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How Priorities of Men and Women for Choosing Railway Transportation Differ? : A Case Study

Melody Khadem Sameni[a]*, Amine Barzegar Tilenoie[b]

[a,b]*Iran University of Scienc and Technology, Narmak, Tehran 16846-13114*

Abstract

For transportation in Iran there are some peculiar conditions: very cheap fuel price and very high road fatalities. In order to facilitate shifting to more sustainable modes we extracted some of the major parameters that affect mode choice from the literature and made a self-developed questionnaire. It was distributed among bus and railway passengers until 400 full questionnaires were collected. In a set of Likert-scale questions we asked them to rate current status of railway and in another set how important they perceive different parameters for mode choice. We were particularly interested in investigating whether there is meaningful statistical difference between the opinions of female and male respondents. The mean scores given to the Likert-scale questions were consistently higher for females than males however the order of major priorities were similar : 1-Safety, 2-Comfort, 3-Punctuality, 4- Speed, 5- Cost. Levene's and T-test were used to test the hypotheses of equality of variance and means respectively. The difference of means were statistically meaningful for cost, punctuality, safety, seeing the landscape and having extensive choice for departure times but for speed and comfort the null hypothesis of equality of means could not be rejected.

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Keywords: Mode choice; Railway Transportation; Questionnaire.

1. Introduction

The price of fuel in Iran is among the cheapest in the world (Fig. 1) which is one of the main contributing factors to high modal share and use of personal car and road transportation. A direct consequence of this has been one of the highest road fatality rates in the world (Rasouli et al., 2008) (Bakhtiyari et al., 2015). Shifting more passengers to railway as a more sustainable mode of transportation has always been a national aspiration but in order to achieve this, railway faces a fierce competition.

* Corresponding author. Tel.: +98-21-73228559 ; fax: +98-21-77451568.
E-mail address: sameni@iust.ac.ir

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According to UIC (2017) statistics, with a population of about 80 million, Iran has over 8500 kilometers of railway lines on which 23 million passenger (12 billion passenger-km) has been transported in 2016. Quality of road, rail and air infrastructure respectively rank 71, 42 and 106 in the world (World Economic Forum, 2018).

While railway transportation literature is abundant in research on different parameters that affect the mode choice by passengers, limited work has been done on gender differences especially in the developing countries and the authors found no evidence of such a study in Iran. In this research we extracted those parameters from a literature and developed a self-designed questionnaire which was distributed among train and bus passengers travelling between Tehran (the capital) to Isfahan (third largest city of the country). The distance between these two cities is 448 kilometers which takes nearly the same time with train and bus (7 hours). Analysis was done to identify whether the perceived weight of cost, duration of trip, punctuality, comfort and safety are statistically significant or not between genders.

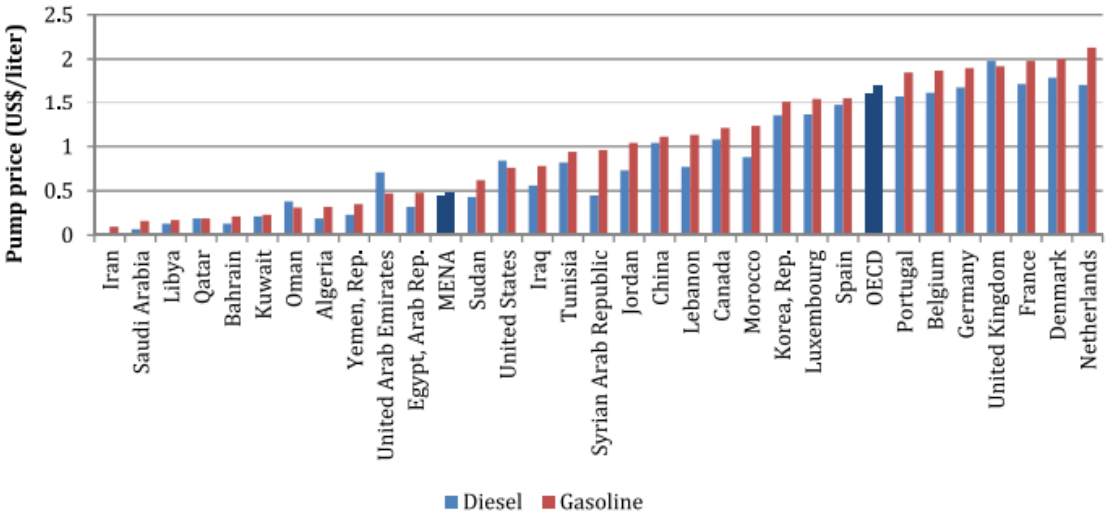

Fig. 1.Average retail prices of diesel and gasoline in selected countries (Fattouh and El-Katiri, 2013) based on World Bank Statistics

2. Literature Review

Blainey et al. (2012) studied different parameters that discourage people from using railway as their preferred mode of transportation. They summarized these factors as 37 barriers and divided them into two major categories of hard and soft ones. Travel time, reliability, frequency, interchange, limitation of railway network, cost and accessibility were major hard barriers while wrong perceptions, dependents on car desire for more freedom and convenience, not having control over railway trip were major soft barriers. Figure 2 shows a summary of these factors and their cost effectiveness.

