

# Travel-based Multitasking on Public Transport: An Empirical Research in Hungary

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## Abstract

On the basis of a survey addressing travel behaviour in 4707 households in Hungary in 2016, activities of passengers (especially on non-local public transport services) are analysed in this paper. Descriptive statistics is applied to provide a general view of household survey results about activities while travelling. K-means clustering is used for the analysis of travel-based multitasking on public transport and chartered commuter bus services. On the basis of one of the very first travel-based multitasking studies in Hungary, we concluded that the prevailing activity is talking to others, followed by relaxing or daydreaming, and listening to music/radio. Based on the outcomes of the clustering of public transport journeys by age of passengers, the main finding is that the use of electronic devices decreases with age and the characteristics of clusters in terms of other activities are diverse.

## Keywords

travel-based multitasking, travel behaviour, public transport, household survey, Hungary

## 1 Introduction

Travel time has been in the focus of transport research for a long time. One of the starting points was the work of Szalai (1972) analysing daily time use in urban areas in 12 countries, concluding that travel accounts for approximately 1 hour per day irrespective of country. A few decades later, Schäfer and Victor (2000) concluded that a person dedicates on average 1.1 hour per day to travel. Fleischer and Tir (2016) summarised research on the travel time budget from the last half-century in Hungary and found that the time spent travelling per day had not changed considerably for the past decades (Table 1).

This average one-hour travel time has, however, been traditionally considered as a waste of time since it was deemed that people cannot engage in productive activities

while travelling. This assumption has driven the definition of the value of travel time, which is key factor in cost benefit analysis (see e.g. González, 1997; Metz, 2008; Wardman, 1998). Nevertheless, recently, due to the increase in the use of portable information and communication technology (smartphones, tablets, laptops) the notion of useless travel time has been criticised by many studies. There is growing evidence that people engage in productive and enjoyable activities while travelling i.e. they carry out *travel-based multitasking* (Keserű and Macharis, 2018).

In the context of multitasking, two combinations of activities may be differentiated:

- *switchtasking* (or task-switching), i.e. carrying out and switching attention between multiple attention-requiring tasks at the same time;
- *background tasking*, i.e. performing a task and doing other (passive) activity in parallel that is not competing for attention.

Although multitasking is usually attached to the first meaning, travel-based multitasking covers the latter in

**Table 1** Transport time budget in Hungary

Year	Age	Average time spent in transport per day (min)
1976/1977	15–69	63.0
1986/1987		61.8
1999/2000	15–74	59.4
2009/2010		65.2

Source: data from Fleischer and Tir (2016)

most cases. Travel may be the primary activity in case of travel modes requiring relevant cognitive effort (e.g. walking, cycling, or driving a car), while secondary activities are passive (e.g. listening to music, talking to others). In the case of passengers, the task being performed on board by a person may be considered the primary activity and travelling as the background one.

Our knowledge of what activities passengers perform and would like to perform is important from various perspectives. Public transport operators can adapt their services to passenger needs to support travel-based multitasking (e.g. by providing free Wi-Fi and power outlets). Vehicle manufacturers may be able to adapt vehicle design to the needs of work or leisure activities on board (e.g. seat spacing, tables, lights) (Van der Waerden et al., 2009). The benefits of being able to spend travel time productively can also contribute to a modal shift to public transport (Wardman and Lyons, 2016).

In this article, a brief analysis of travel-based multitasking is described on the basis of a household survey addressing travel behaviour in Hungary. Only journeys by passengers (especially on buses and trains) are considered. It is expected that by one of the very first evidences from Central and Eastern Europe and in line with the growing literature of this topic (e.g. Kouwenhoven and de Jong, 2018; Varghese and Jana, 2018) outcomes may pave the way for better understanding of travel time use in different cultural and spatial contexts (in this case, Hungary).

