EXPLORING WOMEN TRAVEL BEHAVIOUR IN THE REGION OF ŽILINA FROM LARGE SCALE MOBILITY SURVEY

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ABSTRACT: Women and men often do not experience equal mobility opportunities in their societies. Increasingly gender is being recognized to play a significant role in transport planning, particularly for addressing individual mobility needs in urban and rural areas. Previous studies have shown that transport policy and mobility planning are better suited to men's activities and mobility needs, while women experience the transport system differently than men in terms of accessibility, safety and security. These findings reveal differences in needs and requirements to the transport system and choice of transport mode between men and women. To create a more balanced transport system that increases everyone's mobility and accessibility to all transport modes, it is crucial to distinguish between individuals' travel needs and wishes, which are also closely linked to life circumstances influenced by gender, life stages and socio-economic situation.

To gain an in-depth understanding of women travel patterns in their daily activities, this paper investigates the factors that influence women's decisions between activity participation and choice of transport mode through analysis of mobility behaviour data gathered from 6000 households by Žilina self-governing region between 2013 and 2016.

The results of this analysis provide valuable insights about the possible causal relation among socio-demographics, activity participation characteristics and daily travel mode choice of female and male travellers in the studied cities, which could be incorporated into more gender sensitive designs in mobility planning and travel demand modelling. Furthermore, the outcomes of this study can help decision makers, local and regional authorities and transport companies by raising awareness and providing support for 1) forming sustainable policies to overcome community mobility and accessibility challenges and 2) bringing more gender equality in the region of Žilina by changing traditional transport functionalities and providing more equitable provision of transport systems, particularly in public transport and active modes (non-motorised transport).

Keywords: Gender Sensitive Design, Mobility Planning, Transport Policy, Accessibility, Mode Choice, Active Mode.

1 Introduction

Gender is being recognized to play a significant role in transport planning, particularly for addressing individual mobility needs in urban and rural areas since about 1980 [1, 2, 3, 4]. In recent decades, many efforts toward understanding gender differences in mobility patterns have been accomplished in theory and practice. Investigating the relationships between changes in needs due to demographic and socio-economic changes and spatio-temporal constraints proposed by Hägerstrand [5], was one of the most interesting aspects of identifying women's mode choice behaviour that has been researched in last decade.

A growing literature on travel behaviour indicates significant gender differences in mobility and travel patterns where women experience more trips than men in the developed world and in many developing countries [6]. However, women may be less mobile than men in some developing countries and their travel patterns are more complicated [7, 8]. Parameters like income, age, household size and structure, elder-child care responsibilities, ethnicity, employment status, degree of disability, location, class, and education can cause significant differences among women's mobility patterns. Moreover, some factors such as personal safety, security and quality of service are important concerns of women's mobility [9, 10]. Therefore, taking gender differences into account in travel behaviour it is important to identify women's transportation needs and mobility provisions [11, 12, 13].

Focus on differences in men's and women's travel patterns has been a characteristic feature in many discussions and the gender gap between developed and developing countries requires an acceleration of knowledge transfers between the two spheres [14]. A wide range of research has been done in developed and developing countries to report the gender difference impacts on the travel patterns where, gender differences in travel behaviour are relatively well-known in developed countries in comparing to the developing world [15, 16, 17, 18]. Reference [19] well illustrates the facts that women have unequal access to means of transportation and to transport-related decision-making and that women's travel behaviour differs substantially from that of men. Some of the differences may be related to personal attitudes, temperaments and capabilities. Most of them, however, are directly related to male-female power relationships and gendered responsibilities for reproductive and caretaking tasks. Gender differences in travel behaviour are less marked in societies where women and men have equal access to the transport systems.

Works [20, 21, 22] explain important gender differences relating to perception of personal safety in public transport stations, car parks and other public places where women often change their travel behaviours due to fears of harassment and violence from other passengers. Moreover, gender issues in transportation has produced important results such as differences between women's and men's driving behaviour and safety outcomes, differences between women's and men's travel behaviours, e.g., mode choice, trip chaining, and vehicle design and safety features as they relate to women. In many western countries women are making more trips, and more frequently travel by car as drivers, also traveling longer distances [23]. Also, due to factors such as economic circumstances and age, subgroups of women meet notable differences in the travel patterns. Meanwhile, older women still do not drive as often as older men, and they stop driving earlier [24].

Reference [14] presented critical approach to generalization of men's and women's travel patterns, and to highlight the heterogeneity that exists within groups as well as similarities between traditional traveller categories. Researchers in Denmark, Finland, Norway and Sweden have problematized the stereotypes of gender and travel trajectories in these countries. The standard solution of equating travel behaviour (e.g. choice of transport mode) and travel needs (e.g. preferences) because of many reasons has come under criticism in their work [25, 26]. Promoting dialogue on constraints to women, providing technical assistance to governmental teams in designing and implementing policies and improvements of the institutional capacity of transport agencies in developing economies are considerable solutions. More inclusive urban access would also improve conditions for women and enable them to make choices according to their needs [27].