Importance / Cost-effectiveness	High	Medium	Low
High	• Conscious car dependence (P) • Station access (P) • Habit (D) • Land use patterns (D)	• Government policy (P) • Employers' influence (P) • Cost (D) • Inaccurate perceptions (D) • Sub-optimal market prices (D)	• Ticketing complexity (S) • Image (P)
Medium	• Interchange (P) • Service frequencies (P) • Travel time (P) • Trip chaining (D)	• Crowding (P) • Network limitations (D)	• Cleanliness and maintenance (S) • Comfort (S) • Information provision (S) • Station facilities (S) • Lack of control (P) • Goods and baggage (D) • Individuality (D)
Low	• Convenience and freedom (D)	• Journey planning requirements (S) • Age, health and disability (P) • Other passengers (P) • Personal security (P) • Reliability (D) • Structural car dependence (D)	• Staff provision (S) • Safety (P) • Ethnicity, faith and culture (D) • Locational preferences (D) • Unsuitability of trips for rail (D) • Weather (D)

Fig. 2. Degree of importance and cost effectiveness for different parameters (Blainey et al., 2012)

UIC (2018) conducted a survey and collected 2000 filled questionnaires from 3 countries of UK, Spain and France to investigate most important criteria for the travel mode choice. Price, travel time, wasted time, reliability and time table were top chosen criteria by respondents. A hierarchy of public transport requirements for passengers (Figure 3), has been developed by Batty et al. (2015) which is based on hierarchy of human needs (Maslow, 1943). A regression model formulated the impact of accessibility of railway station on satisfaction of passengers including general condition of station, connection to other modes, car parking space and bicycle parking (Brons et al., 2009). Based on survey from 813 railway travellers on Suzhou rail line in China a satisfaction model was developed based on American customer satisfaction index (Shen et al., 2016). The highest weight and satisfaction index were obtained by "staff service" and "cleanness and comfort".

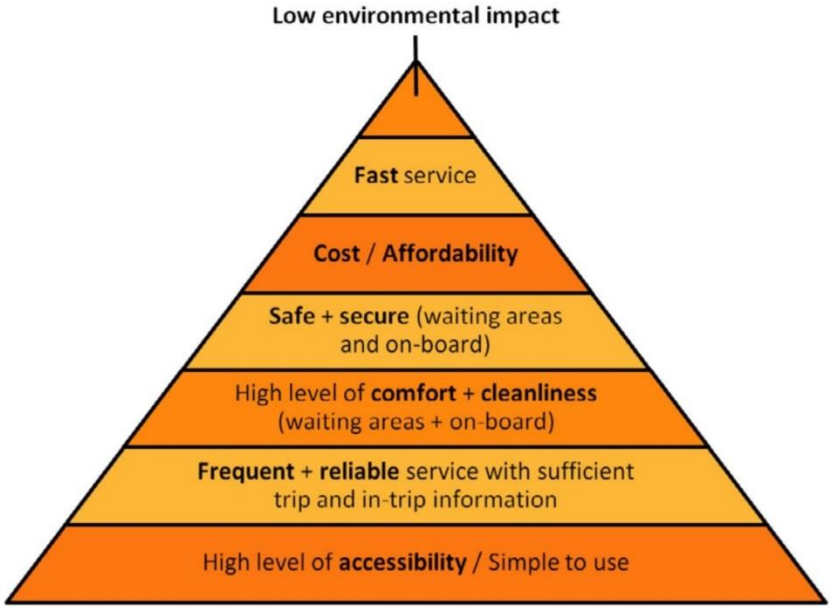

Fig. 3. Hierarchy of passenger needs (batty at al., 2015)

Analytic hierarchy process (AHP) was used to determine perceived quality of railway services in Lithuanian railways (Maskeliūnaite et al., 2009). The results show that arrival and departure time of trains and price of the ticket were had the highest priority. For studying factors that affect mode choice between bus and train in Malaysia, a utility function was developed that included cost, time, headway, accessibility and service (Surbakti and Bombongan, 2017). Similar studies for mode choice for traveling to work in Ireland, Dublin was research based on the data between 1996-2006 (Commins and Nolan, 2011). Even factors such as thermal comport and quality of air conditioning impact passenger satisfaction as study by Ye et al. (2004) shows based on 91 questionnaires collected in China. But of course these two are not among the top factors.

