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RAIL FACTOR AND ITS PERCEPTION IN SMALLER REGIONS - LOVOSICE CASE STUDY

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SUMMARY:

Objectives The paper aims to observe the passengers' attitude towards modal choice regarding the rail factor, a possible preference of the rail-based public transport modes in otherwise similar transport supply conditions. The existence of the rail factor is surveyed regarding the tolerance of the passengers towards the expected longer station approach times or travel times with the regional railway line to be reintroduced in comparison to the existing regional bus lines. **Approach** Before the reintroduction of the railway line no. 113 Most - Lovosice, an online survey with the passengers along the line was conducted. The respondents were asked about modal choices regarding their requirements on the operation frequency and conditions of a possible change in favor of rail-based modes. **Results** The respondents found the train more comfortable, and it is likely to be chosen for the unspecified general journey. However, the regional train should not be considerably slower than the competing bus should the passengers switch in favor of the train. **Contribution** The collected SP data combined with the RP data (transport survey) form the basis for a determination of the rail factor role in regional transport as shown with the case study of the reintroduced line no. 113.

Key words: regional railway line, modal choice, modal attractiveness, travel time

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1. INTRODUCTION

When perceiving means of public transport with similar service and performance characteristics, the passengers approach to them is different (Cain et al, 2009) and rail-based means are supposed to be superior. The phenomenon of rail factor or rail bonus (rail bias) has been described as an inherent, intangible, and even emotional-based passenger preference (Scherer, 2012) for rail-based public transport systems (railway, trams, trolleybuses) over road-based ones. It is often experienced that the new rail-based mode can attract more passengers than the initial bus lines with similar characteristics in terms of tangible modal choice variables such as travel time, travel costs, number of transfers or accessibility. This tendency is also to be seen with cities of comparable size where one city has an electric-powered public transport mode and this city reports a higher modal share of public transport. A similar effect is expected to be present with regional transport, although the accordingly comparable services in the scarcely populated regions are hardly to be found.

According to previously presented research, opinions on the relevance and even presence of the rail factor are mixed and may even be dependent on the geographical and socio-demographic conditions. In general, more studies concerning urban systems seem to be conducted. Axhausen et al. (2001) presented a before-after study of the reverse change from tram to bus service with the conclusion of a small but existing influence of the rail factor in favor of the tram. An influence of the positive rail factor towards the tram by different passenger types explained by intangible variables such as vehicle atmosphere, travel information and subjective comfort was presented by Bunschotten et al. (2013) who also estimated a positive influence on the ridership as 12 %. Contrary to that, Ben Akiva and Morikawa (2002) argue the factors are not specific to rail and there is no rail bonus provided the high-quality BRT system is to be considered. Among the studies focusing on regional rail, both Megel (2002) and Barth et al. (2020) stated the positive rail factor influence differs with age groups and passenger modal captivity.

Despite the attitudes commonly accepted by practitioners, the impact of the rail factor has never been truly researched as there were not any before-after data sets for the Czech conditions. This situation changed with the reopening of the disused regional

railway line no. 113 between Lovosice and Most in the Ústí Region which meets the worldwide phenomenon of regional railway modernization (Veit et al., 2018). Together with consequent transport surveys in the relevant regional bus and railway lines (Metelka and Janoš, 2022), a sociologic survey was organized to determine the passengers attitudes towards the new concept and potential modal changes.

2. METHODS

The survey was conducted at the beginning of December 2019 shortly before the reintroduction of the regular train service on the upgraded railway line no. 113 Lovosice - Most after 12 years without train service compensated by regional bus lines. Because of the time consent, the online form was chosen as the best means to attract a higher number of participants, especially those who reside along the railway line. Because the questions were mainly focused on line no. 113 and its surroundings, the passengers that do not reside in the Ústí Region or do not commute to it were omitted from the results.

The total number of participants was 164 and their characteristics influencing the results are demonstrated in the following sections.

2.1. Demographic structure

Considering the age stratification of the respondents a realistic representation of the population in the Ústí Region was achieved as there were over 70 % of the people who belonged to major age groups 27-40 years and 41-65 years (see Table 1). The group of school children and students as typical public transport users in two age groups 0-15 and 16-26 years nearly 25 % of the respondents. The former age group was less frequent than with the normal population (less than 2 %) due to the distribution channel of the survey (local websites of the villages and the Region etc.) and related unwillingness to fill in the online form. A similar problem was encountered with the people older than 65 years where the shares were despite the short amount of time over 4 %.

The classification according to economic activity shows that over 70 % of the passengers are standard taxpayers and 16,5 % represent high school or college students. The reasons for lower shares of retired people (6 %) and the absence of elementary school students were mentioned above.