Despite the fact that many research studies have been accomplished to broaden the scope of gender dimension in transport planning and policies, there has been little attention to explore the influence of gender on activity participation and trip mode choice as a part of travel behaviour in Slovakia. Therefore, the current research aims to explore and understand gender differences in mobility patterns in the region of Žilina. The analysis of the relationships between type of activity participation and gender helps planers to better understand how men and women organise their daily time and how such organisation affects travel behaviours, particularly their daily travel mode. Besides, more knowledge about women mobility needs provides valuable intuition about the effectiveness of current transportation policy on changing women's activity-travel behaviour (travel pattern) and incorporating into more gender sensitive designs in mobility planning and travel demand modelling.

2 Data collection and sample description

The data used in this paper were collected within the travel behaviour survey organised by the Žilina self-governing region between 2013 and 2016. Geographically, the survey covered the area of the Žilina region and it was conducted in two phases. The first phase was carried out in 2013 for districts of Žilina, Martin, Liptovský Mikuláš and Bytča. The second phase was executed in November 2016 for remaining districts of Čadca, Námestovo, Kysucké Nové Mesto, Turčianske Teplice, Ružomberok, Tvrdošín and Dolný Kubín.

The survey captured mobility behaviour of households for one workday in the mid of the week (Tuesday, Wednesday or Thursday). Participants were asked to fill in three questionnaires: household questionnaire, individual questionnaire and travel diary.

For survey, 6231 households (18 382 inhabitants) were approached to record the data about their trips. In diary questionnaire, people were asked to report their mobility behaviour (i.e. all out-of-home activities) across a one day along with their specifications including trip purpose, trip duration (departure and arrival time), destination (i.e. location of activity performance), mode of transportation, trip length and number of accompanying persons in car. Furthermore, the socio-demographic characteristics of households and of each member were inquired. After a cleaning and screening procedure, the sample was reduced to 17 907 persons among them 9048 (50.5 %) females and 8859 (49.5 %) males living in 5917 households. It should be noted that

the survey was not intended to investigate participation of women in transport, however, the gender of participants seems to be well balanced over the districts of the Žilina region, age groups and social status (see Fig. 1).

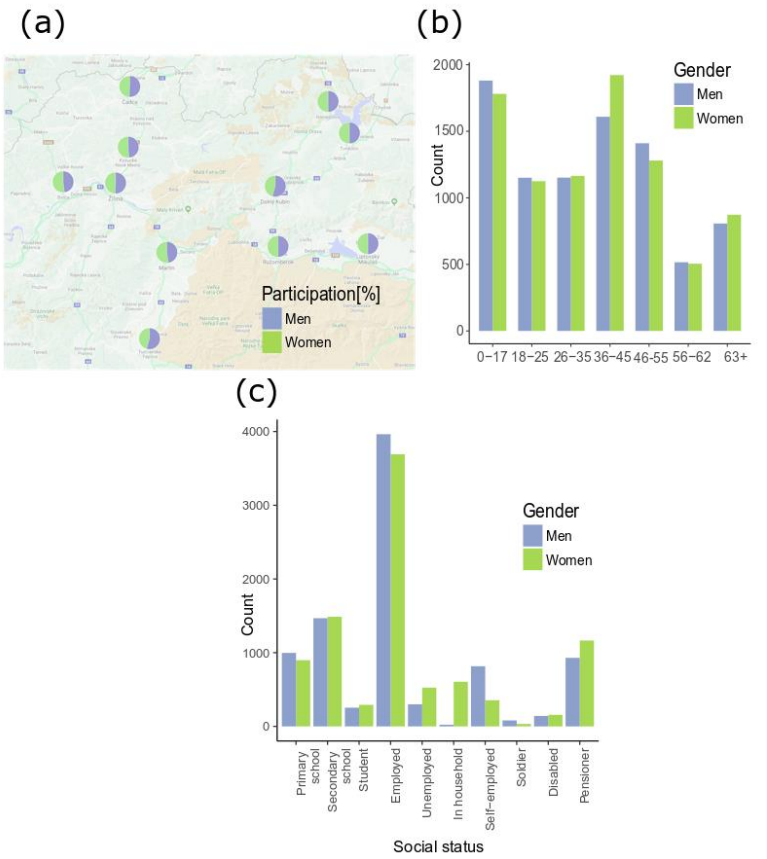

Fig. 1. Participation in the mobility behaviour survey by gender. (a) Distribution of participants' gender over the districts of the Žilina region. (b) Distribution of gender over age groups. (c) Distribution of gender as a function of social status.

