Transportation habits and opinions of railway users in Athens, Greece

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Abstract. The Greek economic crisis of 2009 onwards has affected all aspects of social and economic life of the country, including transportation. Taking into account the link between the economic crisis and transportation, the present study aims to investigate the way that the economic crisis has affected the interurban travel rail habits of the citizens of Athens, the capital of Greece. We conducted a study, using a questionnaire survey with 400 participants, to investigate the general trends concerning the purpose and the frequency of railway travelling and the restrictions of their travel activities due to the economic recession. The results of this study show that more than half of respondents declared that there is not any great difference in their use of rail as transport during last years, while they express a positive opinion as they attribute it to the higher safety and comfort of railway compared to other transportation modes. However, the cost of the ticket and the provided level of service are two significant factors for the participants for the choice of their transportation mode.

1. Introduction

The historical construction of infrastructure such as railroads coincided with periods of rapid economic growth in Western Europe, Japan and the United States [1]. Among transport modes existing today, rail remains of great interest because of certain benefits arising from that is the least polluting and most environmentally friendly. These are just some of the reasons why, in recent years, the European Union's strategy is trying to develop and implement programs to revive rail transport in the Community and to draw more traffic to this type of transport [2]. The abrupt world economic crisis in 2008 has seriously affected global economy with complex and unprecedented impacts. The advanced economics around the world experienced a 7.5\% decline in real GDP during the fourth quarter of 2008 [3]. The crisis has affected all parts of socio-economic activities in European countries with severe consequences mainly in Southern European ones (Spain, Greece, Cyprus and Italy), as well as Ireland.

Taking into account the link between economic crisis and transportation, the present study aims to investigate the way that the economic crisis has affected the travel rail habits of the citizens of Athens, the capital of Greece. Specifically, this study investigates the general trend concerning the purpose and
the frequency of railway travelling and the possibility of restrictions of their travel activities due to the economic recession.

This work is part of a series of works about the opinion of environmental problems, annoyance and mobility in Greece, taking into consideration the impact of the economic crisis of the country since 2008 [see for example, [4], [5], [6], [7], [8].

2. Literature review
Several researchers have dealt with the effects of economic recession on different transport activities. Models and analyses based on the relations between economic indicators (GDP per capita) and transport indicators (tonne-km or passenger-km) reveal these effects. Some studies examined the relations between road freight indicators and economic indicators, such as GDP per capita [9], [10], [11], [12]. The link between revenues (for example GDP/capita) or the economic growth and the cases of domestic air passenger has been studied in several countries, such as traffic in Brazil [13], in China [14], in Mexico [15], or in Greece [7].

The railway transport in Greece is not developed enough today compared to other European countries. The Greek railway network is relatively limited, mainly due to the mountainous terrain of the country. Most of the lines are electrified and are double track with standard gauge (1,435 mm). This network has a part which belongs to the Orient – East Med Corridor, including over 1,000 km or rails. Currently, the operation of the Greek railway network is split between the Hellenic Railways Organisation (OSE), which owns and maintains the infrastructure, and TrainOSE and other private companies that run the trains on the network; namely, provision of rail traction services for the transport of passengers and goods and the development, organization and operation of rail-freight and rail-passenger services, as well as other transport services by track-based modes. The passenger train market in Greece is a monopoly, since TrainOSE has the exclusive right to operate rail services for passengers. In 2017, the distribution of passenger-kilometers travelled by land in Greece is mainly dominated by passenger car (81.4%) and buses (16.4%); railway (0.9%) and tram and metro (1.3%) are minor transport modes.

