DEMAND SPECIFICS OF DISABLED PERSONS AND PERSONS WITH REDUCED MOBILITY FOR BUS TRANSPORT. CASE OF REGIONAL BUS TRANSPORT IN SLOVAKIA

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Abstract

Presupposition for realizing the demand for bus transport is the existence of its potential, which represents the population of that city, region, or state. Public passenger transport is considered to be an instrument of state social policy. The legislation defines it as transport performed to satisfaction the transport needs of persons, especially vulnerable groups, pupils, students, and pensioners. A significant problem in Slovakia and also in abroad is an aging population. The retired population has different transport habits like other groups of passengers (children, pupils and students, economically active persons), which is related to the change of transport requirements, as well as an adaptation the public transport offer. In recent years, the number of license holders of individual disabled persons has been increasing in Slovakia, or possibly individual person with severe disability with a guide. In this article, we focus on examining the issue of the rising trend of issued valid licenses of disabled persons and persons with reduced mobility, and related new measures, to which transport undertakings are confronted and transport service subscribers. The aim is also to identify the motivation to own a disability person license or persons with reduced mobility with the ability to use it for the demand for public passenger transport.

Keywords: bus transportation; demand; disabled persons; persons with reduced mobility; fare price

1. Introduction

One of the main tasks of public passenger transport is satisfying transport requirements by operated area [8, 26]. The importance of proper coordination of public passenger transport is particularly evident in increasing demands in the development of cities and surrounding

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areas and at pressure to reduce environmental pollution [4, 11]. Transport must mainly provide the transport requirements of the company, but it must also contribute to its economic development and raising the standard of living of the population [12, 18].

Transport demand is also referred as secondary demand. This means that primary demand is satisfied through transport. It is, therefore, a secondary demand that results from different convention, activities as well as demand for goods and services. Demand in public passenger transport is conditioned by various factors [15, 17]. Raise living standards, population income [10], geographical location and ownership of a car are just some of the factors, which determine the demand for public passenger transport [7, 20].

An important problem for European countries is the aging of the population, it is expected to intensify in the coming decades. Aging society will have a significant impact on transport systems, in terms of supply, quality of transport services and transport services, as well as security claims for financing transport services [5, 6]. It is necessary to identify traffic patterns of behavior groups of the elderly population to ensure the future functioning of transport systems [1, 25].

Another major problem is, that we are resisting not only in Slovakia is that the number of valid licenses issued is constantly increasing individual disabled persons and the person with reduced mobility. The holders of such licenses are also entitled to reduced fares in public passenger transport systems. The problem is that the legislation is regulated by a national authority, whereas the measure has an impact on regional authorities, respectively at local level, which order suburban bus services or public transport [2, 21]. Another problem is that the claim for a discount on fare only binds to possession of the license of individual disabled persons and the person with reduced mobility. In addition to providing discounts, the requirements must be followed by Regulations of the European Parliament and the Council (EU) no. 181/2011 on the rights of passengers in bus and coach transport and amending the Regulation (ES) no. 2006/2004 (referred to as: "regulation"), which contains in Chapter III the rights of passengers with disabilities and passengers with reduced mobility. Bus and coach services for passengers should benefit all citizens. Disabled persons and persons with reduced mobility, due to disability, age, or any other reason should, therefore, be able to use bus and coach services comparable to that of other residents [3, 16, 24]. Disabled persons and persons with reduced mobility have the same right as all other citizens, the rights to free movement, freedom of choice and non-discrimination. This right is also reflected in the fares of carriers, respectively of fare levels compared to the full fare [22]. The objectivization of entitlement to discounted fare remains a question and a method of demonstrating the claim.

Nowadays, public passenger transport is losing awareness of the population as the standard of living of the population increases. Problems arise with the growth of individual car transport in relation to the environment, particularly in the area of emission production, noise, vibrations, and also traffic accidents and congestion [13, 14]. For these reasons, it is necessary to increase the attractiveness of public passenger transport and its ability to compete with individual car transport in various aspects, particularly in terms of accessibility, travel time and comfort [9, 19, 23].

