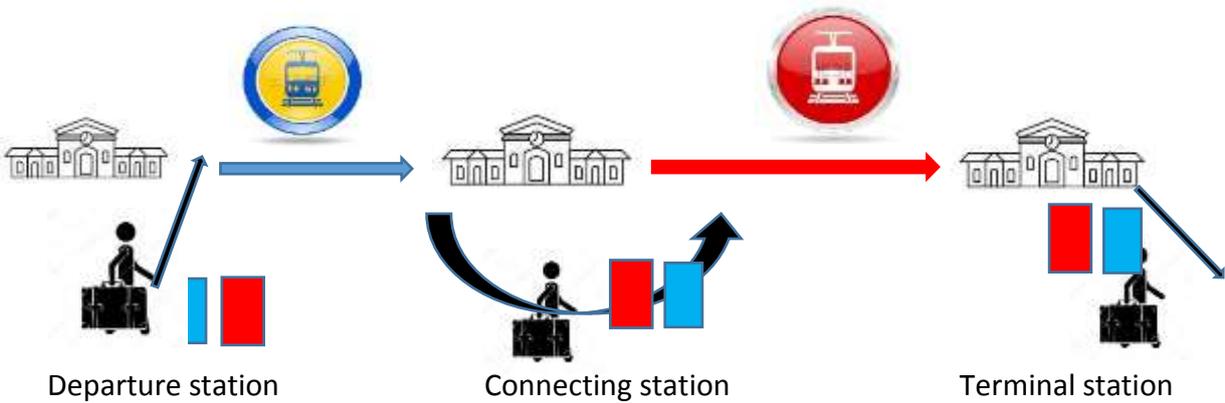


Fig. 6. The passenger is travelling by two trains of two carriers (blue and red) based on two tickets (blue and red)  
Source: authors' study

If we assume that a wholesale tariff allowing the carriers to pay directly, for example, for passenger-km, has been agreed between them, we have the following situation: the passenger purchases the ticket at the departure station and is served by the blue carrier. The ticket is bought in line with the fare and conditions of the blue carrier, including for the train of the red carrier (since part of the journey will take place on the red carrier's train). The blue carrier, which collects the fee for the whole journey, pays the red carrier on the basis of the wholesale tariff. A similar situation will take place when the passenger is served/checked in by the red carrier (for example, on the way back). This situation is illustrated in Fig. 7 below.

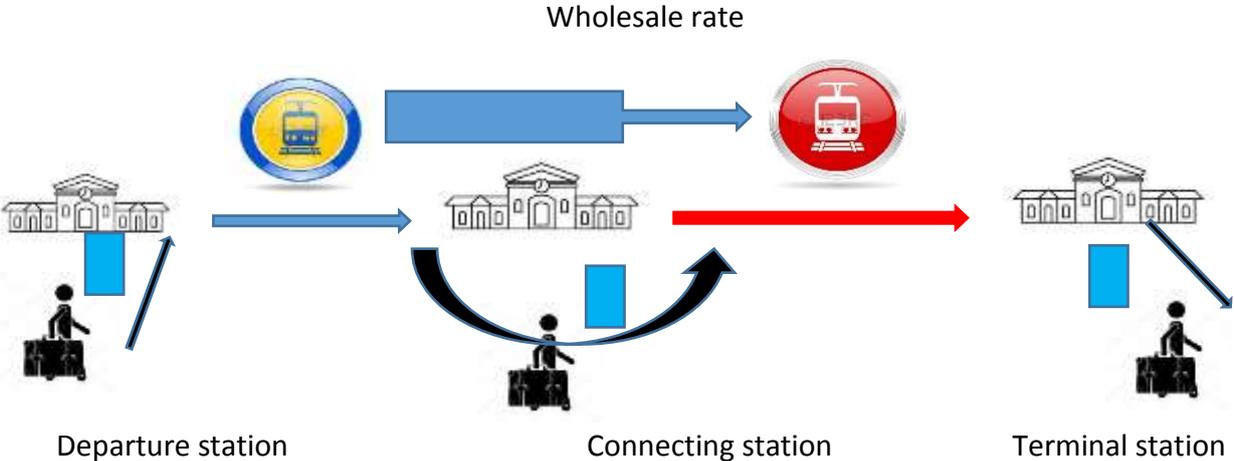


Fig. 7. The passenger is travelling by two trains of two carriers (blue and red) on the basis of one ticket of the blue carrier is valid for the entire journey by rail (trains)  
Source: authors' study

More so, it is necessary to look at situations where the passenger purchases a train ticket, for example, from the red carrier, for the journey to be made on the trains of the red and the blue carrier. Due to traffic disruptions (unforeseeable circumstances or objective reasons), the passenger travels with the green and the blue carrier. This is shown in Fig. 9 below.