3 Modelling methodology

The mode choice is a complex decision-making process per se. To investigate the factors that influence women's decisions between activity participation and choice of transport mode, the Multinomial Logit (MNL) is applied. The MNL models have been applied widely in transportation research, particularly in travel choice modelling due to the fact that the formula for the choice probabilities takes a closed form and is readily interpretable. The MNL model is derived through the application of utility maximization concepts to a set of alternatives from which one, the alternative with maximum utility, is chosen [28].

The probability of selecting mode *i* by individual *n* is expressed as:

$$P_{ni} = \frac{e^{V_{ni}}}{\sum_{i=1}^{J} e^{V_{ni}}} \quad (1)$$

where:

P_{ni} is the probability that mode *i* is chosen by individual *n*
e is the Euler's number
V_{ni} is the estimate of the utility of mode *i* for individual *n*
J is the number of all available travel modes.

The perceived utility of mode *i* by individual *n* is derived as a linear function of explanatory variables (X_{ni}) as:

$$V_{ni} = \sum_n \beta_i * X_{ni}, \quad (2)$$

where β is a vector of parameters.

4 Results

4.1 Descriptive data analysis of the gender role in transport mode choice

For out-of-home activity participation there are at least two activity type segmentations. The first group studies [29] categorise activities into two major groups: mandatory (work, work-related, school and school related activity) and non-mandatory (maintenance/discretionary). The other group studies [30, 31, 32] consider three categories: subsistence (work or school), maintenance (such as child care, grocery shopping, banking, household work, and pickup /drop-off children) and discretionary (such as volunteer and religious activities as well as recreation and entertainment). Trip purpose classification adopted in this study is according to activities requiring travel, which are grouped in five categories: work (work and work-related activity), education (in school or university), shopping (grocery shopping and daily shopping), maintenance (e.g. medical care, banking, administrative services) and leisure (social and recreation activities).

The travel mode indicates the main transportation mode for the trip. Individuals for daily travel activities use different modes according to the household attributes (e.g. age, car ownership, income, etc.) and time of day. Hence, the travel mode reflects the most crucial decision that a traveller makes in terms of using a private car versus public transport and non-motorised or any other mode. Based on the reported data, individuals used eight transport modes for daily travel in the region of Žilina. With these data, we initially started analysing travel behaviour by comparing the number of trips as a function of the trip purpose, visualized in Fig. 2a. Here, we observe differences between behaviour of women and men. Women do more trips for leisure activities (visits, restaurants, cinema etc.) and for shopping activities, while men reported more trips for activities related to work. The number of trips for education (i.e. predominantly taken by youth generation) is very similar. Colours in Fig. 2a indicate the used mean of transport. Trips related to the education are very well balanced also in terms of the used

mean of transport. Most often children get to schools on foot, by public transport or as car passengers. Thus, as expected, the gender transport inequalities emerge in the adult age. Independently on the trip purpose women tend to walk more and apart from commuting, it is for them the dominant mean of transport. For commuting the most often is used private car that is used much more often by men than women. Partly, this can be also attributed to the fact that within the population of adults that took part in the survey it is men who possess a driving license much more often. The only exception is age group from 56 to 62 (see Fig. 2b).

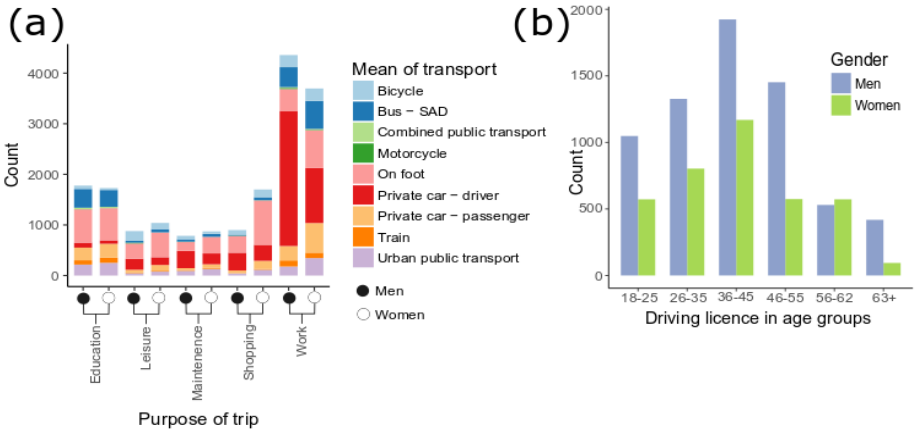

Fig. 2. (a) The number of trips by the purpose and the gender of travelers. Colours indicate used mean of transport. (b) Possession of the driving license among the participants of the survey by age groups.