2. Data, materials and methods

2.1. Analysis of the number and development of issued licenses disabled persons and individual person with reduced mobility

In conditions by the Slovak Republic, we performed an analysis of the number of valid licenses issued by individual disabled persons and person with reduced mobility. The source of the data is the Ministry of Labor, Social Affairs and Family of the Slovak Republic, which monitors the statistics on the number of licenses at national and regional levels (district) level. While in 2013 was in conditions by the Slovak Republic issued 217,072 valid licenses of individual disabled persons and person with reduced mobility, in 2018, the number of valid licenses issued was of value 351,706, an increase of 62% over 5 years. Figure 1 shows the increasing evolution of the number of issued licenses of individual disabled persons and person with reduced mobility in Slovakia between 2013 and 2018.

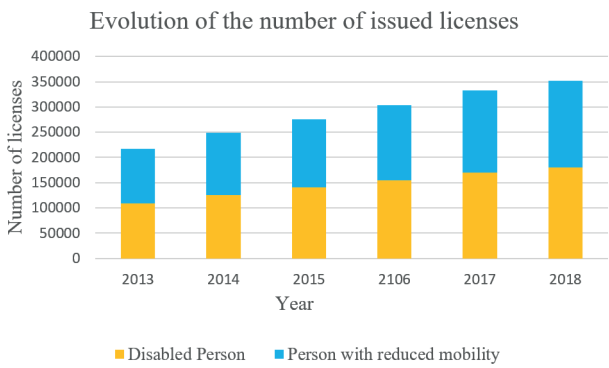

Fig. 1. Number of valid licenses issued in the Slovak Republic
Source: authors based on [Ministry of Labor, Social Affairs and Family of the Slovak Republic]

The absolute number of cards is due to the objectivization of the comparison between regions to relativize to 1,000 inhabitants. The most issued valid licenses per 1,000 inhabitants are in Trenčín self-governing region. Conversely, the least issued valid licenses per 1,000 inhabitants are within the Bratislava and Trnava regions. In all regions the indicator has an increasing tendency, the values are shown in Table 1.

Tab. 1. Number of valid licenses disabled persons and person with reduced mobility issued per 1000 inhabitants: by region, 31 December

Region	2013	2014	2015	2016	2017	2018
Bratislava	28	32	36	40	46	47
Trnava	28	32	36	40	45	48
Nitra	35	40	45	49	54	57
Trenčín	57	64	70	76	81	85
Žilina	47	55	61	68	75	80
Banská Bystrica	43	49	55	60	66	70
Prešov	46	53	59	64	69	73
Košice	36	41	45	49	53	57

Source: Prepared by authors based on data from the Ministry of Labor, Social Affairs and Family of the Slovak Republic and the Statistical Office of the Slovak Republic

2.2. Methods for examining the number of licenses disabled persons and person with reduced mobility and factors affecting the demand of license disabled persons and person with reduced mobility by bus transportation

For research into the motivation of disabled persons and person with reduced mobility (who hold licenses disabled persons and individual person with reduced mobility) to take advantage of this entitlement for commuter bus travel, we are considering the following methods.

Calculation of unit price of fare for licenses holders disabled persons and persons with reduced mobility

On the basis of fiscal decentralization in Slovakia since 1.1.2005 is the fare in suburban bus transport regulated from the position of self-governing regions, exist differences in maximum fares between individual self-governing regions. There are also differences in providing travel discounts. The suburban bus tariff for individual self-governing regions is distant, exist tariff classes according to the distance in km, fares are set within tariff classes. Tariff rates are defined in the form of matrices, where the lines represent tariff distances in km and columns represent the types of fare. In order to be able to compare different fares in different fares, it is necessary to define a suitable variable. This appears to be the average unit price in euros per km for a particular type of fare. The reason for calculating average unit prices in suburban bus transport for comparison, there are also different numbers of tariff classes and their different width in km. The average unit price is determined as an average of the fare values determined for each tariff zone based on the relationship (1):

$$\bar{f}_j = \frac{\sum_{i=1}^{n} \frac{TR_{ij}}{TZavg_i}}{n} = \frac{\sum_{i=1}^{n} \frac{TR_{ij}}{TZavg_i}}{n} = \frac{\sum_{i=1}^{n} \frac{TR_{ij}}{\frac{TDmin_i + TDmax_i}{2}}}{n} = \frac{\sum_{i=1}^{n} 2TR_{ij}}{\frac{TDmin_i + TDmax_i}{n}} \; [€/pkm] \quad (1)$$

f_j – is the average unit price of the „j" type of fare (average fare) in eur/pkm, [eur/pkm]

f_{ij} – is the average unit price (average fare) in the „i" tariff zone for the „j" type of fare v eur/pkm [eur/pkm]