3. Material and Methods

3.1. Questionnaire
The analysis of this paper is based on the data collected using a structured questionnaire, addressed to the active population of the city of Athens. This questionnaire consists of a series of questions that explore the respondent’s general trend concerning the purpose and the frequency of railway travelling, the main factors influencing their decision and whether they restrict their travel activities due to the economic recession. The questionnaire also collects the respondents’ beliefs about the associated ticket prices and different factors that would motivate them to increase the probability to travel more by train. Finally, there are some questions about their opinion of the probable consequences of the deregulation of railway system. The final section of the questionnaire is designed to record the socio-demographic data of the respondents. The survey questionnaire consists of closed-ended questions and the majority of the responses are measured using a five-point Likert scale, ranging from 1 to 5: 1: ‘not at all’, 2: ‘little’, 3: ‘moderately’, 4: ‘much’, 5: ‘very much’ or 1: ‘not at all, 2: ‘little often’, 3: ‘the same’, 4” ‘more often’, 5: ‘much more often’. The survey is conducted from February to April 2018 in the Central Rail Station of Athens, the capital of Greece. A total of 400 valid questionnaires are collected with face-to-face interviews at several times and days within the specific time period. The sampling method used is the following: after the end of each questionnaire, the next questionnaire is addressed to the 10th traveler passing through the main entry gate of the Central Rail Station of Athens. If this traveler denies participating, the questionnaire is addressed to the next 10th one, until a traveler is accepted to participate. It should be mentioned that the great majority of travelers accepted to participate, except in the case of immediate departure of trains. For this reason, no questionnaire is addressed 10’ before a train departure. All interviews are carried out by the same person (the first
author of this study) who was adequately trained. The questionnaires are filled by the interviewer based on the respondent’s answers.

3.2. Data analysis
The results are statistically analyzed. The quantitative variables are indicated as mean ± standard deviation. Frequency analysis, percentages, cross tabulation and chi-square tests of independence are calculated for the categorical variables. The frequencies of observed and expected values are analyzed by means of cross tabulations. These frequencies reveal the relationships between cross-tabulated variables. The chi-square test for independence is used to determine whether the variables corresponding to the questions of the first two sections of the questionnaire are statistically related to the socio-demographic characteristics of the respondents. A 2-sided p-value less than 0.05, is considered to be significant. The principal component analysis (PCA) method is used to decrease the number of variables maximizing the explained variation. Kaiser-Meyer-Olkin (KMO) and Bartlett’s Test of Sphericity are used to ensure that the necessary prerequisites to perform PCA exist [16]. Loading values above 0.6 are considered as “high” and those below 0.4 as “low” [17]. Cronbach’s alfa test is performed to assess the internal consistency of the variables. The alpha values greater than 0.6 are considered as satisfactory [18]. K-means analysis was applied in order to establish a profile of the respondents. K-means is a simple clustering method used when there are data without defined categories or groups. However, no significant results were obtained from the application of K-means analysis. A binary logistic model was used to assess the association of the variables that represented the main research questions with each independent variable. The extracted principal components and the socioeconomic characteristics of the respondents were considered independent variables.

4. Results and discussion

4.1. Analysis of the socio-demographic characteristics of the sample
The 51.25% of the respondents are male and the 48.75% female. Among the 400 participants, 288 of them (72%) are aged 25–54 years. Regarding to marital status, 49.25% of the respondents are married. The 8.5% of the respondents have a primary/secondary school education and those with high school education and university education account for 26.5% and 55.5% respectively. The majority of respondents, approximately 50.5%, are private employees and freelancers (27.25% and 23.25% respectively), 12.75% are civil servants and 8.75% are retired. The percentage of student respondents is 7.75%, while almost the 20.75% are unemployed. The distribution of the income among the different categories is different in the period before and after the economic crisis. The percentage of the respondents who earned less than €10,000 is greater in 2017 than before the economic crisis.

4.2. General travel habits
Table 1 shows the frequency of the answers for each question. Here, a decrease or an increase is considered by taking the sum of high and low decrease/increase respectively.