To understand better the differences between how men and women use for commuting private cars and public transport, we show in Fig. 3 their usage as a function of age group and education level. Private cars are predominantly used by men independently of the age, while the higher level of education leads to lower level of gender inequality. When it comes to the usage of public transport, the situation is different. In young population (age up to 35 years), the usage of public transport is very well balanced and the bias toward women using public transport more, appears only in older population. This is potentially interesting finding, which should be noticed by public transport operators and by authorities to develop measures towards motivating more males in the age group of 30-40 not to change to individual transport, but to keep them using public transport. Similarly, the inequality decreases with the level of education, while in the group of participants with university education we observe good gender balance.

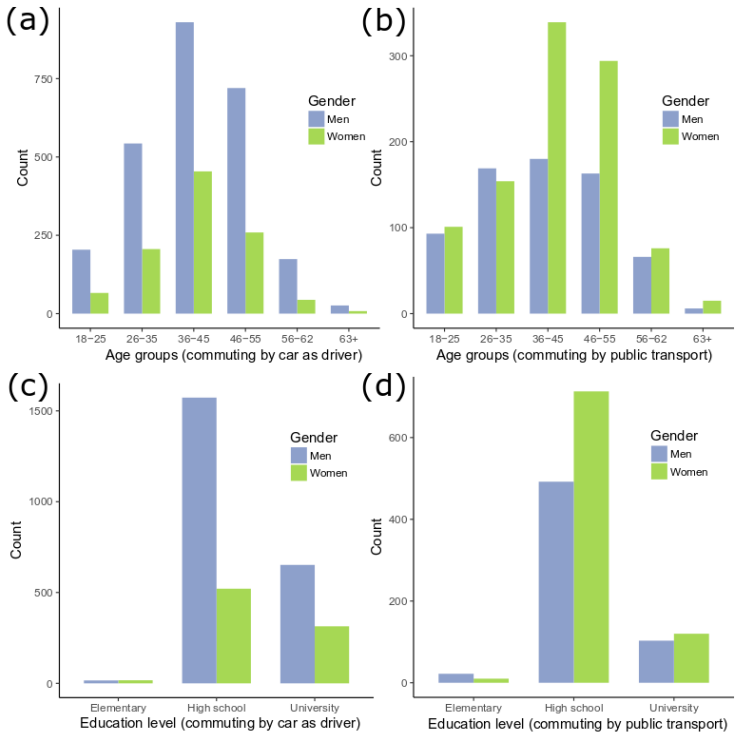

Fig. 3. Comparison of the participants driving to work a private car and using a public transport by gender. (a) Participants driving to work a privite car by age groups (b) Participats using for commuting a public trasport by age groups. (c) Education level of participats driving to work a private car. (d) Education level of participants using for commuting a public tranport.

Apart from differences, descriptive analyses uncovered also many similarities in the travel behaviour of men and women. We have analysed origin-destination matrix of trips among districts of the Žilina region. As expected, the majority of trips are done within individual districts (short trips), but surprisingly the proportions of trips that originate and have a destination in different districts (long trips) are comparable for men and women. This can be also partly seen in Fig. 4a, where we displayed complementary cumulative distributions of travel distances of men and women. From the distributions is clear that travelled distances are very similar. Furthermore, data in Fig. 4b imply that trips of mem and women are also similarly distributed over the time of day. Few more men start they trips early in the morning. Then, we observe a typical morning and afternoon peeks and also towards very late evening hours the number of trips by men and women is very similar. We checked more closely trips made by women after 10:00 pm, finding that the most of them seem to be trips from work to home made by three-shifts production workers. The number of trips on weekdays is approximately twice the number of trips on weekend days (see Fig. 4c and 4d). Again, quite surprisingly, the numbers of trips reported in the survey by men and women are very similar.