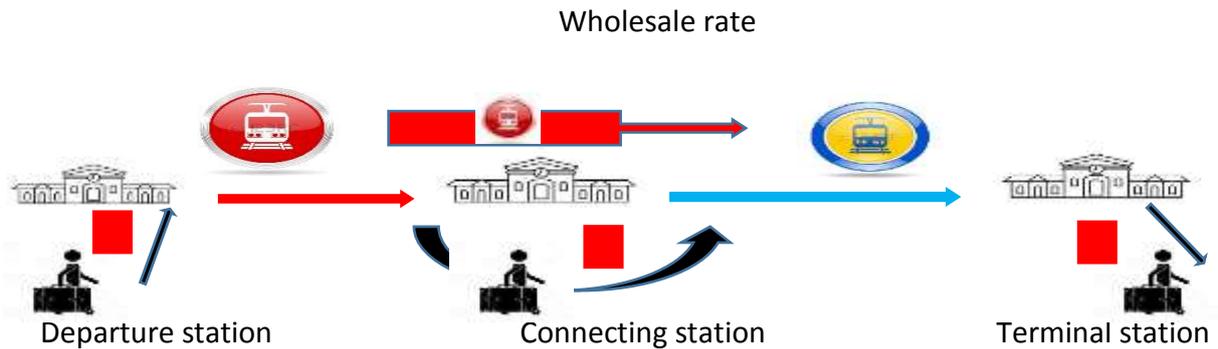


Fig. 8. The passenger is travelling by two trains of two carriers (red and blue) given that one ticket of the red carrier is valid for the entire journey by rail (trains) – payments between carriers on the basis of a wholesale tariff  
Source: authors' study

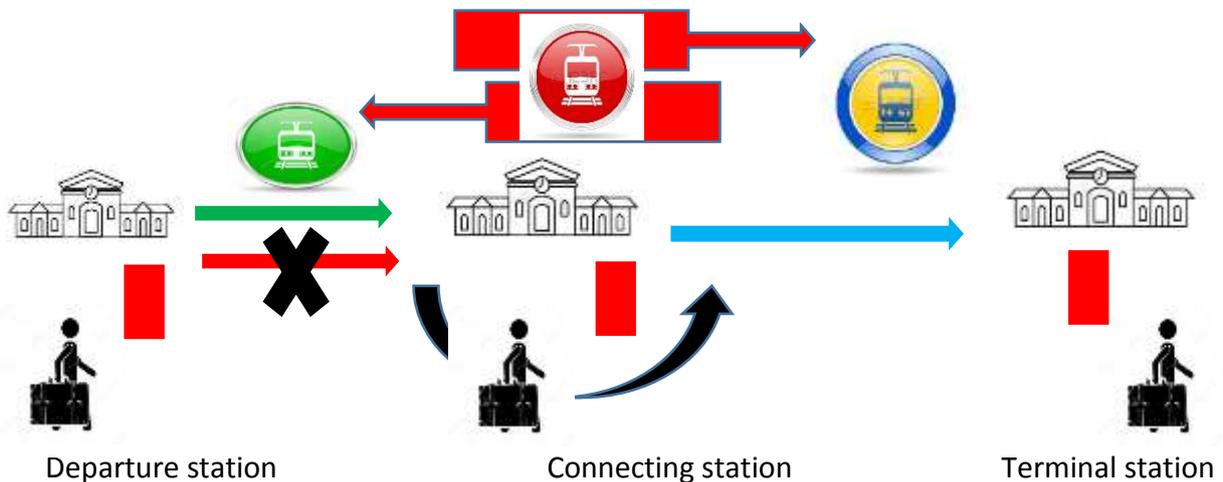


Fig. 9. The passenger is travelling by two trains of two carriers (green and blue) given that one ticket of the red carrier is valid for the entire journey by rail (trains)  
Source: authors' study

This situation indicates that the retail charge was collected by the red carrier who issued the ticket (originally for the journey on the red carrier's train, and subsequently, on the blue carrier's train). Due to unforeseeable circumstances (objective reasons), it was necessary to travel on the green carrier's, and then, on the blue carrier's train. The red carrier pays both the green and the blue carrier on the basis of a wholesale tariff. Furthermore, the red carrier is required to handle complaint procedures.

Thus, the concept of wholesale tariffs for payments between carriers is based on the assumption that the ticket for the journey on the trains of different carriers is issued by the carrier dealing with the passenger at the time of ticket purchase. This may be at the time of check-in at the station when buying the ticket via the internet channel or buying the ticket through an agent (multi-agent). This is shown in Fig. 10 below.