TR_{ij} – is the tariff rate (tariff rate) in „i" tariff zone for the „j" type of fare in eur/p

n – is the number of tariff zones

$TZavg_i$ – is the arithmetic mean of the lower and upper limits of the „i"tariff zone [km]

$TDmin_i$ – is the lower limit of the i-th tariff zone [km]

$TDmax_i$ – it is upper limit of the i-th tariff zone [km]

Correlation analysis

Correlation analysis examines the tightness of statistical dependence between quantitative variables. Correlation analysis, unlike regression, does not express causally – subsequent relationship. The variable Y does not depend on the variable X, but the two random variables X and Y change together. Regression analysis assumes that the variable Y is random and variable X is fixed. The correlation analysis tool is called the correlation coefficient (mark like „r)". Determines the degree of tightness (degree) of dependence. The correlation coefficient is a measure of the linear dependence of two variables and we can express it with the following relationship (2):

$$r_{xy} = \frac{n \cdot \sum_{i=1}^{n} x_i \cdot y_i - \sum_{i=1}^{n} x_i \cdot \sum_{i=1}^{n} y_i}{\sqrt{\left[n \cdot \sum_{i=1}^{n} {x_i}^2 - \left(\sum_{i=1}^{n} x_i\right)^2\right] \cdot \left[n \cdot \sum_{i=1}^{n} {y_i}^2 - \left(\sum_{i=1}^{n} y_i\right)^2\right]}} \tag{2}$$

r – correlation value

n – number of associated values

x – value of the first variable

y – value of the second variable

Covariance theory

Covariance in mathematical statistics expresses the dependence of two random variables. If larger values of one variable usually correspond to larger values of the other variable, and the same applies to smaller values, then this is a positive covariance. If the larger values of one variable usually correspond to the smaller values of the other variable, covariance is negative. The covariance size is not normalized, because it depends on the size of the variables. Whether the variables X and Y are in a linear relationship with each other can be determined by the covariance coefficient:

$$cov\ xy = \frac{1}{n} \cdot \sum_{i=1}^{n} (x_i - \bar{x}) \cdot (y_i - \bar{y}) = \overline{x \cdot y} - \bar{x} \cdot \bar{y} \tag{3}$$

cov – covariance value,

n – number of associated pairs (xi, yi),

x – value of the first variable,

y – value of the second variable

The resulting numerical value is not important for covariance theory, but the resulting sign, that is, whether the resulting value is zero, positive or negative. If the covariance coefficient is 0, then the variables X and Y are independent. If the value of the coefficient is more than 0, therefore positive, so there is a direct linear relationship between the variables X and Y. If the coefficient becomes less than 0, then there is an indirect linear relationship between X and Y and it means that while one variable is increasing, the other variable is decreasing.

Average growth rate

It expresses the average time series growth coefficient from time series values from 1 to „n", it is average time series growth.

$$\overline{K_t} = \sqrt[n-1]{\frac{y_n}{y_1}} \tag{4}$$

n – number of time series members,

y_1 – value of the 1st member of the time series,

y_n – value of the „nth" member of the time series.

3. Results and dissemination

3.1. Assessment of the evolution of the number of licenses for individual disabled person and individual person with reduced mobility

In Slovakia, the number of valid licenses disabled person and person with reduced mobility issued has been increasing in recent years. People with disabilities who hold licenses disabled person and person with reduced mobility are entitled to several benefits. In the conditions of the Slovak Republic, holders of licenses disabled person and person with reduced mobility are transported in all self-governing regions with discounted (special) fare. For discount fares, they are also transported in public transport systems in regional cities. Railway Company Slovakia, a.s. has a separate ticket price list for holders of licenses disabled person and person with reduced mobility which provides a discounted fare for holders of those licenses compared to the basic fare.