The first question investigates the effect of the economic crisis on the rail transport of respondents. The great majority of the respondents (85.3%) declare that there is not any great difference in their use of rail as transport mode or there is a small increase or decrease. Only 6% declare that their transport by rail has significantly increased and 8.7% has significantly decreased. The economic crisis has an impact on the frequency of use on all the other modes of transport as well. The use of taxi, private car, airplane and ship is respectively declared to be “not at all” and “less often” used by the 95.5%, 76.25%, 74.5% and 64% of the respondents. Bicycle is the mode which its use has the lowest change due to economic crisis. Even if bicycle is proved to be an excellent option to substitute private car, the spatial extent and the absence of infrastructures seems to prohibit the use of bicycling in Athens [19]. On the contrary, the economic crisis has a significant impact on the use of public urban transportation and interurban bus travels, since the 45.25% and 43.75% respectively of the respondents declare an increase in their use.
Some significant statistical associations exist between the change of frequency of use of different travel modes, after the beginning of the economic crisis, and the personal characteristics of the respondents. The 85.2% of retired and unemployed respondents have reduced the use of private car, against only the 70.9% of the other categories of occupation (p-value=0.001<0.05). On the contrary, only the 65.8% of retired and unemployed respondents have increased the use of public transportation, against the 75.7% of the other categories of occupation (p-value=0.033<0.05). Additionally, the 78.3% of the respondents with children have increased the frequency of use of public transportation, against only the 68.7% of the respondents with no children (p-value=0.043<0.05). Only the 19.5% of retired and unemployed respondents have increased the use of airplane, against the 29.1% of the other categories of occupation (p-value=0.033<0.05), while only the 28.9 % of retired and unemployed respondents have increased the use of ship travel, against the 40.2% of the other categories of occupation (p-value=0.022<0.05). Only the 54.3% of married respondents have increased the use of bus compared to 64% of single participants (p-value=0.048<0.05), while 68.5% of civil servants have increased the use of bus compared only to the 47.2% of private employee (p-value=0.002<0.05).

The frequency of use of different travel modes is found to be positively associated with the income of the last year (of 2017). The 81.3% of the respondents with income less than €20,000 decrease the use of their private car against 65.6% of the higher incomes (p-value=0.001<0.05). In the same direction, the use of taxi is quite small in this income category comparing to higher ones (only 2.9%, against 7.8% for the higher incomes, p-value=0.028<0.05). In the same category of income, the 68.8% of respondents do not travel by ship, due to economic crisis (against only 46.1% of the higher incomes, p-value=0.004<0.05). The 32.5% of the respondents aged greater than 45 years and the 29.8% of the respondents with children, use more frequently the airplane travel (against only 20.3% and 17.4% for the aged less than 45 years old and the respondents without children respectively, p-value=0.006<0.05 and p-value=0.007<0.05 respectively).

Comparing the railway with the other modes of urban and interurban transport, the majority of respondents express a positive opinion about the rail transport and they attribute it to the higher safety (90.25%) and comfort (69.5%) of railway compared to other modes, while the 46.5% attribute it to its lower price. Passengers often select the transport mode which they consider, according to their experience, safer. The feeling of safety includes safety on the journey, personal safety on the train, and personal safety in the station. Comfort mainly refers to the integrated feeling about the railway service in the course of the journey. Overcrowding, comfortable temperature on board and windows and doors adequately functioning on board are used to describe comfort. The respondents report as the main reason for using railway personal/family reasons (39.25%), professional reasons (30.5%), shopping and access to public services (11% each).

The respondents declare that, after the economic crisis, the main factors affecting their frequency of travelling by rail have changed. As rail transport is considered as the cheapest one in Greece comparing to the other modes of transport, financial reasons is the first factor for the 74.74% of the respondents (the sum of the “enough”, “more”, “much more”), followed by the change of mobility habits (57.75% of the respondents), family and professional reasons (38%), environment protection (26%) and medical reasons (17.5%).

These results show that, after the economic crisis of the last 10 years in Greece, the use and maintenance of a private car becomes harder for the lower income classes; also retired and low income people decreased their displacements, and families and low income people are more and more oriented to cheaper transportation modes. However, the habits of rail users are not significantly affected.