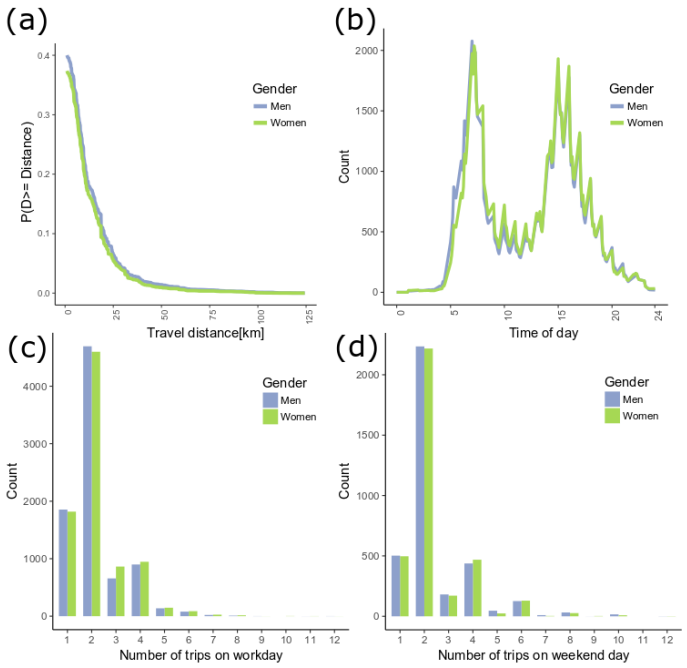

Fig. 4. Identified similarities in mobility behaviour of females and males in the Žilina region. (a) Complementary cummulative ditribution of trip length in kilometres. (b) Number of travelers as a function of time of day. (c) Typical number of trips in a work day. (d) Average number of trips in weekends.

4.2 Analysis of differences in the travel behaviour of men and women in the Žilina region

Travel behaviour data of people over the age of 18 was analysed using MNL regression in SPSS23 that is appropriate when the outcome variables are categorical with more than two categories and the predictors are of any type. The modal choice model was estimated by using the maximum likelihood method. The results after modification according to final model represent that our model was fitted well (Table 1). The Pseudo R-Square indices in Multinomial Logistic regression is treated as R^2. Pseudo R-Square values can reach to a maximum of 1 and larger that indicate more of the variation is explained by the model.

Table 1. Pseudo R-Square.

Cox and Snell	0.587
Nagelkerke	0.607
McFadden	0.259

Estimation results of MNL is presented in Table 2. The estimated results reveal the significant effects of used variables on travel mode-choice which are discussed in following.

- ***Gender*** with regards to individuals' characteristics, gender has positive significant effect on women trips by public transport, private car as passenger, train, bicycle and walk. The multinomial logit for women relative to men is 1.047 unit higher for choosing private car as passenger given all other available travel modes in the model are held constant. Therefore, it can be interpreted women in region of Žilina are more likely than men to travel by car as passenger.
- ***Age:*** respondents age as we expected was not significant predictor for choosing travel mode. According the results, age has negative impact on trips using intercity bus and foot. It means that young people more likely use less intercity bus for their daily trips compared with older people who mostly use private car as drivers.

Table 2. Multinomial modal choice model estimation in the Žilina region.

Travel Mode[a]		B	Std. Error	Wald	df	Sig.	Exp(B)	95 % Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
Walk	Intercept	.997	.255	15.233	1	.000			
	Age	-.012	.003	16.838	1	.000	.988	.982	.994
	Travel Distance	-.471	.019	618.060	1	.000	.624	.602	.648
	Social Status	.105	.027	15.449	1	.000	1.111	1.054	1.170
	[Gender=1]	.926	.075	153.745	1	.000	2.526	2.181	2.924
	[Gender=2]	0	.	.	0	.	.	.	.
	[Trip purpose (work)=1]	-.880	.172	26.097	1	.000	.415	.296	.581
	[Trip purpose (education)=2]	.681	.314	4.709	1	.030	1.976	1.068	3.655
	[Trip purpose (shopping)=3]	-.436	.171	6.513	1	.011	.646	.462	.904
	[Trip purpose (maintenance)=4]	-.375	.140	7.160	1	.007	.687	.522	.905
	[Trip purpose (leisure)=5]	0	.	.	0	.	.	.	.
	[Departure time (6:00-8:00) =1]	3.565	.133	720.212	1	.000	35.332	27.233	45.839
	[Departure time (8:00-15:00) =2]	0	.	.	0	.	.	.	.
	[Departure time (15:00-17:00) =3]	-.253	.153	2.745	1	.098	.776	.575	1.047
	[Departure time (17:00-22:00) =4]	-.261	.164	2.549	1	.110	.770	.559	1.061
	[Departure time (22:00-6:00) =5]	-.737	.181	16.640	1	.000	.478	.336	.682
	[Driving license=0]	-.538	.184	8.566	1	.003	.584	.407	.837
	[Driving license=1]	0	.	.	0	.	.	.	.
Bicycle	Intercept	-.358	.364	.965	1	.326			
	Age	-.004	.004	.716	1	.397	.996	.988	1.005
	Travel Distance	-.267	.019	196.241	1	.000	.766	.738	.795
	Social Status	-.031	.040	.620	1	.431	.969	.896	1.048
	[Gender=1]	.609	.110	30.637	1	.000	1.839	1.482	2.281
	[Gender=2]	0	.	.	0	.	.	.	.
	[Trip purpose (work)=1]	-.777	.246	9.992	1	.002	.460	.284	.744
	[Trip purpose (education)=2]	-1.959	1.050	3.479	1	.062	.141	.018	1.105
	[Trip purpose (shopping)=3]	-.335	.237	1.991	1	.158	.715	.449	1.139
	[Trip purpose (maintenance)=4]	-.273	.199	1.892	1	.169	.761	.515	1.123
	[Trip purpose (leisure)=5]	0	.	.	0	.	.	.	.
	[Departure time (6:00-8:00) =1]	3.448	.158	475.505	1	.000	31.445	23.065	42.870
	[Departure time (8:00-15:00) =2]	0	.	.	0	.	.	.	.
	[Departure time (15:00-17:00) =3]	-.213	.220	.940	1	.332	.808	.525	1.243
	[Departure time (17:00-22:00) =4]	-.366	.235	2.430	1	.119	.694	.438	1.099
	[Departure time (22:00-6:00) =5]	-1.232	.273	20.408	1	.000	.292	.171	.498
	[Driving license=0]	-.832	.270	9.502	1	.002	.435	.257	.739
	[Driving license=1]	0	.	.	0	.	.	.	.

