

FACTORS AFFECTING TRANSPORT MODE CHOICES FOR DAILY TRAVEL STUDY MADE IN THE CITY OF BATNA (ALGERIA)

العوامل المؤثرة على الاختيار النمطي في النقل -دراسة في مدينة باتنة (الجزائر)-

Imene MESSAMAH, doctorate candidate

Farès BOUBAKOUR, Professor

Laboratory of Management-Transport-Logistics, University El Hadj Lakhdar
Batna, Algeria.

Abstract:

The paper presents the results of a study aimed to find out the reasons that affect Batna individuals' mode choice.

The research was based on an administrated questionnaire. We administrated 200 questionnaires (self-administrated survey) to the residents of Banta city, the key findings from this study demonstrated that the factors that affect mostly our commuter's transport mode choice are : timing and security.

The study also showed that car users care more about avoiding congestion while bus users worry more about the price they spend during their commuting.

Finally, it was concluded that there are not specific factors that affect daily mode choice; the travel behavior is a very complex process, and a mix of factors affects it.

Key words: travel behavior, commute mode choice, modal split, Batna.

ملخص

تقدم هذه المقالة نتائج دراسة أجريت لمعرفة العوامل التي تؤثر على الاختيار النمطي في وسائل النقل اليومي للمقيمين في مدينة باتنة-الجزائر، وهذا انطلاقا من معالجة إجابات 200 استبيان.

بينت النتائج المستخلصة من هذه الدراسة أن الوقت والأمن هما أهم العوامل التي تؤثر على اختيار نمط التنقل للعينة المدروسة، كما توصلت أيضا إلى أن مستعملي السيارة الشخصية خلال

تنقلاتهم اليومية يهتمون أكثر بتجنب الازدحام المروري بينما مستعملي الحافلات يأخذون بعين الاعتبار المبلغ المنفق خلال الرحلة.

كما خلصت الدراسة إلى عدم وجود عامل محدد يؤثر في عملية الاختيار خلال التنقلات اليومية، فسلوك المتنقلين عملية معقدة تتأثر بمجموعة عوامل. الكلمات المفتاحية: سلوك التنقل، الاختيار النمطي، التحول النمطي، باتنة.

1-INTRODUCTION :

In the last years, the level of mobility has increased due to the huge development in different sectors, which generates more and more travel needs for work, school, social activities... So in order to reach their destination; people use different transportation modes weather motorized once such us car, bus, metro, tramway or non-motorized modes like bicycle and walking. People today are very attached to their car (anable; 2005) and it has become more than just a transportation means for them; most of users link it with comfort, luxury and sense of liberty. (hagman 2003 ;Jensen 1999). This car dependence is causing a lot of environmental issues such as pollution, greenhouse gas emission, pollution,etc. In France, for example car use is the first source of air pollution. (L.Rubens and P.Goslin, 2009).

According to some studies (Bamberg et al, 2003, ory 2004;) with the increase of car use problems we have to consider the switch towards public transport, and in order to achieve this split we need to study the travels' behavior, because as some of them suggested , people may not drive because it is a necessity but they drive by choice . (Handy et al, 2005), however ***“travel behavior is complex. For each journey, people have the choice between different transport modes, each one having specific characteristics, advantages and disadvantages, and costs. Additionally the choice of, one specific transport mode can vary over time and with the type of journey”*** (G.Beira~o_, J.A. Sarsfield Cabral, P 479). Moreover, the choice is influenced by different factors so in order for policy makers to encourage the

shift towards public transport, it is crucial to study those factors to understand really, what makes people chose specific transportation modes for their daily mobility.

This paper presents data from a qualitative study involving public transport users and car users and intends to study the factors Related to the choice of transport mode in Batna City.

Literature review:

The literature on the factors influencing mode choice shows a variety of approaches; a study on the reasons behind commuters' mode choice was conducted on 75 residents of the region of Iles de France; in which 23 use car and the rest use public transport (for daily travel work-school). The interviewees were asked to choose of a list of 19 options to select the reasons of their preferred mode choice. The question intended to explain the reasons they took in-mind in selecting their preferred mode when commuting. The most chosen reason, for both car users and public transport users, was "for practical reasons Mean=4.91, Mean=4.27 respectively.