For this research, we analyzed the available time series of the number of issued licenses disabled person and person with reduced mobility in the period 2013 to 2018 by regions of the Slovak Republic. The number of issued licenses disabled person and person with reduced mobility is different from one region to another, it has an increasing course in each region in the period under review, but the increase is not even. Therefore, we evaluate this development by the average growth rate, the relationship (4).

We evaluate the development of the number of licenses by two indicators – the average growth rate of the number of licenses disabled person and person with reduced mobility and the average growth rate of the number of licenses disabled person and person with reduced mobility per 1,000 inhabitants.

The calculated values by relation (4) for individual self-governing regions and the whole Slovak Republic are given in Table 2. In the self-governing regions, the yearly increase in the number of licenses disabled person and person with reduced mobility ranges from 8% to 12% (the value of the coefficient ranges from 1.08 to 1.12). The growth for the whole Slovak Republic is by 10% year on year. The average year on year growth rates from Table 2 is input for the correlation analysis in chapter 3.3.

Tab. 2. Average year on year growth rate of valid issued licenses disabled person and person with reduced mobility

Region	Average year on year growth rate of the number of licenses disabled person, the person with reduced mobility	Average year on year growth rate of the number of licenses disabled person, the person with reduced mobility per 1000 inhabitants
Bratislava	1.12	1.11
Trnava	1.12	1.11
Nitra	1.10	1.10
Trenčín	1.08	1.08
Žilina	1.11	1.11
Banská Bystrica	1.10	1.10
Prešov	1.10	1.10
Košice	1.10	1.10
Slovak Republic	1.10	1.10

Source: Elaborated by authors

Note: The average year on year rate of growth of the number of licenses disabled person and person with reduced mobility is based on the number of licenses issued between 2013 and 2018.

3.2. Fares in suburban bus transport for holders of licenses disabled person and person with reduced mobility in the regions of Slovak Republic

By applying the relationship (1), the values of the average unit price for individual types of fare in regional bus transport in the regions of the Slovak Republic were calculated, the values are shown in Table 3. Tariff rates and tariff conditions are different and individual in individual regions, so for research of motivation and demand of disabled person or person with reduced mobility, we consider with average unit price in individual regions. Disabled person and person with reduced mobility are transported at a special fare which is lower than the full fare. Therefore, when researching the motivation of the holders of licenses the disabled person and person with reduced mobility to realize the demand for suburban bus transport, we also consider comparing the special fare with the full fare, respectively as a full-fare discount. The highest average unit price for the ordinary fare is in the Prešov region and Košice region. It reaches the value in given regions 0.0751 €/pkm. Among the above-mentioned regions, the average unit price for ordinary travel has the lowest Nitra region, this value is 0.0626 €/pkm. Passengers traveling for an ordinary fare can also travel at a discount using a traffic card. In the Žilina region, the highest average unit price for the ordinary fare is paid from a traffic card, this value is 0.0666 €/pkm. Vice-versa in the Trnava region the average unit price for a given type of fare paid from a transport card reaches value 0.0561 €/pkm. Another type of fare is special fare or reduced fare. For this type of fare, selected groups of passengers specified in the tariffs of carriers operating in

the public interest travels. We can see that even for a given type of fare, the average unit prices vary between regions and there is also a difference whether the passenger pays the fare in cash or from a traffic card. As part of the special cash-paid fare we can see that the highest average unit price is in the Trenčin self-governing region, this value is 0.0518 €/pkm, vice-versa the lower average unit price has Banska Bystrica self-governing region (0.0330 €/pkm). The Trenčin self-governing region has the highest average unit price (0.0483 €/pkm) even at special (discounted) fare paid by card. On the other hand, the region of Banská Bystrica has the lowest average unit price, this value is 0.0293 €/pkm. The average unit price of fare from Table 3 is an input for the correlation analysis in chapter 3.3.

Tab. 3. The average unit price of fare in suburban bus transport for individual types of fare in self-governing regions of the Slovak Republic

Region	Average unit price [€/pkm]			
	Ordinary fare	Ordinary fare from traffic card	Special fare	Special fare from traffic card
Trnava	0.0658	0.0561	0.0371	0.0303
Nitra	0.0626	0.0574	0.0374	0.0322
Trenčín	0.0649	0.0571	0.0518	0.0483
Žilina	0.0699	0.0666	0.0422	0.0381
Banská Bystrica	0.0704	0.0602	0.0330	0.0293
Prešov	0.0751	0.0611	0.0463	0.0367
Košice	0.0751	0.0611	0.0463	0.0367
Mean	0.0691	0.0599	0.0420	0.0359

Source: Elaboreted by authors

Note.: The Bratislava self-governing region provides transport services with an integrated transport system in which the integrated transport system tariff is applied. In a given system, there is no distance tariff, but a zone tariff.

