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PRICES AS AN ELEMENT OF COMPARATIVE STUDIES ON PEOPLE'S TRAVELS IN CITIES

Ticket prices are one of crucial factors of urban public transport services competitiveness. Ticket prices are expected not only to ensure appropriate revenue for the urban public transport organiser, by they are also an important instrument of cities' transport policy. The paper is aimed at comparison of urban public transport prices in the largest Polish cities taking into consideration diversified purchasing power as well as the economic potential of city residents and also the competitiveness against the individual car transport. The presented and applied method for comparisons is recommended in particular to compare centres featuring high diversification of the economic potential and of the purchasing power of the population.

Keywords: Urban public transport, prices, fares, comparative analysis, cities, pricing policy.

1. Introduction

Comparative studies are significant in the price management process, including the urban public transport, first of all to compare substitute methods for people's travels, such as urban public transport, taxis, or individual car transport. The comparisons of qualitative features and other significant characteristics for travellers as well as of price or cost of specific travel allow to assess the attractiveness, competitiveness and substitutability of various travelling methods. This way one can assess e.g. the tendency to give up the urban public and to use the individual transport.

Although the issues of price setting provided some output in the urban transport economics [1 - 5], but the literature on the topic is short of price comparative studies, which would allow to assess the pricing policy in cities and directions of tariff systems development. So far this issue has been described in the broadest way in the book 'Urban Transport Prices In Europe' (2007), edited by R. Tomanek [6], in which prices and tariffs of urban public transport were studied and compared in 100 European cities.

This paper focuses primarily on price comparative studies, including in particular price comparisons between the largest cities in Poland and referring those prices to the purchasing power of city residents and also to the economic potential. Such comparisons allow to evaluate the price policy pursued in the urban public transport in Poland.

2. Comparative Studies on Urban Public Transport Prices

When analysing prices, including public transport service prices, it is not possible to limit oneself to the provision of nominal figures or their changes in a selected period of time. The nominal value, or supplemented only by this value change in time, explains not much without any reference. It becomes necessary to refer the price to the consumer goods and services price increase index, and from the service provider point of view – to indices presenting price rises of the basic productive factors. In the case of transport services, where the fuel and labour costs are important cost elements, the human factor has double importance. On the one hand the remunerations and related charges generate a substantial cost, on the other hand remunerations create the purchasing power and hence possibilities to buy specific goods on the market. So higher remunerations are a factor increasing the entity costs, but also increasing possibilities to buy specific goods and eliminating their price increase.

The comparison of prices in a time period, taking into account the change of money value in time, or comparisons of substitutes' price changes do not exhaust the work, which would allow to assess the price development – in this case prices of urban public transport services. It is also advisable to make comparisons in space, i.e. with other cities. The scope of comparison can be limited only to cities within the country,

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Comparison of nominal prices of basic ticket types in studied cities in 2016

Table 1

Area/Ticket type	Nominal price of single travel ticket in the urban zone (PLN)	Nominal price of single travel time ticket (30-40 minutes) (PLN)	Nominal price of a personal monthly ticket or 30-day ticket for the whole network (PLN)	Nominal price of a bearer monthly ticket or 30-day ticket for the whole network (PLN)
Poznan	-	4.60	199.00	-
Szczecin	-	3.00	162.00	170.00
Bydgoszcz	3.00	-	120.00	140.00
Wroclaw	3.00	3.00	98.00	170.00
Katowice	3.10	3.70	144.00	168.00
Gdansk	3.20	-	104.00	117.00
Krakow	3.80	3.80	144.00	200.00
Lodz	3.80	3.40	96.00	148.00
Warsaw	4.40	-	196.00	230.00
Minimum	3.00	3.00	96.00	117.00

Source: Own study based on studied cities websites.

but it is also possible to make comparisons with other cities in Europe or worldwide. Certain rules should be obviously observed, most generally – compared cities should be similar in size, e.g. in terms of population. Also it is necessary to consider the fact that capital cities are cities of special political, administrative and economic situation. Numerous central offices have their seats there, but also entities operating on European and global, and not only on the national scale. This frequently translates into higher revenues of the city and population, into higher standards of services, and frequently also into higher prices.