Car users justify their use of cars by avoiding annoyance (Mean=3.91), to avoid being late (Mean=3.85), to have more control of the situation (Mean=3.35), and for the pleasure of driving (Mean=3.66). While public transport users explain their selection by: "for practical reasons" (Mean=4.27), for economic reasons (Mean=3.29), to avoid parking problems (Mean=3.14), for environment reasons (Mean=2.92), to avoid accidents (Mean=2.13) and for more security (Mean=2.00).

This study indicates that the arguments for using private car are more positive, more symbolic and related to the individual (comfort, pleasure ...) which explains that users have a positive image about the car, while public transport users' arguments concern more the community rather than the individual.

In addition to that, the results from study will help the decision makers to encourage the shift to public transport by focusing on making public transport more comfortable and enjoyable. (Rubens, L., Gosling, P., & Moch, A. 2011).

In another study made by **Tyrinopoulos, Y., & Antoniou 2013** tried to understand the factors affecting commuters' mode choice, they administered 600 questionnaires to adult citizens (above 18) in a center of mobility called "Municipality of KALALARIA, GREECE." Regarding the used mode in daily movements (school-work), 62% of interviewees used the private car and 38% used public transport. The study showed that the most concerning reason for individuals is parking problems. They also gave the sample a list of various factors which inhibiting the use of public transport; lack of public transport information, bad accessibility, high fare, crowding and unreliability, after the analysis it was found that ***"the most factor discouraging the use of public transport was crowding ,followed by unreliability. The high fare, the lack of public transport information and bad accessibility to the transit network do not seem to discourage the respondent's use of public transport"*** (Tyrinopoulos, Y., & Antoniou, 2013, P37).

In this study, the authors suggested to policy makers to take advantage of the results, especially regarding the *discouraging factors* in order to make public transport more attractive to users and make more policies to reduce car use.

In the effort to understanding commuters' reasons for choosing transport modes, a study was made in Shanghai, China on private car commuters' satisfactions towards both the car itself and public transport and why they chose to move by their cars. Their study covered 460 private car commuters but only 394 were used for the analysis.

The main questions in this study were related to the satisfaction towards car, what they like about commuting by it, and if they are ready to switch to public transport; what are the factors that interest them about this switch. From their analysis they found that the most important attributes to car use were "convenience"(Mean=4.47), "reliability"(Mean=4.30), after that they concluded that the private car provides shorter time of transportation (Mean=4.39) and its more comfortable (Mean=3.90) while public transport is only

cheaper (Mean=3.38) especially females; according to them females are more likely to switch to public transport because they care more about the cost than males, also the results showed that public transport provides more relaxation (Mean=3.69) (because it's not them who drive).

The authors suggested for transport authorities to improve public transport's reliability, comfort and timeliness to attract users to shift towards it. **(Wang, L., Li, L., Wu, B., & Bai, Y, 2013)**

In Porto, Portugal **Beirão, G., & Cabral, J. S 2007** conducted 24 semi-structured interviews with regular and occasional users for public transport and private cars to understand their attitudes when moving and what affect their mode choice. The sample was divided in 3 groups:

1- Public transport users (7 participants);

2- Car users (10 participants); and

3- Both (7participants). (Beirão, G., & Cabral, J. S, P480)

The results showed that travel time is an important factor especially for work/school movements, car users admitted that they like to feel in control and do not like surprises, but sometimes they feel very tired and stressed from driving, the point they see public transport as a more relaxed mode. As the authors stated, none of the responds complained about the cost of public transport and most of car users see it as a cheaper mode comparing to the cost of car use. The last factor that received a high interest for them, and more specifically occasional users (the both group), was the lack of information. They declared that there is a possibility for them to switch to public transport if it will be provided with more information.

The key findings of this study showed that if public transport can compete with private car it must be at users' requirements, it is not really a fact that all car users will switch to public transport.

However, ***“the intentions to switch mode expressed by car users and occasional public transport users shows that improving the image and levels of service being offered can attract potential***

users to public transport service.”(Beirão, G., & Cabral, J. S, P487)

Kaufman 2012 has studied the reasons behind the choice of mode of 2198 car owners and residents of areas with good transport coverage; which means individuals in a position to choose between their cars and public transport in Genève Lausanne Berne, and compare the results of this study with a previous one conducted in the same areas in 1994 for 1,500 individuals.

The results showed that in 1994 indicated that people preferred to move around using their private car rather than public transport for reasons related to freedom, flexibility as well as cultural and social reasons. While in 2011 after the improvements in public transport network, users become more attracted to use it rather than their personnel cars.