Regional bus transport competes with rail passenger transport, therefore we have analyzed its price level. Carrier "Železničná spoločnosť Slovensko" has different tariffs for travel in 1st and 2nd class, with different price lists. Persons with licenses disabled person and person with reduced mobility are subject to two price lists, price list No.4 and price list No.10, C. By applying relationship (1), we calculated the average unit price of rail passenger fare for the various fare types, the values are given in Table 4.

Tab. 4. Average unit price for rail transport carried out in the public interest

Ordinary fare 2nd class (Price list No.1, A)	Ordinary fare 1st class (price list No.10, A)	Special fare 2nd class (Price list No.1, B)	Fare 2nd class for disabled person and person with reduced mobility (Price list No.4)	Fare 1st class for a pupil, student, child to 15 years, disabled person, person with reduced mobility (Price list No.10, C)
0.0662	0.0997	0.0330	0.0265	0.0499

Source: Elaborated by authors on based data ŽSSK

The average unit price for ordinary fare in suburban bus transport for individual regions and the average unit price in rail transport for ordinary fare in the 2nd class is at approximately the same level. Approximately the same average unit price was for special fare in suburban bus transport and rail transport.

As the article deals with the issue of the increase of issued licenses disabled person and person with reduced mobility we were interested in what discounts holders of individual licenses have when traveling by suburban bus transport within individual self-governing regions. Holders of licenses disabled person and person with reduced mobility are transported for special (discounted) fare within self-governing regions Nitra, Trnava, Trenčín, Prešov, Košice and Banská Bystrica. A guide for person with reduced mobility is transported in the given regions for special (discounted) travel. Holders of licenses disabled person and guide for person with reduced mobility are transported for special (discounted) fare within Žilina self-governing region. The person with reduced mobility which is holding of licenses is transported within the region for a special fare of 0.05 € for every 25 km. In rail transport, the holders of licenses disabled person and person with reduced mobility and guide for person with reduced mobility are also entitled to a fare discount. From 17.11.2014, holders of licenses travel free of charge to the territory of the Slovak Republic in rail transport.

The motivation for obtaining the licenses disabled person and person with reduced mobility and its subsequent application when traveling by suburban bus transport may also be a price advantage when traveling, the mean a reduction in the price of a special fare for a group of passengers compared to ordinary fare. A comparison of the price concessions in Table 5.

Tab. 5. Level of special fare advantage to full-fare in individual self-governing regions

Region	Advantage of special fare over full fare in cash payment [%]	Advantage of special fare over full fare in payment from traffic card [%]
Trnava	44	46
Nitra	40	44
Trenčín	20	15
Žilina	40	43
Banská Bystrica	53	51
Prešov	38	40
Košice	38	40

Source: Elaborated by authors

Banská Bystrica Self-governing region provides the highest discount on travel fare when paying cash in the amount of 53% of ordinary travel fare. When paying a fare from the traffic card, the Banská Bystrica Region provides a discount of 43% of the ordinary fare. Trenčín self-governing region provides a lower discount on travel fare when paying cash in the amount of 20% of ordinary travel fare. When paying a fare from the traffic card, it is 15% of the regular fare. The values of the price advantage for the holders of licenses disabled person and person with reduced mobility from Table 5 are input for the correlation analysis in chapter 3.3.

3.3. Correlation analysis of factors of motivation to own and use licenses disabled person and person with reduced mobility for the demand for bus transport in Slovak regions

Using relationship (2) we investigated the relationships between the factors characterizing the number of licenses disabled person and person with reduced mobility and their potential motivators to own them (average unit price of bus fare for holders of licenses disabled person and person with reduced mobility, preferential special fare for holders of licenses disabled person and person with reduced mobility). The results of the calculations are given in the correlation matrix, Table 6. Correlation analysis is carried out based on indicators data for individual regions from chapters 3.1 and 3.2.