Table 1. Demographic structure of the participants (N=164)

Age of the participants	0-15	16-26	26-40	40-35	66+
Share	1,2%	23,8%	34,8%	36,0%	4,3%

2.2. Relationship to public transport

Most of the respondents (over 63 %) use public transport for regular journeys whereas about 28 % are occasional users. Many of them may use annual or seasonal passes (Kříž and Janoš, 2019) and thus form some kind of captive riders as the transport supply is less variable in the small region and the ownership of the passes reflects the frequency of use. In these groups of public transport riders, over 60 % use the regional bus service between Most and Lovosice. The rest of the respondents claim that despite not using public transport now they are not strictly against it. This fact confirms that no captive drivers participated in the survey as there is hardly any reason for them to fill in the form. The most frequent reasons for not using public transport are car ownership long travel times reached by public transport and long distances to public transport access points.

3. RESULTS

In this chapter, the perception aspects of the regional railway line are presented.

3.1. Comfort

As only the stated preferences were collected an objective methodology of the qualitative assessment could not be applied. Therefore, the presented data are focused on the subjective perception of the participants.

When comparing regional buses and regional railways in general without further localization the train is strictly preferred (see Table 2). For a non-specific regional journey, almost 80 % of the respondents choose a train and a similar number of participants perceive the train as more comfortable than the bus. The data indicate that if there are similar key performance characteristics e.g. travel time with the bus and the train, the train may carry more passengers than the bus with the same parameters. Such a result was expected in terms of the rail factor influence.

Table 2. General modal preferences of the respondents (N=164)

Aspect	Train	Bus	No difference
Preference for general regional journey	79,3 %	20,7%	-
Perceived as more pleasant and comfortable	79,3 %	8,5%	12,2%

3.2. Frequency

The respondents who stated they did not know the planned operational concept for the reopened railway line no. 113 were asked about the operation frequency of the new line on workdays. The desired operation frequencies that alone may convince the respondents to take the train are shown in Figure 1.

Some 70 % of the respondents answered in favor of the new operation concept (train every 60 min during peak hours with the period fluctuation (Drábek and Pospíšil, 2018) to 120 min during off-peak hours) with the 60 min headway being strongly preferred. The results fully correspond to the authors' expectations and support the claim that an attractive regional public transport supply may be reached if there is at least a 60-minute headway on offer in the core network during peak hours.

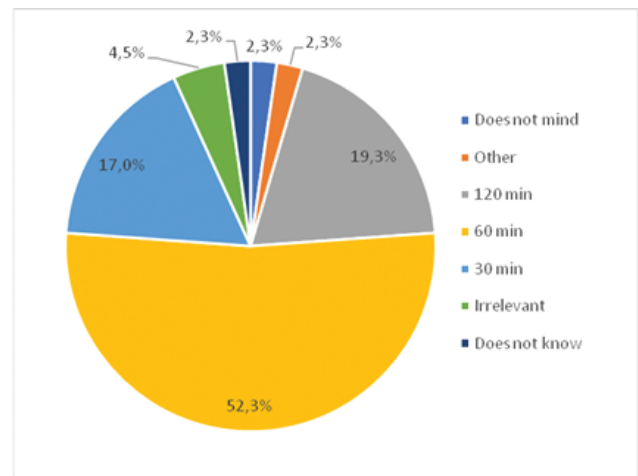


Figure 1. What is the minimum headway during the weekdays for you to start using the train? (N=88)

3.3. Travel time

The same group of respondents was asked about their door-to-door travel time perception regarding different modal choice possibilities. The original

door-to-door travel time reached by a regional bus was set to 30 min and the reaction to possible travel time extension when switching to the regional railway was a subject of the survey. The respondents were introduced to a realistic span of travel times usually reached by short or medium regional public transport journeys between 20 and 60 min.

The results are shown in Figure 2. Approximately one-third of the respondents were unwilling to any door-to-door travel time extension and even wanted to shorten the door-to-door travel time reached by train whereas more than 20 % even wanted to shorten the travel time by one-third. This phenomenon may be caused by a public image of the train as a fast means of transport and travel time reductions may fit in. However, another third accepts the original travel time, and the last third could cope with a travel time extension.

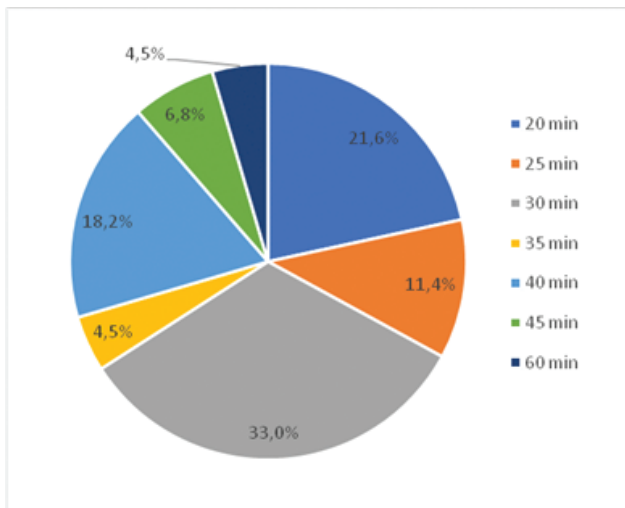


Figure 2. If your door-to-door travel time by bus is 30 min, what travel time would you accept by train with the same journey? (N=88)

The original hypothesis with prevailing preservation of the original travel time and slight preference in favor of mild travel time extension could therefore not be confirmed. It also shows that the passengers are quite sensitive to door-to-door travel time value and if there is room for its change or a tolerance of its extension, minor changes such as 5 min are less important. However, the influence of the rail factor may be contained in the fact that even with the train being less accessible (usually longer distances to its stops in comparison with bus stops), the overall travel time seems to remain the same which indicates the willingness of the respondents to approach the more distant train station and to compensate for this discomfort by faster and more comfortable train ride.