In addition to the revolution that occurred in the world of communication and technology has made moving through public transport easier for users, because they can use their phones or other means of technology inside of the bus, tramway or other transport mode.

Methodology

-In order to answer our main question and understand why individuals prefer a specific mode over another we administrated 200 questionnaires (self-administrated survey) to the residence of Banta city

-The administrated questionnaires were designed to bring out tow essential points :

- **First**, what are the factors that influence individual's mode choice-more specifically car users and bus users?
- **Second**, is there a possibility for car users to shift towards public transport if a tramway is implemented in the city of Batna?

- The retrieved questionnaires have been analyzed using SPSS (Statistical Package for the Social Sciences) software, version 22

Defining the sample study:

The sample study was comprised of:

- 102 males, 98 females;
- The majority of our respondents were from 18 to 25 years old (49.5%), from 26 to 40 years old (41.5%), 5% of them were more than 40 years old and only 4% were under 18;
- Most of the respondents were employees and students (84), (80) while 18 of them had free profession, 11 were unemployed and seven (7) were pupils;
- For the educational level, 88% of our sample had an university education level and 12% of them had high school or less education level;
- 59.5% of the respondents reside the Centre of Banta city, 28.5% live in the suburban and the rest 12% reside pre-urban areas;
- The income of the sample is represented in the following graph as follows:

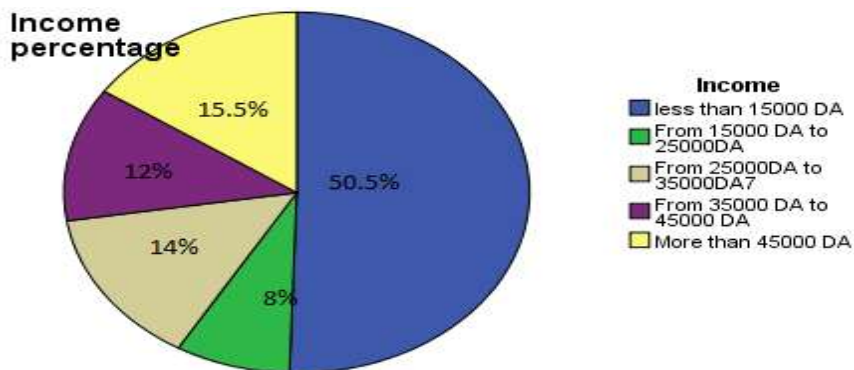


Figure01: income of the sample

- When considering the reasons for traveling, we found that 56.5% travel for work, 40.5% for school, 2.5% for shopping and 0.5% for other reasons.

- In order to make this movements the results showed that 56.5% of the respondents use the bus, 33.5% use their private car, 3.5% choose to move by taxi, only 1% of them move by bicycle and 5% prefer walking to their destinations.
- 26.5% of the interviews do own private car, 73.5% do not and 84.5% of them want to buy it.
- 49.6% of those who do not own a private car are ready to buy one if their income increased, 18.6% will if they obtain a loan for car ownership, the rest of them will do it because of the bad quality of public transport in the city, because it gives them the feeling of independence.
- 69.5% of the studied sample have a driving license and 52.7% of them want to by a car.

Results:

First- Mode choice factors for Banta's individual daily travel:

a) The results showed that 66.5% of the respondents do not have a choice for using their daily mode, 69.2% of them use public transport and 17.3% use private car. Whether 65.7% of the rest of them (those who have a choice in their daily transport mode) use private car for their daily travel and 31.3% use public transport. (Table 01).

		Choice	
		yes	No
Transport _Mode	car	65,7%	17,3%
	bus	31,3%	69,2%
	taxi	0,0%	5,3%
	bicycle	1,5%	1,5%
	Walking	1,5%	6,8%

Table 01: individual's choice in their daily mode

b) In order for us to understand on what basis individuals chose their daily mode, we gave them a list of attributes or factors (price, speed, security, timing, avoiding congestion, cleanness of

the mode freedom and social image) and asked them to rank each one of them on a five-level Likert scale according to their importance.(1-unimportant 5-important). To analyze the results, we divided our means into 5 ranges:

-] 1-1.8] **unimportant;**] 1.8-2.6] **of little importance;**
-] 2.61-3.4] **moderately important;**] 3.41-4.2] **important;**
-] 4.21-5] **very important.**