a. The reference category is: Private car-driver.

Table 2. Multinomial modal choice model estimation in the Žilina region (Cont.).

Travel Mode[a]		B	Std. Error	Wald	df	Sig.	Exp(B)	95 % Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
Motorcycle	Intercept	-3.653	.968	14.230	1	.000			
	Age	-.008	.010	.557	1	.456	.992	.973	1.013
	Travel Distance	-.063	.017	13.213	1	.000	.939	.907	.971
	Social Status	.186	.088	4.458	1	.035	1.204	1.013	1.430
	[Gender=1]	-.805	.317	6.446	1	.011	.447	.240	.832
	[Gender=2]	0	.	.	0	.	.	.	.
	[Trip purpose (work)=1]	-.990	.507	3.818	1	.051	.372	.138	1.003
	[Trip purpose (education)=2]	.859	.856	1.007	1	.316	2.362	.441	12.654
	[Trip purpose (shopping)=3]	-.661	.471	1.969	1	.161	.516	.205	1.300
	[Trip purpose (maintenance)=4]	-1.083	.371	8.518	1	.004	.339	.164	.701
	[Trip purpose (leisure)=5]	0	.	.	0	.	.	.	.
	[Departure time (6:00-8:00) =1]	1.573	.401	15.407	1	.000	4.822	2.198	10.577
	[Departure time (8:00-15:00) =2]	0	.	.	0	.	.	.	.
	[Departure time (15:00-17:00) =3]	.094	.802	.014	1	.906	1.099	.228	5.292
	[Departure time (17:00-22:00) =4]	.538	.184	8.566	1	.003	1.713	1.194	2.455
	[Departure time (22:00-6:00) =5]	0	.	.	0	.	.	.	.
	[Driving license=0]	-3.565	.133	720.212	1	.000	.028	.022	.037
	[Driving license=1]	0	.	.	0	.	.	.	.
Private car - Passenger	Intercept	-1.650	.295	31.276	1	.000			
	Age	-.004	.004	1.465	1	.226	.996	.989	1.003
	Travel Distance	.005	.003	3.079	1	.079	1.005	.999	1.010
	Social Status	-.034	.031	1.198	1	.274	.966	.909	1.027
	[Gender=1]	1.407	.087	263.433	1	.000	4.084	3.446	4.840
	[Gender=2]	0	.	.	0	.	.	.	.
	[Trip purpose (work)=1]	-.017	.217	.006	1	.939	.984	.642	1.506
	[Trip purpose (education)=2]	1.040	.340	9.338	1	.002	2.830	1.452	5.517
	[Trip purpose (shopping)=3]	-.435	.242	3.213	1	.073	.647	.403	1.041
	[Trip purpose (maintenance)=4]	.150	.190	.625	1	.429	1.162	.801	1.686
	[Trip purpose (leisure)=5]	0	.	.	0	.	.	.	.
	[Departure time (6:00-8:00) =1]	3.194	.138	536.492	1	.000	24.395	18.617	31.967
	[Departure time (8:00-15:00) =2]	0	.	.	0	.	.	.	.
	[Departure time (15:00-17:00) =3]	-.592	.140	17.946	1	.000	.553	.421	.728
	[Departure time (17:00-22:00) =4]	-.845	.157	28.827	1	.000	.430	.316	.585
	[Departure time (22:00-6:00) =5]	-.644	.175	13.524	1	.000	.525	.373	.740
	[Driving license=0]	-.716	.185	14.936	1	.000	.489	.340	.703
	[Driving license=1]	0	.	.	0	.	.	.	.
Public Transport	Intercept	-.058	.340	.029	1	.865			
	Age	.007	.004	2.953	1	.086	1.007	.999	1.016
	Travel Distance	-.315	.020	258.831	1	.000	.730	.702	.758
	Social Status	-.213	.040	28.462	1	.000	.808	.747	.874
	[Gender=1]	.664	.103	41.528	1	.000	1.942	1.587	2.376
	[Gender=2]	0	.	.	0	.	.	.	.
	[Trip purpose (work)=1]	-.221	.246	.806	1	.369	.802	.495	1.299
	[Trip purpose (education)=2]	1.983	.371	28.564	1	.000	7.266	3.511	15.036
	[Trip purpose (shopping)=3]	-.545	.261	4.368	1	.037	.580	.348	.967
	[Trip purpose (maintenance)=4]	.153	.206	.551	1	.458	1.165	.778	1.746
	[Trip purpose (leisure)=5]	0	.	.	0	.	.	.	.
	[Departure time (6:00-8:00) =1]	3.828	.151	641.600	1	.000	45.970	34.185	61.818
	[Departure time (8:00-15:00) =2]	0	.	.	0	.	.	.	.
	[Departure time (15:00-17:00) =3]	-.981	.184	28.406	1	.000	.375	.262	.538
	[Departure time (17:00-22:00) =4]	-.769	.199	14.968	1	.000	.464	.314	.684
	[Departure time (22:00-6:00) =5]	-1.202	.227	28.042	1	.000	.301	.193	.469
	[Driving license=0]	-1.024	.230	19.864	1	.000	.359	.229	.563
	[Driving license=1]	0	.	.	0	.	.	.	.