The calculations confirmed the indirect relationship between the average unit price of fare for disabled person, person with reduced mobility in bus transport and the number of licenses disabled person and person with reduced mobility. This is the middle strength of the relationship. Concerning the way of payment of travel expenses (cash, traffic card) and the way of expressing the number of licenses for disabled person and person with reduced mobility (absolute nimber of licenses, number of licenses per 1,000 inhabitants), the correlation coefficient reaches the value from -0.468 to -0.6543. The negative sign of the coefficient is logically interpretable, the fall in the price of fare leads to an increase in the motivation to own licenses disabled person and person with reduced mobility, on the

other hand, the rise in the price of the fare slows the incentive to own the licenses disabled person and person with reduced mobility.

The direct relationship was confirmed when examining the special fare (discount) for the full fare (cash, traffic card) and the way of expressing the number of licenses disabled person and person with reduced mobility (absolute number of licenses, number of licenses per 1,000 inhabitants), the correlation coefficient ranges from 0.1949 to 0.6959, from weak to almost strong dependence. The coefficient is higher when taking into account the absolute number of licenses disabled person and person with reduced mobility. The positive sign of the coefficient is logically interpretable, the increase in the price of the special fare over the full fare causes an increase in the motivation to own the licenses disabled person and person with reduced mobility.

Tab. 6. The correlation matrix with the coefficients of correlation between the factors characterizes the number of licenses disabled person and person with reduced mobility (columns) and their potential motivators to own them (rows)

	Average year on year growth rate „Number of licenses disabled person and person with reduced mobility"	Average year on year growth rate „Number of licenses disabled person and person with reduced mobility per 1000 inhabitants"
Average unit price in suburban bus transport for the special fare paid in cash	-0.5718	-0.4838
Average unit price in suburban bus transport for the special fare paid from traffic card	-0.6543	-0.468
Advantage of special fare over full fare in cash payment	0.5792	0.2806
Advantage of special fare over full fare when paying from traffic card	0.6959	0.1949

Source: Elaborated by authors

3.4. Research on demand for bus transport in Žilina self-governing region

There is also a significant increase in the number licenses of disabled person and person with reduced mobility in the Žilina self-governing region. Between 2013 and 2018 their number increased by 22,650 licenses, an increase of almost 70% over 5 years. On average, the number of valid licenses of disabled person and persosn with reduced mobility increases every year about 4,530 licenses. Year on year increase in the number of persons transported which are carried for fare intended for the holders of the licenses disabled person and person with reduced mobility is at a level of more than 35,500 passengers.

The proportion of number of passengers carried disabled person and person with reduced mobility the total number of passengers transported in the Žilina region by suburban bus transport increased from 5.96% in 2013 to 8.12% in 2018, which represents an increase of 2.16 percentage points.

Direct linear dependence between the number of valid licenses disabled person and person with reduced mobility was confirmed in the conditions of the Žilina region and the number of passengers carried who hold the license disabled person and person with reduced mobility, Table 7. The correlation coefficient is 0.487, which represents a strong linear dependence. With the increasing number of person holding the licenses disabled person and person with reduced mobility (number of valid licenses disabled person and person with reduced mobility), the number of transported disabled person and person with reduced mobility in the suburban bus is also increasing in the Žilina region.

Tab. 7. Relationship between the number of valid licenses disabled person and person with reduced mobility and the number of passengers carried as special fares for license holders disabled person and person with reduced mobility in bus transport in Žilina region

Year	Number of licenses disabled person and person with reduced mobility (ks)	Number of passengers carried, which are holder license disabled person and person with reduced mobility (persons)
2013	32,537	1,783,750
2014	37,718	1,873,928
2015	42,286	1,912,742
2016	47,200	1,950,010
2017	51,970	1,901,314
2018	55,187	1,961,553
Correlation	0.847	
Covariance	390,280,634.3	

Source: Elaborated by authors based on data of Žilina self-governing region

4. Conclusions

The motivation to own license disabled person and person with reduced mobility can also be the possibility to realize the demand for suburban bus transport for reduced fares. Research in the regions of Slovakia confirmed the medium indirect strength of the relationship between the average unit price of fare disabled person and person with reduced mobility in suburban bus transport and the number of valid licenses disabled person and person with reduced mobility. The incentive may also be a reduced fares for this group of passengers compared to the basic fares.