3.4. Potential modal shift

Despite the reintroduction of the disused regional railway line no. 113 with 60 or 120 minute headways since December 2019, the Ústí Region decided against reducing any of the bus lines between Most and Lovosice so the new train line is a significant extension of the regional public transport supply. After some evaluation of the new concept, related partial bus line reductions and the modifications of the transport supply in favor of the new railway line are to be expected since not only operation concept changes but also the inevitable infrastructure means for travel time reduction were introduced. Only the combination of these factors in contrast to the mere reintroduction of the railway operation may contribute to relevant modal split changes.

All respondents were asked if they were going to use the train as a potential substitution for the bus with similar timetable features. The results presented in Figure 3 show that the train is an acceptable alternative for more than 80 % of the respondents. Only 10 % of people would switch to individual transport and for 3 % such change would be the subject of an official complaint. These results may also mean that the new operational concept was designed to successfully meet the needs of its customers and that the rail-based mode with similar timetable features may compensate for the minor discomfort its distant access points may cause.

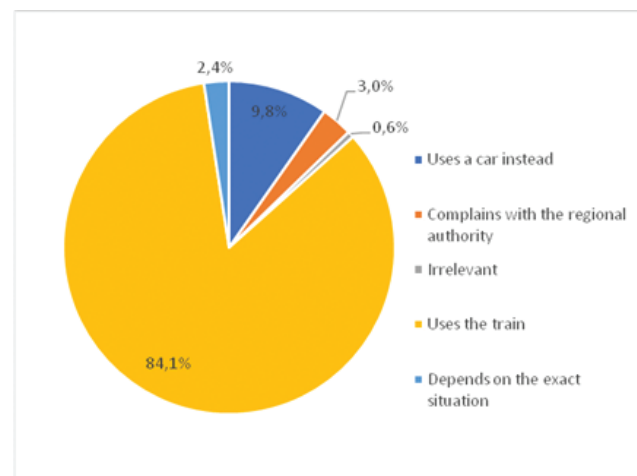


Figure 3. What would you do if there was a significant reduction of the current bus lines in favor of the train with a similar timetable? (N=164)

4. DISCUSSION

According to the data obtained from the SP-survey, if the passengers must choose between a train and

a bus the train is preferred because of its comfort, speed, ability to carry bicycles or the on-board restroom. These qualitative aspects are similar to the intangible values identified by Bunschotten et al. (2013). Therefore, a better perception of the regional railway in comparison to the regional bus is present.

However, if the train cannot achieve at least similar values as the bus in terms of door-to-door travel time, the advantages mentioned above become neglected as the passengers are unwilling to accept longer journey times only because they can travel by train. This statement confirms the results given in the discussed foreign studies as tangible values must correspond to each other for the intangible rail factor to be estimated (Axhausen et al., 2001).

Despite the best efforts of the researchers, the collected data and the related claims are somehow limited by the data collection method. The online form used for the survey was not able to fully represent all the relevant age groups, especially the typical public transport customers. It does not include the proportional shares of the youngest schoolchildren that form an essential part of the public transport customers as captive riders in the regional bus lines. The online form may have been an obstacle for the elderly or retired passengers, too, resulting in potential changes in preferences (Megel, 2002).

In addition, the qualitative attitude of the participants may be influenced by the fact that the people with a natural interest in the railway mode are more likely to fill in the form. This fact was also confirmed by the absence of captive drivers with higher preferences for individual transport in suburban and rural areas (Braun Kohlová, 2009) in the survey. However, only the answers from the participants of the Ústí Region were considered to prevent undesirable preferences towards the popular railway mode based on pure fandom.

5. CONCLUSION

The study was conducted in separate stages using the opportunity to obtain before-after data sets collected with the reopening of the disused railway line upgraded to meet the standards of the substitute bus lines. The sociological survey confirmed the importance of the tangible variables used in macroscopic transport models (i.e. travel time), it, however, implied that should those be comparable, the rail-based public transport system is more likely to be chosen.

The Stated Preferences given by the passengers are to be further verified using the Revealed Preferences collected in a transport survey that was conducted after the pandemic in 2021 (Metelka et al., 2022) and is required to incorporate statistical measures to reflect the persisting influence of the reduced mobility with the passengers. The survey may help to determine if the passengers' preferences and their transport behavior as stated preference correspond to their willingness to use the train rather than the regional bus lines as revealed preference. The comparison of the passenger numbers collected before the railway line reintroduction and after it may support the existence of perceived higher attractiveness of the rail-based transport modes called rail factor and further contribute to its research in the conditions of the Czech Republic.

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