a. The reference category is: Private car-driver

Table 2. Multinomial modal choice model estimation in the Žilina region (Cont.).

Travel Mode[a]		B	Std. Error	Wald	df	Sig.	Exp(B)	95 % Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
Train	Intercept	-.915	.432	4.493	1	.034			
	Age	-.006	.005	1.347	1	.246	.994	.984	1.004
	Travel Distance	.018	.003	32.705	1	.000	1.018	1.012	1.024
	Social Status	-.347	.055	39.249	1	.000	.707	.634	.788
	[Gender=1]	.813	.118	47.892	1	.000	2.256	1.792	2.840
	[Gender=2]	0	.	.	0	.	.	.	.
	[Trip purpose (work)=1]	-.178	.353	.256	1	.613	.837	.419	1.671
	[Trip purpose (education)=2]	1.931	.431	20.036	1	.000	6.898	2.961	16.068
	[Trip purpose (shopping)=3]	-.633	.445	2.020	1	.155	.531	.222	1.271
	[Trip purpose (maintenance)=4]	.402	.322	1.562	1	.211	1.495	.796	2.807
	[Trip purpose (leisure)=5]	0	.	.	0	.	.	.	.
	[Departure time (6:00-8:00) =1]	3.459	.161	460.068	1	.000	31.786	23.172	43.602
	[Departure time (8:00-15:00) =2]	0	.	.	0	.	.	.	.
	[Departure time (15:00-17:00) =3]	-1.291	.184	49.100	1	.000	.275	.192	.395
	[Departure time (17:00-22:00) =4]	-1.365	.200	46.567	1	.000	.255	.173	.378
	[Departure time (22:00-6:00) =5]	-1.333	.225	35.181	1	.000	.264	.170	.410
	[Driving license=0]	-1.288	.238	29.220	1	.000	.276	.173	.440
	[Driving license=1]	0	.	.	0	.	.	.	.
Intercity Bus-SAD	Intercept	-.509	.303	2.819	1	.093			
	Age	-.011	.003	10.433	1	.001	.989	.982	.996
	Travel Distance	.019	.002	73.231	1	.000	1.019	1.015	1.023
	Social Status	-.233	.033	49.195	1	.000	.792	.742	.845
	[Gender=1]	.807	.081	100.487	1	.000	2.241	1.914	2.625
	[Gender=2]	0	.	.	0	.	.	.	.
	[Trip purpose (work)=1]	.284	.247	1.321	1	.250	1.328	.819	2.154
	[Trip purpose (education)=2]	1.665	.334	24.763	1	.000	5.283	2.743	10.177
	[Trip purpose (shopping)=3]	-.591	.306	3.736	1	.053	.554	.304	1.008
	[Trip purpose (maintenance)=4]	.718	.228	9.926	1	.002	2.050	1.312	3.203
	[Trip purpose (leisure)=5]	0	.	.	0	.	.	.	.
	[Departure time (6:00-8:00) =1]	3.511	.136	669.727	1	.000	33.498	25.676	43.704
	[Departure time (8:00-15:00) =2]	0	.	.	0	.	.	.	.
	[Departure time (15:00-17:00) =3]	-1.132	.127	79.890	1	.000	.322	.251	.413
	[Departure time (17:00-22:00) =4]	-.885	.136	42.611	1	.000	.413	.316	.538
	[Departure time (22:00-6:00) =5]	-1.477	.163	82.405	1	.000	.228	.166	.314
	[Driving license=0]	-1.379	.172	64.256	1	.000	.252	.180	.353
	[Driving license=1]	0	.	.	0	.	.	.	.

b. The reference category is: Private car-driver.