Conditions for issuing licenses disabled person and person with reduced mobility are defined from the state level and these decisions and the number of licenses issued determine the demand for public passenger transport on the regional as well at local level and budgets of municipalities as ordering suburban bus transport. Under the conditions of the Slovak Republic, the self-governing is the ordering party for suburban bus services. The provision of public services for suburban bus transport up to 100 km is subject to price regulation. From its position, the self-governing region sets the maximum prices for transport, which the carrier subsequently defines in the tariff.

The share of this group of passengers in total demand is increasing, as confirmed by a case study in the Žilina self-governing region. That study also confirmed that in terms of time development is has a strong direct correlation between the number of valid licenses disabled person and person with reduced mobility and the holders´demand for suburban bus transport.

In case is no change in the method of issuing and proving the eligibility of the license disabled person and person with reduced mobility a further increase in the number of licenses can be expected. In this case, it will be necessary to take measures from the position of public transport service customers concerning the objectification of the eligibility of special fares for license holders.

The measure may be the introduction of entitlement to a special fare, which the license holders buy from the bus driver only from the traffic card, not in cash. The card will be issued by the carrier and the card will be valid for 12 months. The traffic card will contain a photo of the holder of the license. The traffic card will be issued upon presentation of a valid license disabled person and person with reduced mobility. This would eliminate the risks of paper licenses by persons who do not hold them. It would also eliminate the risks of using expired licenses. The interconnection of the carrier's information systems with the public administration information system, in particular the database of valid licenses, would provide for a multi-level control of the application of a special fare group of passengers holding license disabled person and person with reduced mobility. This area also requires further research on the requirements of these passengers, on the quality of transport services, their satisfaction with the quality of transport services, the scope of the offer as well as the possibilities and intensity of their transport, and support from transport customers and bus carriers.

5. Acknowledgement

This paper has been developed under support of project: MŠVVŠ SR VEGA No. 1/0566/18 KONEČNÝ, V.: Research on the impact of supply and quality of transport services on the competitiveness and sustainability of demand for public transport.

6. References

[1] Alonso A., Monzon A., Cascajo R.: Comparative analysis of passenger transport sustainability in Europin city. Ecological Indicators. 2015, 48, 578–592, DOI: 10.1016/j.ecolind.2014.09.022.

[2] Buehler R., Pucher J.: Making public transport financially sustainable. Transport Policy. 2011, 18(1), 126–138, DOI: 10.1016/j.tranpol.2010.07.002.

[3] Buhler C., Heck H., Becker J.: How to inform people with reduced mobility about public transport. Computers Helping People with Special Needs, Proceedings. 2008, 5150, 973+.

[4] Dydkowski G., Gnap J.: Premises and limitations of free public transport implementation. Communications – Scientific Letters of the University of Zilina. 2019, 21(4), 13–18, ISSN:13364205.

[5] Fatima K., Moridpour S.: Measuring public transport accessibility for elderly. MATEC Web of Conferences 2018 6th International Conference on Traffic and Logistic Engineering (ICTLE 2018). 2019, 259, DOI: 10.1051/matecconf/201925903006.

[6] Fatima K., Moridpour S., Saghapour T., De Gruyter C.: A case study of elderly public transport accessibility. 2018 Asia-Pacific Conference on Intelligent Medical (APCIM)/2018 7Th International Conference on Transportation and Traffic Engineering (ICTTE2018). 2018, 253–257, DOI: 10.1145/3321619.3321651.

[7] Gašparík J., Stopka O., Pečený L.: Quality evaluation in regional passenger rail transport. Naše More. 2015, 62(3), 114–118, DOI: 10.17818/NM/2015/SI5.

[8] Hansson J., Pettersson F., Svensson H., Wretstrand A.: Preferences in regional public transport: a literature review. European Transport Research Review. 2019, 11(1), DOI: 10.1186/s12544-019-0374-4.

[9] Holmgren J.: A strategy for increased public transport usage – The effects of implementing a welfare maximizing policy. Research in Transportation Economics. 2014, 48, 221–226, DOI: 10.1016/j.retrec.2014.09.046.