The above studies focus on general determinants of mode choice. There is limited research on the impact of gender on this matter. Various aspect of gender and mobility is discussed in the book edited by Cresswell (2016) covering evidence from different countries including Denmark, Kenya, Uganda and India. A study on a comparison between attribute that shape travel mode choice in Germany and the US showed that man are two times more likely to use bicycle than woman in the US whereas in Germany the chances are equal (Buehler et al., 2011). Studies show that the length of commute for woman in general is shorter than man (Crane, 2007) (Gordon et al., 1989) . Hanson (2010) provided a comprehensive survey of literature on gender and mobility.

A panel study for the period between 1998-2008 in Germany shows using car by woman increases when they have small children while it decreases for man (Scheiner and Holz-Rau, 2012). Another similar study investigate the impact of gender for choosing car in the Netherlands (Schwanen, 2011).

In this paper for the first time, we study whether and how female and male criteria for choosing railway transportation differ. This topic is understudied especially in developing countries. Insights resulted from this paper can help the practitioners to better plan and provide transportation services that can meet the needs of society.

3. Methodology

The developed questionnaire had four major sections: The first one was regarding the demography of the respondents (gender, age group, status of employment and educational level). The second section included questions on the current mode of the trip and frequency of travel between Tehran –Isfahan, the purpose of the trip (business, educational or recreational) and whether the passenger was traveling alone or there others accompanying him/her (friend, family, coworkers, others). The third section was about how they rate the current status of railway transportation on this route. For this a five level Likert-scale set of questions was developed asking how important are safety, cost, duration of the trip, reliability, connection to other modes, location and accessibility of station, information availability, facilities onboard train. The forth section asked question regarding the importance of each of the following factors for choosing their preferred mode of transportation: safety, cost, speed and duration of trip, punctuality, seeing natural sceneries, wide choice of departure times and comfort.

Paper questionnaires were distributed among passengers onboard the train as well as passengers using the bus on this route. It was done during several attempts from November 2016 till September 2017. According to national statistics over 3.7 million passengers travelled between Tehran-Isfahan in 2016 by different modes of transportation. The minimum appropriate sampling size was calculated according to the Cochran's formula (Kotrlik and Higgins, 2001) which yielded 384 for the alpha level of 5%. The sampling was stopped when 400 fully filled questionnaires were gathered. To test the reliability of the result, the Cronbach's alpha was calculated which was equal to 0.756 and in the acceptable range (Cortina, 1993).

4. Results

The respondents were 232 male (58%) and 168 were female (32%). In total 56.1% had a bachelor degree or higher and 12.3% were unemployed. More descriptive statistics are presented in Table 1. The largest group of respondents was in the category of 26-35 years old. Over the half of the journeys were for business.

Table 1. Descriptive summary of the respondents

Age group	%	Trip frequency in month	%	Purpose of the trip	%
Less than 18	2.8	It isn't regulated	55.8	Business	53
18-25	22.5	Once	17	Educational	9.3
26-35	38.5	2 Times	9	Leisure	35.5
36-45	19	3 Times	5		
46-55	9.7	4 or more	11.5		
More than 55	7.5				

Table 2 includes the results of the third section of questionnaire. The lowest rating was for the speed and the highest belonged to safety. It is worth mentioning that Tehran-Isfahan is the first route of the country that high speed railway is currently under construction which would immensely reduce the travel time of railway in the near future. Highest standard deviation belongs to connectivity of railway to different cities and connectivity to other modes which is due to the difference of Tehran (which is much better connected) to Isfahan.

Table 2. Evaluation of the passengers from the current status of railway at Tehran-Isfahan route

Factors	Average	Standard deviation	Female Average	Male Average
Safety	2.62	1.75	2.64	2.59
Cost	2.30	1.63	2.42	2.20
Speed	1.99	1.58	2.11	1.91
Punctuality	2.21	1.73	2.29	2.15
Connectivity of railway to different cities	2.14	1.78	2.24	2.06
Connectivity to other modes	2.27	1.81	2.35	2.21
Location of Station	2.22	1.72	2.23	2.21
Availability of information	2.28	1.76	2.41	2.19
Facilities onboard the train and cleanliness	2.23	1.73	2.29	2.18

The results of the fourth section are presented in Table 3. It can be seen that safety is of utmost importance (as previously mentioned due to high fatality rates on the roads). Comfort and punctuality come second and third. Seeing the landscape was the least important factor.