- ***Driving license***: the results demonstrate that driving license availability has negative impacts on people trips by intercity bus, train, public transport, car as passenger, bicycle and walk. For instance, multinomial log-odds of people who do not possess driving licenses to driving license holders is -1.379 unit higher for preferring intercity bus to private car given all available travel modes which means current users of intercity bus are more likely to prefer private car for daily trips in case of possession of driving license.
- ***Social status:*** the social status as a categorical variable was modelled for nine groups: 1. high-school student, 2. university student, 3. employee, 4. self-employed, 5. unemployed, 6. in household (homemaker), 7. pensioner, 8. soldier and 9. disabled. The estimated coefficient of social status was positive for selecting walk and motorcycle for performing out-of-home activities while it has significant negative effect on trips made by public transport, train and intercity bus. These

results indicate that probability of using public transport, train and intercity bus was greater for students and employees than others (e.g. pensioners and in household).

- ***Trip purpose:*** the trip purpose associated to people's type of out-of-home activity participation evidentially has major impact on mode choice. Obtained results reveal that in the region of Žilina, work trip has negative impact on use of bicycle, motorcycle and walk that demonstrate people are more likely use private car than other travel modes for work trips. In contrast education trips was identified to be positively significant for choosing train in long distance trips, private car as passenger and walk in short distance trips to go to school or university.
- ***Travel distance:*** the travel distance was identified to be negatively significant on choice of walk, bicycle and motorcycle among other alternatives. It obviously indicates with increasing travel distance people has less tendency to walk or use bicycle for daily trips in urban areas.
- ***Departure time:*** according to results, departure time substantially affects individuals' mode choice. As can be seen in Table (2), in the evenings people tend to select less public transport and intercity bus and train that reflects the high tendency to use private car for trips after 5 p.m. Results also show the early morning departure time positively affects the use of public transport, bicycle and walking to the destination.

5 Conclusions

This paper focused on investigation of factors that influence women's choice of transport mode for daily trips in the region of Žilina. A Multinomial Logistic model (MNL) was applied for estimating effects of selected variables on individual's modal choice using mobility behaviour data gathered from 6000 households by Žilina self-governing region between 2013 and 2016.

Findings from this study show that women without driving license choose public transport and intercity bus more than men for their daily education trips when trip starts between 6:00 to 8:00 a. m. Furthermore, the results indicate the influence of departure time on women use of car as passenger. It means that females who don't have driving license and make their education trip as a first trip of day in the morning prefer to use car as passenger to their destination. In addition, modelling findings prove with increasing travel distance for education trips, women use more likely train among available transport modes than men. According to outcome of this study, we found the significant negative effect of evening departure on use of public transport by females. This is probably due to the low-frequency of public transport (30-minutes headway) services after 5:00 pm and women's perception of security, safety and risk of violence in public transport.

Understanding effective factors in people decision-making process about travel and activity participation could help planners, policy makers and authorities to implement more gender sensitive designs in urban mobility plans and to prepare inclusive transport policies in the region of Žilina. These findings also have important implications for the Žilina self-governing development agency (RAZSK) for providing better environment for walking and cycling in terms of being safe and guide the public transport service

providers that are interested in attracting more users.

In this research, the lack of required and reliable data enforced us to limit the scope of our analysis and we were not able to analyse the interaction among household members for joint-activity participation and travel behaviour, particularly the modal choice. In recent years several elements have been changed: the increasing women's participation in the labour force, the decreasing importance of the traditional family nucleus, individuals' type and frequency of activity, and travel behaviour. To better evaluate how women, choose the travel mode, the results should be extended by focusing on assessing women's experiences and specific transport requirements, by the mean of an exploration of their own perception of their mobility constraints and needs, and of innovative solutions to meet these needs. Women's perception and attitudes about ICT and new business model's solution that already exists in the mobility systems and that women already experienced should be explored to understand, if these types of solutions could improve their mobility or to what extent it could constitute new constraints and inequality sources. Further research is required to evaluate the effects of adopting inclusive transport policies and long-term investments for employing new technologies changing people attitudes and travel behaviour in the direction of sustainable transport management.

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