## 2 Data and methods

### 2.1 Survey

Previous research applied both qualitative (e.g. ethnography, focus groups, semi-structured interviews) and quantitative methods (e.g. interviews or observations) to detect multitasking characteristics (Keserű and Macharis, 2018). The present study is based on a household survey carried out as part of a project aiming to define Origin-Destination (OD) matrices in Hungary in 2016/2017 (Siska and Szűcs, 2017). The survey was intended to understand general travel behaviour by asking for a detailed account of all journeys made on the last full working day and weekend/holiday preceding the survey. One question addressed activities during travel. Only non-local journeys (and local legs of non-local journeys) are considered here, as the main project addressed travel behaviour between settlements, and household surveys were carried out mainly in towns and rural areas (and only rarely in large cities).

Concerning travel-based multitasking related to a journey, respondents could choose one item from the following: reading; work-related activities; studying; talking to others; listening to music or radio; talking on the phone; messaging; browsing the internet, playing, watching movies (on mobile devices); eating or drinking; relaxing; doing nothing; other. Based on experience during the data collection and data processing, the overlapping categories of "doing nothing" and "relaxing" have been merged. The "other" option has been indicated merely by drivers (e.g. professional bus drivers), thus their answers have been ignored.

### 2.2 Sample

In total, 4707 households were surveyed in 14 districts and 2 cities of Hungary in the autumn of 2016. The number of respondents was 9281, who provided information about 20,332 journeys. As mentioned above, not all journeys are considered in the present study: ignoring local journeys and those done by non-motorized individual modes or as a driver of a motor vehicle, the total number of analysed journeys is reduced to 4385. 3374 were taken on a weekday and 1011 on weekends or holidays.

The *full sample* (Table 2, KSH, 2013) includes journeys by all transport modes (in total, 4385). The *reduced sample* consists of journeys by public transport (train, bus) and chartered commuter bus services (1973 journeys).

Representativeness in terms of sex, age groups and household size seems to be good with respect to the population of Hungary. Some differences are due to random sampling and some others may be explained by the following reasons:

- data was collected for a large scale project (to define Origin-Destination matrices for all modes in Hungary) and the household survey aimed to understand travel behaviour of motorists, i.e. mostly adults, thus children are underrepresented (and consequently other age categories are overrepresented) in the full sample;
- lower proportion of inactive respondents may be due to the changes of unemployment rates from 2011 (11.1 %) to 2016 (5.1 %) in Hungary.

In the sample, most journeys on workdays are to work or school (54.4 %), visiting friends and relatives or leisure (in sum, 23.6 %) and shopping (12.0 %). A majority (74.9 %) takes this journey on a regular basis, i.e. usually on all workdays but at least once a week. Only one out of ten (10.7 %) journeys are taken rarely or for the first time ever.

**Table 2** Sample characteristics

Characteristics		2016 (full sample)	2016 (reduced sample) %	2011 (census in Hungary)	
Sex	Female	52.8	55.0	52.2	
	Male	47.2	45.0	47.8	
Age	6–18	6.9	15.1	17.3	5–19
	19–30	14.8	22.7	12.6	20–29
	31–45	25.7	24.0	23.8	30–44
	46–60	25.6	26.5	22.1	45–59
	60+	27.1	11.7	24.2	60–
Education	Grade 0 to 7	14.8	3.1	12.4	
	Grade 8	23.1	23.2	19.3	
	Vocational training	27.3	34.8	25.2	
	High school	25.8	28.9	25.0	
	Higher education	9.0	9.6	18.1	
Occupation	Student (dependent)	34.0	21.1	35.4	
	Manager, employed, self-employed	46.1	66.4	39.7	
	Inactive (pensioner, child care, unemployed, other)	19.9	12.5	24.9	

Source: own collection; census data from KSH (2013)

### 2.3 Methods

In this article, descriptive statistics is applied to provide a general view of household survey results about activities while travelling, then advanced statistics, namely cluster analysis, is used for the analysis of travel-based multitasking on public transport and chartered commuter bus services. This aims to define relatively homogeneous groups of journeys and, subsequently, passengers and their activities, in order to understand their characteristics. This may allow the study of multitasking by features like age or employment status. The analysis is done by non-hierarchic K-means clustering. The number of clusters have been defined arbitrarily, by preliminary assumptions, as described below.