**Table 1. Description of variables.**

| QUESTIONS | ANSWERS as frequency (%) |
|-----------|---------------------------|
| Question/Variable | high increase | low increase | constant | low decrease | high decrease | Mean | S.D. |
| 1. Do you think that after economic crisis, the use of rail for your transportation showed | 6 | 27 | 27.75 | 30.5 | 8.75 | 3.09 | ±1.077 |
| Question/Variable | not all | less often | the same | often | more often |
2. Due to the economic crisis, the frequency of the use of
   1. private car
   2. public transportation
   3. bus
   4. taxi
   5. motorcycle
   6. bicycle
   7. airplane
   8. ship

3. The rail transport to the same destination, compared
to other modes is considered to be
   1. more economical
   2. more comfortable
   3. safer

4. The reasons for rail transport
   1. family reasons
   2. professional reasons
   3. financial reasons
   4. direct destinations
   5. medical reasons
   6. change of mobility habits
   7. environmental protection
   8. accuracy in schedules

5. Note the extent to which the following reasons affected your rail transport after the economic crisis:
   1. family reasons
   2. professional reasons
   3. financial reasons
   4. medical reasons
   5. environmental protection
   6. change of mobility habits

6. How do you evaluate the cost of ticket in your rail travel
   1. quite cheap
   2. cheap
   3. fair
   4. expensive
   5. quite expensive

7. The cost of ticket in your rail travel, before/after the economic crisis has been
   not at all
   less
   enough
   more
   much more

8. Do you believe that the cost of tickets, due the economic crisis, has to be reduced
   1. not at all
   2. less
   3. the same
   4. more
   5. much more

9. Do you believe the level of services offered in the rail transport
   1. not at all
   2. less often
   3. the same
   4. often
   5. more often

10. Do you want to travel by train more or less often
    1. not at all
    2. less
    3. the same
    4. more
    5. much more

11. How often do you travel by train (per month)
    1. not at all
    2. less
    3. the same
    4. more
    5. much more

12. The upgrade of the level of the following services will convince you to travel more often by train
    1. reduction of ticket price
    2. more comfort
    3. more safety
    4. direct destinations
    5. increase the frequency of schedules
    6. accuracy in schedules
    7. dense geographical coverage

13. Perceptions about the control of Greek railway
    1. private
    2. Cooperative/ Private control
    3. Cooperative/ public control
    4. Public
4.3. Opinion about ticker price and service quality

A series of questions are addressed to respondents concerning their opinion on the price of rail ticket. One out of three of the respondents (33.35%) declare that the price of the ticket is expensive, while the 57.75% consider it as fair and only the 9% of them consider it cheap. This indicates that the rail users belong to the lowest income classes or that the price is considered high for the service offered. Moreover, the 43% of the respondents declare that the price of the ticket has increased in the period after economic crisis, while the 43.75% consider that no increase or decrease has taken place. This last parameter is statistically significant with gender: women express more firmly than men the view of increase (50.8% for women compared to only 35.6% for men (p-value=0.002<0.05)), with family situation: married respondents declare firmly the increased price of ticket than single (48.2% for the married against 37.9% for the single, p-value=0.038<0.05) and with educational level: this opinion decreases as the educational level increases; 64.3% of the high school education level consider that the price of the ticket has decreased in the period after economic crisis while the same opinion have the 53.1% of the higher education level (p-value=0.031<0.05). The above indicates that the perceived increases/decreases in prices are not always linked to reality and depend on the personal and sociodemographic characteristics of the respondent. The 41% (sum much and very much) of the participants declare that the cost of the ticket needs to be reduced due the general economic situation. Age has a significant impact on this opinion: the 47.9% of participants aged more than 45 years old claim the lower prices, compared to 37.2% of aged lower than 45 (p-value=0.032<0.05). Professional status has also an impact, as the 49% of the retired/unemployed respondents declare this statement, compared to 37.5% of the freelancers (p-value=0.024<0.05). Concerning the quality of services offered, about the half of the respondents (45.5%) believe that the economic crisis has a negative impact on this quality, the 43% think that no change occurred and only a small percentage (11.5%) believe that this quality has improved. No correlation with the sociodemographic characteristics is observed here. The above responses about the cost of ticket and the quality of service are in line with the results of the Greek Regulatory Authority for Railways, where most of the complaint items concern reimbursements and delays [20]. Also, the relative Eurobarometer finds that, on average, the 39% of the Greek respondents are satisfied with each aspect of railway travel, (e.g. frequency of the trains, availability of through tickets, punctuality and reliability) who are ranked as having high and good satisfaction.