The results were as follows:

- Price: 38% of the studied sample consider the price important when choosing their daily mode, 33% of them find it important, 13.5% of little importance, 8.5% do not consider it when choosing and 6.5% find it moderately important.
- Speed: 35.5% of the sample claim that the speed is an important factor for their choice, 34% consider it very important, 16% of little importance, 16% of little importance, 9.5%unimportant and 5% see the speed of the mode moderately important.
- Avoiding congestion: 34% of the sample indicated that avoiding congestion when commuting is an important factor for them, 32% indicated that it is a very important factor, 15% of little importance, 13% unimportant and the rest consider it moderately important.
- Security: 41% of the interviews worry about the security and consider it as a very important attributes, 33% find it important, 15 of little importance, 7% unimportant and 4% moderately important.
- Travel time: Almost half of the studied sample declare that time is a very important factor for their daily mode choice, 29.5% of them find it important, 10% of little importance, 8.5% unimportant and 2.5% moderately important.
- Cleanness: 38.5% of the sample find the cleanness of the mode important, 30% of them take it very important, 16% of

little importance, 8% unimportant and 7.5% moderately important.

- Freedom: 31% of the studied sample declare that the freedom their chosen mode give them is important, 24% find it very important, 24,5% of little importance, 12% unimportant, 8.5% moderately important.
- Social image: 30% of the individuals do not really care about their social image when moving with their current mode, 25% find it of little importance, 20% find it important, 17.5% find it very important and 7.5% of them find it moderately important.

When calculating the means of the previous factors, we found that the attribute that affects the most our samples mode choice is timing $M=4$, followed by security inside and outside the vehicle $M=3.86$, the cost of travel (fuel, ticket,) $M=3.74$, the speed of the mode $M=3.68$, how clean is the mode they're using $M=3.66$, avoiding congestion $M=3.58$. The results also showed that least affecting factors were freedom ($M=3.30$) and the social image $M=2.70$ and this can be explained because 56.5% of the respondents use bus for their daily travel and 69.2% have no choice but using this mode.

	timing	security	price	speed	cleaness	avoid_congestion	freedom	social image
Means	4,0000	3,8600	3,7400	3,6850	3,6650	3,5800	3,3050	2,7000

Table 02: means of the factors affecting mode choice

-We also wanted to make a scoop on the factors that affect car and bus users' mode choice.

As mentioned before 56.5% of the respondents use the bus for their daily movements and 33.5% use their private car.

	timing	security	price	speed	avoid_congestion	cleaness	social	freedom
Bus	3,8761	3,8673	3,823	3,6195	3,4425	3,646	2,8673	3,3009
car	4,1642	3,8507	3,4478	3,7761	3,8358	3,7761	2,5373	3,1493

Table 03: means of the factors affecting car users' and bus users' mode choice

It is interested to notice that timing ($M_1=4.16$), ($M_2=3.87$) and security ($M_1=3.85$), ($M_2=3.86$) are the factors that affect mostly our studied sample mode choice despite their current used mode car or bus. Then it was noticed, that avoiding congestion affect mostly car users while bus users are concerned more about the price.

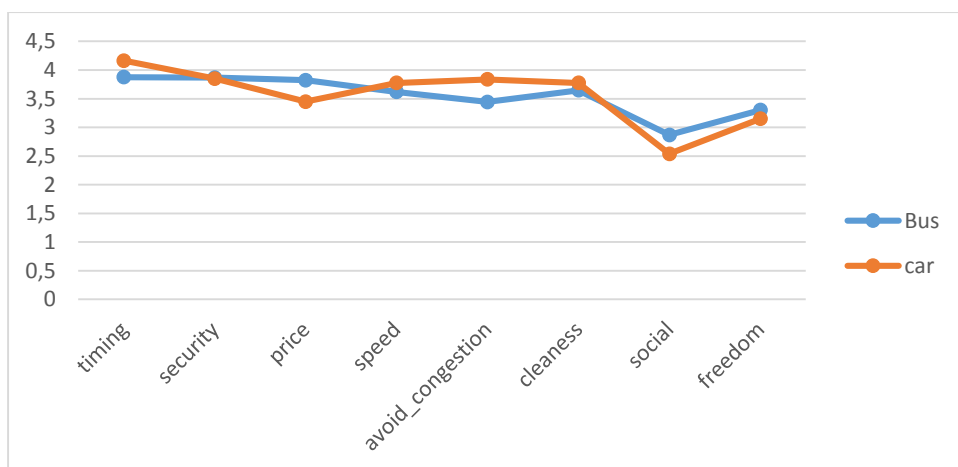


Figure 02: means of the factors affecting car users' and bus users' mode choice.