The paper compares prices binding in the largest Polish cities (population in excess of 300,000 people). Table 1 specifies nominal prices of basic ticket types in the studied cities.

To illustrate the existing differences, the next Table 2 refers the nominal prices to the minimum, i.e. the lowest price of specific tickets in the studied group of cities. High diversification of nominal ticket prices is visible in studied cities. The price of single travel ticket in the urban zone in Warsaw is more than 46% higher than the cheapest similar ticket in Wroclaw and Bydgoszcz.

Comparison of nominal prices in the given city with the lowest ticket price (minimum)

Table 2

Area/Ticket type	Difference between nominal price of single travel ticket in the urban zone and the minimum	Difference between nominal price of single travel time ticket (30-40 minutes) and the minimum	Difference between nominal price of a personal monthly ticket or 30-day ticket for the whole network and the minimum	Difference between nominal price of a bearer monthly ticket or 30-day ticket for the whole network and the minimum
Poznan	-	53.3%	107.3%	-
Szczecin	-	0.0%	68.8%	45.3%
Bydgoszcz	0.0%	-	25.0%	19.7%
Wroclaw	0.0%	0.0%	2.1%	45.3%
Katowice	3.3%	23.3%	50.0%	43.6%
Gdansk	6.7%	-	8.3%	0.0%
Krakow	26.7%	26.7%	50.0%	70.9%
Lodz	26.7%	13.3%	0.0%	26.5%
Warsaw	46.7%	-	104.2%	96.6%

Source: own study based on figures from Table 1.

Nominal prices have been compared, but also diversified economic potential of cities and diversified situation of residents, resulting from different obtained labour incomes, have been considered. The level of Gross Domestic Product (GDP) obtained in specific city or group of cities and the average gross salary were adopted as the basic differentiating measures for the given city or area. Those measures were used to calculate adjusted prices - nominal prices were corrected multiplying them by the value showing to what extent the mean GDP for analysed cities is higher or smaller than the given city GDP and in a similar way - to what extent the average gross salary for analysed cities is higher or smaller than the average salary of the given city. The adjusted prices were calculated acc. to the following formulae:

1.
$$\text{Adjusted price} = \text{nominal price} \times \frac{\text{average GDP for the group of studied cities}}{\text{GDP for given city}}$$
2.
$$\text{Adjusted price} = \text{nominal price} \times \frac{\text{average gross salary for the group of studied cities}}{\text{average gross salary for given city}}$$

Table 3 compares the studied cities in terms of their economic situation. GDP per capita and the average monthly gross salary in the given city in 2013 are specified in the table.

GDP per capita and the average monthly gross salary in studied cities in 2013

Table 3

Area	Annual GDP per capita (PLN)	Average monthly gross salary (PLN)
Bydgoszcz	44,720.38	3,554.43
Szczecin	50,437.07	4,029.51
Lodz	53,402.63	3,710.91
Katowice	59,623.28	4,797.17
Gdansk	61,822.72	4,481.04
Krakow	69,015.22	3,997.80
Wroclaw	69,071.79	4,129.56
Poznan	86,577.69	4,256.82
Warsaw	126,618.82	5,226.05

Source: Regional Data Bank of the Central Statistical Office (RDB CSO) [7]

Nominal prices of basic ticket types in studied cities were adjusted by the GDP value acc. to formula 1. Results of analysis are specified in Table 4, presenting values reflecting ticket prices after the performed correction.