## 3 Results and discussion

### 3.1 Travel-based multitasking of passengers in general

If journeys by passengers of all transport modes are considered ( $n = 4385$ , full sample), talking to others is the most frequent activity while travelling (approx. 40 %), followed by relaxing (30 %) and listening to music or radio (15 %). Other activities requiring the use of mobile devices (talking on the phone, messaging, browsing, playing, etc.) account for 5–6 %. However, no relevant differences are to be noted between men and women. Women tend to talk to others, read or study, while men use mobile devices or relax in a higher proportion. Some further outcomes are as follows:

- work-related activities are done primarily by those travelling for work-related purposes;
- similarly, studying is the most frequent among people going to school (and those not revealing their trip purposes are studying in a similar proportion);
- people going to school use electronic devices in the highest proportion;
- reading is carried out primarily by people going to work.

Some possible correlation of travel mode and multitasking may be observed even without further analysis. A majority of passengers (three out of four people) talk; the rest relax or listen to music/radio (10 % each) in passenger cars. The range of activities seems to be the most diverse among train passengers: although most of them relax, respondents – maybe due to a presumably longer journey – report a higher rate of reading (15.8 %), studying (8.1 %) and use of electronic devices than people using other modes. Talking to others and relaxing are also relevant activities but not to the extent of, e.g. bus passengers. Reading (3.3 % of bus passengers) and studying (1.5 %) are rare in road passenger transport. People on buses talk, listen to music/radio or, in the largest proportion, do nothing (relaxing, daydreaming, etc.).

The comparison of these outcomes to data from other countries is difficult due to the lack of standard multitasking categories, the diverse composition of the samples (i.e. which transport modes are included) and the lack of

cross-sectional data from the same time periods (as technological development and changes in smartphone penetration can change multitasking patterns quickly) (Keserű and Macharis, 2018). Therefore, any comparison to other countries is only indicative. Nevertheless, previous research has shown that, similarly to the results of this research, the most prevalent multitasking activities are talking to other passengers (Mokhtarian et al., 2015; Patriarche and Huynen, 2014; Timmermans and Van der Waerden, 2008; Zhang and Timmermans, 2010) and relaxing, including window gazing, sleeping, and doing nothing (Guo et al., 2015; Russell et al., 2011; Vilhelmson et al., 2011; Zhang and Timmermans, 2010). At the same time, a significant increase has been detected in the use of ICT devices over time in the UK (Lyons et al., 2016) and the US (Schwieterman and Battaglia, 2014), where longitudinal data is available.

### 3.2 Travel-based multitasking on public transport

In sum, 1973 journeys by 1084 passengers have been analysed to review the activities while travelling on public transport (train, bus) and chartered commuter bus services. In this reduced sample, the proportion of women is 55.5 %, the average age is 39.1 years. With respect to the full sample, working people are overrepresented and their distribution is different to the full sample: the number of managers and self-employed is low (< 1 %) and, consequently, the proportion of other workers is higher than in the full sample. It seems that managers – most probably due to their income, higher car ownership rate, lifestyle, schedule and other personal motivation – do not use public transport or company buses on these kinds of trips. In sum, students make 21.1 %, active workers 66.4 %, and inactive people 12.5 % of the journeys.

Most journeys in the sample are done by public bus services (67 %), followed by chartered commuter buses (18 %) and trains (15 %). Obviously, commuting prevails (to work 30 %, to school 11.1 %), and the share of other trip purposes is much less considerable (shopping 3.7 %, health-related 3.4 %, visiting friends and relatives 2.8 %, running errands 2.1 %, leisure 1.9 %, work-related travel 1.3 %). Furthermore, the purpose of returning home (43.8 %) is also considered. As mentioned above, journeys have been grouped by a preliminary assumption, namely that age (and related socioeconomic status) determines clusters. Four clusters have been created: early, young, middle and late adulthood. Clusters are seen in Table 3. It may be underlined that journeys (and not people) are clustered here.