Table 3. Importance of parameters for mode choice

Factors	Average of Importance-All	Standard deviation-All	Female Average	Male Average
Safety	4.66	1.07	4.74	4.60
Cost	3.85	1.27	3.94	3.78
Speed	4.01	1.26	4.10	3.94
Punctuality	4.15	1.40	4.32	4.02
Seeing the landscape	3.57	1.45	3.78	3.42
Extensive range of choice for departure times	3.56	1.55	3.68	3.47
Comfort	4.33	1.26	4.42	4.27

As it can be seen in Tables 2 and 3, the average scores given by females in all the items are higher than males. However to analyze whether the difference is statistically meaningful or not and to answer the main research questions T-test and Levene's test were used for factors affecting mode choice and the results are presented in Table 4.

The null hypothesis in each case is that the mean of the scores for two groups (females and males) are equal and the alternate hypothesis is that the means of these two independent samples are different. P-value is chosen as 5%.

For safety, Levene's test indicates that the variance of the two groups is not equal ($0.00 < 0.05$). Therefore we refer to the results on the second row ("equal variances not assumed") and find out that the null hypothesis for equality of means is rejected too ($0.03 < 0.05$). Therefore with the confidence level of 95% we can infer that females rate safety higher than males. Similarly the exact same references (variance and mean of the two groups are not equal) are inferred for cost, punctuality and seeing the landscape.

Table 4. Results of statistical tests for significance of difference between means scores of the two groups

		Levene's Test for equality of variances		T-test for equality of Means		
		F	Sig.	t	D.f	Sig.
Safety	Equal variances assumed	15.696	0.00	2.039	385	0.042
	Equal variances not assumed			2.179	379.3	0.030
Cost	Equal variances assumed	4.791	0.029	1.993	380	0.047
	Equal variances not assumed			2.061	374.6	0.040
Speed	Equal variances assumed	0.0	0.998	1.671	378	0.095
	Equal variances not assumed			1.692	357	0.091
Punctuality	Equal variances assumed	6.553	0.011	2.535	371	0.012
	Equal variances not assumed			2.590	362.4	0.010
Seeing the landscape	Equal variances assumed	4.896	0.028	2.219	377	0.027
	Equal variances not assumed			2.245	360.1	0.025
Extensive range of choice for departure times	Equal variances assumed	0.044	0.834	0.813	362	0.417
	Equal variances not assumed			0.815	336.3	0.416
Comfort	Equal variances assumed	0.058	0.809	0.625	378	0.533
	Equal variances not assumed			0.617	331.2	0.537

For speed, Levene's test indicate that the variance of the two groups are equal (0.998>0.05) so we use the results of the first row ("equal variances assumed"). We cannot reject the null hypothesis of equality of means in this case (0.095>0.05). Therefore speed is equally important for the two groups. The same inference can be done for the case of comfort.

For extensive range of choice for departure times, the variances can be assumed to be equal but the T-test results show that the null hypothesis cannot be rejected (0.417>0.05). Hence for females and males having more choices for departure times is equally important.

It can be seen that some criteria for choosing railway transportation are equally important for females and males while females can pay more attention to some other criteria such as safety and cost. These have implications for transportation planning and can be used to help attract more passengers to the railways.

5. Conclusions

Shifting people to use sustainable modes of transportation is a challenge in most developing countries especially for the case of Iran that has very cheap fuel price. Thus it is important to study different aspects of how people choose their mode of transportation. In this research for Tehran-Isfahan route, passengers rated safety as the strongest point and speed as the weakest feature of railways. High importance of safety can be due to existing concerns at the society due to fatality rates on roads which is among the highest in the world. Considerably low position for cost (which is contrary to the litreture) can be due to cheap fuel prices which leads to cheap transportation fares. As it takes about 7 hours to tavel by train on this 448 km railway route, it is no surprise that speed has got the lowest ranking. Another part of research focused on how important different parameters for mode choice of the respondants are. We noticed that on all the items females have given higher scores comparing to males. Levene's and T-tests of the responses from the passengers showed that for the case of safety, cost, puntuality and seeing the landscape, the mean and variances of the two groups were not equal. For speed and comfort the variance and the mean of the two groups were equal. For the extensive range of choice for departure time the variance was equal but the mean for the females was higher.

It can be concluded that attracting passengers to railways need better insights about their thinkings and decision making mechanism. Different groups of people might have different concerns (males and females in this case). Even in some cases, for instance in some developing countries due to specefic national situations, some emprical evidences might not be alighned with the litrerature. Further similar studies in other countries are suggested expecialy for oil-exporting ones. Psychological analysis of the results could also be of interest. One possible hypothesis can be that males are more judmental than females when it comes to making rational decisions.

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