In Table 5 the obtained results are compared to the minimal value, i.e. the lowest adjusted price for the studied

Comparison of basic ticket prices adjusted by the GDP index for the given city/region

Table 4

Area/ Ticket type	Price of single travel ticket in the urban zone (GDP adjusted) (PLN)	Price of single travel time ticket (30-40 minutes) (GDP adjusted) (PLN)	Price of a personal monthly ticket or 30-day ticket for the whole network (GDP adjusted) (PLN)	Price of a bearer monthly ticket or 30-day ticket for the whole network (GDP adjusted) (PLN)
Poznan	-	3.44	177.86	-
Szczecin	-	3.85	248.54	258.21
Warsaw	2.72	-	119.78	139.16
Wroclaw	3.40	2.81	109.79	188.55
Gdansk	4.06	-	130.17	144.98
Katowice	4.07	4.02	186.89	215.86
Krakow	4.31	3.57	161.46	222.00
Bydgoszcz	5.26	-	207.64	239.83
Lodz	5.58	4.13	139.11	212.31
Minimum	2.72	2.81	109.79	139.16

Source: own study.

Comparison of adjusted ticket prices with the lowest adjusted ticket price (minimum) in the studied group of cities Table 5

Area/ Ticket type	Difference between nominal price of single travel ticket in the urban zone (GDP adjusted) and the minimum	Difference between nominal price of single travel time ticket (30-40 minutes) (GDP adjusted) and the minimum	Difference between nominal price of a personal monthly ticket or 30-day ticket for the whole network (GDP adjusted) and the minimum	Difference between nominal price of a bearer monthly ticket or 30-day ticket for the whole network (GDP adjusted) and the minimum
Poznan	-	+22.4%	+62.0%	-
Szczecin	-	+37.0%	+126.4%	+85.5%
Warsaw	0.0%	-	+9.1%	0.0%
Wroclaw	+25.0%	0.0%	0.0%	+35.5%
Gdansk	+49.3%	-	+18.6%	+4.2%
Katowice	+49.6%	+43.1%	+70.2%	+55.1%
Krakow	+58.5%	+27.0%	+47.1%	+59.5%
Bydgoszcz	+93.4%	-	+89.1%	+72.3%
Lodz	+105.1%	+47.0%	+26.7%	+52.6%

Source: own study based on figures from Table 4.

cities. The carried out analysis shows e.g. that the highest nominal prices of single travel ticket in the urban zone exist in Warsaw, and then in Krakow and Lodz, and those of a personal monthly ticket or 30-day ticket valid for the whole network in Warsaw and Poznan. However, after the adjustment of nominal prices with the adopted GDP index it is possible to notice that - having considered the city economic situation - these relationships have changed. And so Warsaw ranks among the cheapest cities taking into account adjusted analysed ticket prices, Lodz and Bydgoszcz are cities, where

the single travel ticket prices in the urban zone are the highest after the adjustment made, and in Szczecin the adjusted monthly ticket prices are much higher than in the other cities.

It is also worth to refer ticket prices in the studies cities to the purchasing power of their residents. Table 6 specifies value reflecting ticket prices adjusted by the average monthly gross salary for the given city or subregion (depending on the data availability in the Central Statistical Office database). Table 7, like previous tables, compared the obtained results with the minimum value.

Comparison of basic ticket prices adjusted by the average monthly gross salary for the given city/subregion Table 6

Area/ Ticket type	Price of single travel ticket in the urban zone (adjusted by the average monthly gross salary) (PLN)	Price of single travel time ticket (30-40 minutes) (adjusted by the average monthly gross salary) (PLN)	Price of a personal monthly ticket or 30-day ticket for the whole network (adjusted by the average monthly gross salary) (PLN)	Price of a bearer monthly ticket or 30-day ticket for the whole network (adjusted by the average monthly gross salary) (PLN)
Poznan	-	4.50	205.25	-
Szczecin	-	3.10	176.51	185.70
Katowice	2.86	3.21	131.79	154.15
Gdansk	3.16	-	101.90	114.93
Wroclaw	3.22	3.03	104.19	181.21
Warsaw	3.73	-	164.66	193.72
Bydgoszcz	3.74	-	148.23	173.37
Krakow	4.21	3.96	158.15	220.21
Lodz	4.53	3.82	113.58	175.55
Minimum	2.86	3.03	101.90	114.93

Source: own study.