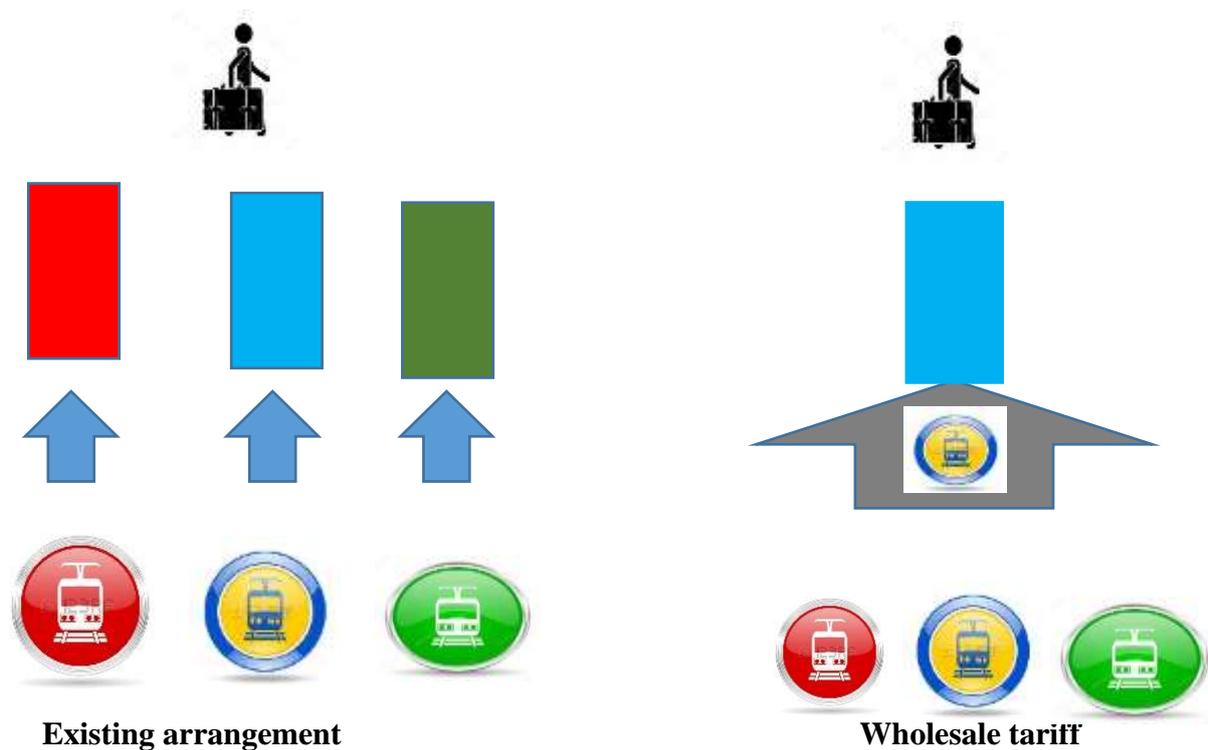


Fig. 10. The concept of wholesale tariffs as a clearing house between carriers versus the existing arrangements for the transport service based on the trains (connections) of various carriers  
Source: authors' study

It should be noted that in the above considerations, the train classes of individual carriers were equivalent. The situation becomes, to some extent, more complicated, if we take into account train classes. Train classes are reflected in wholesale tariffs, by analogy with the sale of a single ticket for the trains of different carriers and for different classes of trains. A number of situations, which may arise, should be included in the wholesale tariffs scheme.

## 5. CONCLUSIONS

It seems that there is a creative opportunity to adapt and make use of the concept of wholesale tariffs in practice as a tool for tariff and ticket integration in the rail passenger transport sector.

The benefits of applying the concept of wholesale tariffs include:

- Increased competition of rail passenger transport due to easier customer service and lower prices of rail tickets (limited breaking of tariffs).
- Simplification of passenger service in the event of carrier (train) change (return of tickets, purchase of further tickets, etc.). The payments take place between the carriers based on wholesale tariffs. The carrier, which collected the passenger fee is charged.

- Drawing interest of rail passenger carriers in using the offer of other carriers, so far perceived as competitors, due to the economies of scale of the network (I can sell tickets for a different carrier's train without providing that connection myself and make a profit on this) — the cooptation phenomenon.
- More interest of carriers in synchronising their timetables (I can provide my services to other travellers or another train will serve my passengers).
- Development of IT systems for the tickets sales and distribution.

Limitations/threats to the system based on the concept of wholesale tariffs include:

- No experience in this regard (in rail, however, there is experience in the telecommunications market).
- Need to mandate the conclusion of wholesale agreements by passenger rail carriers (role for UTK as the regulator). Attention should be paid to dominant companies in the rail passenger market (for example, holding more than a 10% share in passenger services).
- Different standards of carriers' offers (especially in terms of quality), for example, metropolitan, long-distance transport such as TLK (low-cost rail), IC or EC, which should be reflected in the wholesale tariff design.
- A number of complex unforeseen events of both objective nature (independent of carriers, for example, force majeure) and partially attributable to the carrier (for example, locomotive failure).

The concept of wholesale tariffs is successfully used in the telecommunications market and it is difficult to imagine today that this market operates without wholesale tariffs and the role of the regulator. Based on the positive experience in the market for telecommunications services, it is possible to develop conceptual work on the use of wholesale tariffs for coordination as well as tariff and ticket integration of rail carriers to increase the attractiveness of rail passenger services. The concept of wholesale tariffs for payments between carriers can have a positive impact on consumers (passengers) and on rail carriers, in the context of shaping the competitiveness of rail passenger services. Additionally, it should be borne in mind that this concept presents some risks, particularly for carriers. It is important to state that this article is purely indicative of the possibility of adapting wholesale tariffs to the operation of rail passenger transport in Poland for the purpose of tariff and ticket integration of carriers providing transport services.

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