[10] Holmgren J.: An analysis of the determinants of local public transport demand focusing the effects of income changes. European Transport Research Review. 2013, 5(2), 101–107, DOI: 10.1007/s12544-013-0094-0.

[11] Ibarra-Rojas O.J., Delgado F., Giesen R., Munoz J.C.: Planning, operation, and control of bus transport systems:A literature review. Transportation Research Part B-Methodologigal. 2015, 77, 38–75, DOI: 10.1016/j.trb.2015.03.002.

[12] Ingvardson J.B., Nielsen O.A.: How urban density, network topology and socio-economy influence public transport ridership: Empirical evidence from 48 European metropolitan areas. Journal of Transport Geography. 2018, 72, 50–63, DOI: 10.1016/j.jtrangeo.2018.07.002.

[13] Kalasova A., Mikulski J., Kubikova S.: The impactof intelligent transport systems on an accident rate of the chosen part of road communication network in the Slovak republic. Communications in Computer and Information Science, 2016, 640, 47–58, DOI: 10.1007/978-3-319-49646-7_5.

[14] Kalasova A., Cernicky L., Hamar M.: A New Approach to Road Safety in Slovakia, Telematics in the Transport Environment. Communications in Computer and Information Science. 2012, 329, 388–395, DOI: 10.1007/978-3-642-34050-5_44.

[15] Kral P., Janoskova K., Kliestik T.: Key determinants of the public transport user´s satisfaction. Administratie si Management Public. 2018, 31, 36–51, DOI: 10.24818/amp/2018.31-03.

[16] Ludici A., Bertoli L., Faccio E.: The "invisible"needs of women with disabilities in transportation systems. Crime Prevention&Community Safety. 2017, 19(3-4), 264–275, DOI: 10.1057/s41300-017-0031-6.

[17] Metz D.: Demographic determinants of daily travel demand. Transport Policy. 2012, 21, 20–25, DOI: 10.1016/j.tranpol.2012.01.007.

[18] Mouratidis K., Ettema D., Naess P.: Urban form, travel behavior, and travel satisfaction. Transportation Research Part A-Policy and Practice. 2019, 129, 306–320, DOI: 10.1016/j.tra.2019.09.002.

[19] Mrnikova M., Poliak M., Šimurková P., Reuter N.: Why is important establishment of the organizer in integrated transport system in Slovak republic? 2018 XI International Science and Technical Conference Automotive Safety. 2018, DOI: 10.1109/AUTOSAFE.2018.8373318.

[20] Paulley N., Balcombe R., Mackett R., Titheridge H., Preston J., Wardman M., et al.: The demand for public transport: The effects of fares, quality of service, income and car ownership. Transport Policy. 2006, 13(4), 295–306, DOI: 10.1016/j.tranpol.2005.12.004.

[21] Poliak M.: Procedure for award of contracts and contracting in public passenger transport. Urban Transport Systems, 2017, DOI: http://dx.doi.org/10.5772/64820.

[22] Poliak M.: The relationship with reasonable profit and risk in public passenger transport in the Slovakia. Ekonomicky Casopis. 2013, 61(2), 206–220.

[23] Poliak M., Simurkova P., Cheu K.: Wage inequality across the road transport sector within the EU. Transport Problems. 2019, 14(2), 145–153, DOI: 10.20858/tp.2019.14.2.13.

[24] Starzynska B., Kujawinska A., Grabowska M., Diakun J., Wiecek-Janka E., Schnieder L, et al.: Requirements elicitation of passengers with reduced mobility for the design of high quality, accessible and inclusive public transport services. Management and Production Engineering Review. 2015, 6(3), 70–76, DOI: 10.1515/mper-2015-0028.

[25] Veternik M., Gogola M.: Examining of correlation between demographic development of population and their travel behaviour. 12th International Scientific Conference of Young Scientists on Sustainable, Modern and Safe Transport. 2017, 192, 929–934, DOI: 10.1016/j.proeng.2017.06.160.

[26] Winska M., Gzik A.: Determining the level of satisfaction among users of public transport in Lublin. The Archiwes of Automotive Engineering – Archiwum Motoryzacji. 2019, 85(3), 19–39, DOI: 10.14669/AM.VOL85.ART2.