Comparison of ticket prices adjusted by the average monthly gross salary with the lowest adjusted ticket price (minimum) in the studied group of cities

Table 7

Area/ Ticket type	Difference between nominal price of single travel ticket in the urban zone (adjusted by the average monthly gross salary) and the minimum	Difference between nominal price of single travel time (30-40 minutes) (adjusted by the average monthly gross salary) and the minimum	Difference between nominal price of a personal monthly ticket or 30-day ticket for the whole network (adjusted by the average monthly gross salary) and the minimum	Difference between nominal price of a bearer monthly ticket or 30-day ticket for the whole network (adjusted by the average monthly gross salary) and the minimum
Poznan	-	+48.5%	+101.4%	-
Szczecin	-	+2.3%	+73.2%	+61.6%
Katowice	0.0%	+5.9%	+29.3%	+34.1%
Gdansk	+10.5%	-	0.0%	0.0%
Wroclaw	+12.6%	0.0%	+2.2%	+57.7%
Warsaw	+30.4%	-	+61.6%	+68.6%
Bydgoszcz	+30.8%	-	+45.5%	+50.8%
Krakow	+47.2%	+30.7%	+55.2%	+91.6%
Lodz	+58.4%	+26.1%	+11.5%	+52.7%

Source: own study based on figures from Table 6.

The comparison of nominal ticket prices with the purchasing power substantially changes relationships between the studied cities. Having considered the purchasing power, i.e. adjusting nominal prices by the average monthly gross salary index for the given city/subregion, it turns out that relatively high nominal ticket prices in such cities as Warsaw or Katowice become much lower compared to other cities. Therefore such comparison allows to make the carried out price analysis significantly more objective. A similar effect may be obtained counting the number of tickets, which can be purchased e.g. for the average salary in the given region (Table 8).

Table 8 shows that even in such a case as e.g. Warsaw, where ticket prices are higher, for the average remuneration for work in this city it is possible to buy more tickets than in other cities. Although in the other cities ticket prices are lower, but the proportion of salaries is so unfavourable, that allows to buy a smaller number of tickets, despite their lower price. The highest number of single travel tickets for the urban zone, for the average monthly salary, can be purchased in Katowice. In the case of studied season ticket types the most favourable relationship occurs in Gdansk.

In the case of studying urban transport prices in the largest Polish cities it is also very important to compare costs related

Number of tickets, which can be bought for the average monthly gross salary

Table 8

Area/ Ticket type	Average monthly gross salary (PLN)	Single travel ticket in the urban zone	Single travel time ticket (30-40 minutes)	Personal monthly or 30-day ticket for the whole network	Bearer monthly or 30-day ticket for the whole network
Bydgoszcz	3,554.43	1,185	-	30	25
Lodz	3,710.91	977	1,091	39	25
Krakow	3,997.80	1,052	1,052	28	20
Szczecin	4,029.51	-	1,343	25	24
Wroclaw	4,129.56	1,377	1,377	42	24
Poznan	4,256.82	-	925	21	-
Gdansk	4,481.04	1,400	-	43	38
Katowice	4,797.17	1,547	1,297	33	29
Warsaw	5,226.05	1,188	-	27	23
Maximum	5,226.05	1,547	1,377	43	38

Source: Own study based on the RDB CSO data and studied cities websites.

Comparison of costs of travelling by a private car to the city centre and costs of parking the car with the basic ticket price in the urban public transport

Table 9

City	Charge for the first hour of parking (PLN)	Fuel cost to drive 5 km (PLN)	Total costs (fuel + parking charge) (PLN)	Basic ticket price (PLN)	Difference between basic ticket price and the total cost of travelling by a private car (PLN)
Poznan	3	1.63	4.63	4.6	-0.03
Warsaw	3	1.63	4.63	4.4	-0.23
Katowice	2	1.63	3.63	3.1	-0.53
Krakow	3	1.63	4.63	3.8	-0.83
Lodz	3	1.63	4.63	3.4	-1.23
Gdansk	3	1.63	4.63	3.4	-1.23
Szczecin	2.8	1.63	4.43	3	-1.43
Bydgoszcz	3	1.63	4.63	3	-1.63
Wroclaw	3	1.63	4.63	3	-1.63