Second- the shift towards tramway

We also wanted to study the willingness of our studied sample -and more particularly car users- to abandon or reduce their excessive car use if a new public transport will be **implemented** in the city of Batna (tramway).

We started by asking the car users about their reaction to an increase in fuel prices; surprisingly 82.7% of them stated that they are not ready to give up their cars in this situation, and 17.3% are ready to do it.

This may be due to the fact the current fuel price did not affect the attractiveness of the private car despite of the recent increase in fuel prices in Algeria.

In addition, we can explain this resistance to car use dependence to the modest quality of the current public transport in the city, and the lack of other alternatives.

However when we asked our interviews about their reaction to the implementation of tramway; we found that 63 % are willing to reduce their excessive use and use their private car only for the week-end or long trips, 26.5% claimed that they will continue using it, and only 10.2% of the individuals are ready to shift to tramway and give it up completely.

Conclusion

The key findings from this study indicate that the factors that affect mostly our commuter's transport mode choice are timing and security. While the least affecting factor was the social image giving by the chosen mode and this may be due to the composition of the studied sample, 56.5% of them use bus for their daily movements.

The study also showed that car users care more about avoiding congestion while bus users worry more about the price they spend during their commuting.

Through the out coming of this study, encouraging modal shift towards tramway for car users insists on improving timing and security of it and put an affordable price for bus users.

In conclusion, the present study demonstrated that there are not specific factors that affect daily mode choice; the travel behavior is a very complex process, and its affected by a mix of factors.

These factors affect differently each user according to his daily mode, his location and his sociodemographic characteristics, so in order for policy makers to make his journeys more sustainable all of the mix mentioned above should be taking into consideration.

References

- 1- Anable, J., 2005. 'Complacent car addicts' or 'aspiring environmentalists'? Identifying travel behaviour segments using attitude theory. *Transport Policy* 12 (1), 65–78
- 2- Bamberg, S., Ajzen, I., Schmidt, P., 2003. Choice of travel mode in the theory of planned behavior: the roles of past behavior habit, and reasoned action. *Basic and Applied Social Psychology* 25 (3), 175–187.
- 3- Beirão, G., & Cabral, J. S. (2007). Understanding attitudes towards public transport and private car: A qualitative study. *Transport policy*, 2007, vol. 14, no 6, p. 478-489.
- 4- Hagman, O., 2003. Mobilizing meanings of mobility: car users' constructions of the goods and bads of car use. *Transportation Research Part D* 8 (1), 1–9.
- 5- Handy, S., Weston, L., & Mokhtarian, P. L. "Driving by choice or necessity?". *Transportation Research Part A: Policy and Practice*, 2005, vol. 39, no 2, pp.183-203.
- 6- Jensen, M., 1999. Passion and heart in transport—a sociological analysis on transport behaviour. *Transport Policy* 6 (1), 19–33.
- 7- Munafò, S., Christie, D., Vincent-Geslin, S., & Kaufmann, V. *Les mutations du choix modal chez les actifs motorisés urbains, Étude comparée des agglomérations de Genève, Lausanne, Berne et Yverdon-les-Bains*, 2012.
- 8- Ory, D.T., Mokhtarian, P.L., Redmond, L.S., Salomon, I., Collantes, G.O., and Choo, s. (2004). "When is commuting desirable to the individual?" *Growth and change*, Vol.35, No3. Pp.334-359.
- 9- Rubens, L., Gosling, P., & Moch, A. « Favoriser le report modal : connaître les raisons liées au choix d'un mode de déplacement pour le changer ». *Pratiques psychologiques*, 2011, vol. 17, no 1, pp. 19-29.
- 10- Tyrinopoulos, Y., & Antoniou, C. "Factors affecting modal choice in urban mobility". *European Transport Research Review*, 5(1), 27-39, 2013, vol. 5, no 1, p. 27-39.
- 11- Wang, L., Li, L., Wu, B., & Bai, Y. "Private Car Switched to Public Transit by Commuters, in Shanghai, China". *Procedia-Social and Behavioral Sciences*, 2013, vol. 96, p. 1293-1303.