In sum, age-based clustering assumptions seem to be correct. Furthermore, not only personal (age-related), but also travel-based multitasking characteristics are different in these groups. In addition to what is said in the table, it may be highlighted that:

- relaxing or doing nothing (daydreaming or other passive activities), the most frequent among all activities while travelling on public transport services increasingly prevails with age;
- in contrast, the proportion of talking to others and using electronic devices decreases with age;
- the only activity requiring the use of electronic devices that is present in all four clusters is listening to music/radio, however, it is rare in the late adulthood group (1.2 %);
- share of work-related activities is minimal, it is the highest in Cluster 3 (0.6 %);
- studying is almost negligible in Clusters 2 to 4 (< 0.2 %);
- the proportion of reading is similar in all clusters (10 % in Cluster 3, and 8 to 9 % in the others);
- eating or drinking is rare in all clusters, and these activities completely disappear in higher age groups.

### 4 Conclusion

The study revealed what kind of activities are performed during non-local journeys, especially on public transport vehicles (train and bus) and chartered commuter bus services (in 2016). In conclusion, it may be highlighted that – on the basis of one of the very first travel-based multitasking research in Hungary – the prevailing activity on non-local journeys is talking to others, followed by relaxing or daydreaming, and listening to music/radio. The low proportion of activities carried out on smartphones or tablets may be explained by the growing but still relatively low rate of smartphone ownership and mobile internet access in 2016. By the outcomes of clustering of public transport journeys by the age of passengers, the main finding, on the one hand, is that the use of electronic devices decreases with age. On the other hand, characteristics of clusters are quite diverse in terms of other activities.

One of the main limitations of the present study is the applied data collection method. People had to report on their activities while travelling one or several days after the journey, so it may be assumed that some of them chose the activity they usually do on this type of journeys (e.g. nothing) instead of what they actually did (e.g. eventually

**Table 3** Sample characteristics

Variables	Clusters			
	1	2	3	4
Group size (no. of journeys)	752	585	468	168
Age (years)	20.7	39.9	54.8	71.4
Deviation	5.4	5.0	4.3	5.1
Occupation	mostly students (55 %) and employees (40 %)	mainly intellectual employees (30 %) and manual workers (64 %)	mainly intellectual (22 %) and physical workers (65 %), some pensioners (8 %)	pensioners in majority (90 %)
Education level	ongoing studies are dominant	the cluster with the highest levels: high school 32 %, higher education 13 %; but mainly vocational training (44 %)	mainly vocational training (47 %) and less higher education degrees than in younger groups	mostly primary education (42 %) and vocational training (33 %)
Household size (pers.)	3.9	3.5	2.8	1.9
Deviation	1.5	1.3	1.3	1.0
Financial status of the household	rating of the household's financial status decreases with age			
Travel mode	the proportion of the use of train is similar in all groups (14 to 16 %)			
	the use of chartered commuter bus services is rare (12 %)	one out of four travels by chartered commuter bus services		no use of chartered commuter buses at all
Trip purpose	mainly to school	mainly to work	mainly to work but also some health-related trip	mainly health related trips and shopping, visiting friends or relatives
Frequency of this journey	mainly on all weekdays (74 %), or several times per week (15 %)	similar proportions like in cluster 1: weekdays 71 %, several times per week 14 %	the share of "several times per week" is higher than in Clusters 1 and 2 (21 %); weekdays 59 %	several times per month 32 %, less often 27 %, daily frequency on weekdays is rare (4 %)
Travel-based multitasking (activities while travelling)	studying only appears here (7 %)	the highest proportion of reading among clusters (10 %)		no talking on the phone, no messaging, no browsing
	the proportion of relaxing increases with age (30 % in Cluster 1; 63 % in Cluster 4)			
	the proportion of talking to others (33 % in Cluster 1; 27 % in Cluster 4) and the use of electronic devices (23 %; 1 % decreases with age)			

talking on the phone). However, the data collected by the household survey allows a deeper analysis of the personal and journey-related circumstances, which would not have been possible by a different data collection method (e.g. by observations).

In the next project phases, further statistical analysis can lead to findings that may be used for the assessment of travel time valuation and, subsequently, for reconsidering mobility planning procedures (guidelines, manuals, etc.). Future research directions may be the comparison

with observations in other contexts and the update of the present research by new observations in Hungary.

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