Source: Own study based on studied cities websites.

to travelling by a private car with ticket prices for the urban public transport. Table 9 specifies the costs of travelling to the city centre (the distance of 5 km was adopted), which include the cost of fuel and the cost of parking the car for one hour, as well as prices of basic tickets for the urban public transport binding in the given city.

The analysis of costs of travelling by a private car, performed in Table 8, considers only the fuel costs apart from the parking charge, and it is necessary to remember that an average cost of travelling by a private car is much higher than the fuel cost. Because the cost calculation should include depreciation, costs of regular maintenance, of repairs, car parking (e.g. garage), or the insurance costs. However, the marginal cost counts for the consumer and it is the cost of fuel purchase and the amount of parking charge, if related to the specific travel, which are most often considered by the consumer [6].

Table 9 shows that in each of studied cases the urban public transport, in terms of cost, was more competitive than the individual transport. From this point of view such cities as Wroclaw, Bydgoszcz, and also Szczecin, come out to be most favourable. Instead, Poznan and Warsaw are the cities, where the price competitiveness of the urban public transport was lowest against private cars. So taking into account a high diversification of studied cities and the fact that both Warsaw and Poznan are the cities of relatively high GDP and of relatively high average monthly salary, the amount of parking charge in the city centre may raise doubts. The amount of parking charge is almost the same in every studied city, which results from Polish regulations, which defined the maximum amount (PLN 3) for the first hour of parking on public road [8]. In this way the cities have limited possibilities to use this instrument within the pursued transport policy. This results, in

the context of various incomes of city residents and differing economic situation of cities, in particular the largest ones in Poland, in a situation that a real impact of paid parking in the city centres is weakened.

3. Conclusions

In contemporary economy the comparative studies are being more and more important, becoming one of main research methods, apart from induction and deduction. They create an opportunity to analyse economic phenomena in various systems and of various range. Comparative studies on prices are not an easy research task, because they require designing and applying measures or their aggregates, enabling to carry out as objective as possible assessment of phenomena and processes. The price analysis certainly requires to assess the change dynamics, to refer the price level to the economic situation as well as to carry out comparison between similar entities/units.

The comparison of ticket prices in the largest cities shows that the highest nominal prices of urban public transport tickets occur in Warsaw, Lodz and Krakow, and the lowest in Bydgoszcz and Wroclaw. However, a true picture of those prices amount is provided only by the comparison of ticket prices with the purchasing power and with the economic situation. In this context, having considered the purchasing power, the highest burden of ticket prices for residents exists in Lodz, Krakow and Bydgoszcz. Despite the lowest nominal prices in the studied group the burden in Bydgoszcz is among the highest ones. Instead Warsaw, despite the highest nominal ticket prices, is in the group of cities, where ticket prices,

taking into account the purchasing power and economic situation, are relatively the lowest.

In the comparative analysis it is also very important to make a comparison with substitute goods and services. So when studying the prices of urban public transport in cities it is necessary to refer to travelling by private cars, i.e. substitute services for the public transport. In this case it is most appropriate to compare prices of single travel tickets, intended for persons seldom using the public transport, with costs of fuel and parking charges. In all studied cities the use of urban public transport is cheaper than travelling by car, which should

be positively evaluated. However, the maximum amount of parking charges, regulated in Polish legislation, is the element substantially limiting actions of cities to improve the urban public transport attractiveness against private cars.

Comparative studies on prices can be a significant element of the policy pursued by the studied cities in the field of shaping the public transport prices. The carried out analysis shows also how important it is to consider – in comparative studies of prices, including the urban transport prices – the macroeconomic factors, which can substantially change the perspective of economic phenomena assessment.

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