4.4. Rail travel habits

More than the half of the respondents (55.25%) travel by train 1-5 times/month, the 21.75% travel 6-10 times/month, the 7.5% travel 11-15 times/month, the 5.75% travel 16-20 times/month and the 9.75% travel 21-25 times/month. The 38.75% of the respondents declare that they want to travel more often by train, while the 29.5% of them want to keep the same frequency and the 31.75% want to travel less often. A chi-squared test for independence indicates that participants aged more than 45years old and participants with children express more positively their intention to travel more often by rail (p-value=0.003<0.05).

Furthermore, the respondents are asked to express their opinion about the possibility to travel more often by train in case of upgrading the train’s quality of service. Generally, the more the passengers
feel satisfied on the railway service quality, the more the probability that the passengers will travel by train more often. The criteria that influence their opinion are the reduction in ticket price (62.5%), the punctuality (61.25%), a shorter travel time (48.75%) and the increase in the density of geographical coverage (56%). It is notable to be mentioned that the high level of safety (10.25%) and comfort (24.75%) of rail transport are not strong enough to increase the probability that the passengers will travel more by train.

4.5. Opinion about deregulation

The opinion of the respondents about the consequences of the deregulation and restructuring measures in the Greek railway sector is recorded. More than the one third of the respondents (34.75%) claim that the railway system should be owned and controlled by the state, while only the 16.75% of them prefer private control and the 39.5% of the respondents claim a mixed system, either by public (20.75%) or private (18.75%) control. The ownership of railway transport is associated with gender (p-value=0.033<0.05); the females emphasize more the public character of railway than males. About the half of the respondents (48.25%) believe that the privatization of railway transport and the participation of several companies in the market would lead to a decrease in the price of tickets, while the one forth (27%) believe that the same price will be maintained, and the other fourth (24.75%) think that the price will increase. A chi-squared test for independence indicates that civil servants express more positively their belief that the cost of the ticket would decrease (p-value=0.006<0.05), than part-time occupation workers (54.4 % against 34.7% of them). The majority of the respondents believe that the privatization of railway transport would lead to increased quality of services offered and level of safety (85% and 67.25% of the respondents respectively). Finally, two out of three (66.25%) respondents claim that a specific part of the railway travelers (e.g. unemployed, low income, youth, disabled) should travel free of charge, while the 32% has the opinion that all should pay a fare.

5. Conclusions

The present work summarizes the results of a statistical survey conducted from February to April 2018, in Athens, exploring the views of the rail users about the impacts of the economic crisis on their railway habits. The results reveal that the majority of the participant declare that the economic crisis had an impact on the frequency of use of the transport modes; this impact is strongly associated with the sociodemographic characteristics of participants. Concerning rail transport, more than the half of the respondents declare that there is not any great difference in their use of rail as transport, while they express a positive opinion towards rail transport, as they attribute it to its higher safety and comfort compared to the other transportation modes. However, the participants reveal the cost of the ticket and the provided level of service as two significant factors for the use of rail transport.

The research findings could be a useful tool for transport policy makers and rail companies to provide the appropriate framework to increase the attractiveness of rail travels mainly through the increasing of provided facilities. This work also provides some direction for future research which can be carried out in the same area in order to investigate the potential changes in the perceptions of the passengers in conjunction with the changes in the macroeconomic factors. Moreover, valuable conclusions can be drawn by conducting similar surveys in other main railway stations in Greece.

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