Travel patterns of three distinct driver age groups in Greece

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ABSTRACT

Within this research the travel patterns of passenger car drivers are investigated in relation to their age, as recorded from a national travel survey conducted in Greece. For the needs of this research drivers are classified into three mutually exclusive age groups - namely, young (18-24), adult (25-64) and elderly (65+). The mobility of these three driver groups - expressed into average annual distance driven - is then investigated with respect to parameters involving driver characteristics (experience, gender), vehicle characteristics (engine size) and the nature of the trip (time of trip and road type). Several patterns are analysed and the dependence of the various travel patterns on driver age is tested through ANalysis Of VAriance (ANOVA) mainly by the use of the Welch-test. Results show that driver experience is not an influencing factor for driver mobility, whereas driver gender and vehicle characteristics, such as engine size are. Furthermore, results illustrate dependencies between driver age and driving at night and during the weekends, highlighting the relationship between driver age and trip purpose. The distribution of mobility across the different road types does not reveal any interactions with driver age, however, specific trends are detected when distance driven is also segregated into weekday and weekend categories, indicating a relationship between driver age and mobility in relation to type of day.

1. Introduction

Driver travel patterns are frequently a major contributing factor for the design of strategies related to road safety, driver training, licensing issues and transportation planning. However, little research has been conducted on driver travel patterns in terms

of driver mobility as defined by the driven distance variable. Research on driver mobility can be found in various studies as a supplementary parameter, which is investigated in conjunction to other primary discussed topics.

In the field of road safety driver mobility plays and important role as it serves as a means to define driver exposure and hence risk rates. In particular, Massie *et al.*[1] noted that annual distance is one of the stronger predictors for accident involvement. The travel patterns of young and novice – more than often these two categories overlap – drivers have been studied indirectly in relation to road safety issues (Ward *et al.*[2]). Lourens *et al.*[3] (1999) related driving violations and accident involvement in relation to annual distance, and driver's sex, age and education level. Clarke *et al.*[4] investigated the accidents of young drivers in relation to driver age and experience, and time of day. Such studies comprise the basis of the formation of licensing schemes such as the graduate licensing system (Hedlund *et al.*[5]; Stevenson[6]; McKay[7]) or inclusion of night-time driving in the licensing test. The travel patterns of vulnerable driver categories – including young/novice and elderly drivers – are also useful for the design of training schemes (Hildebrand[8]) for these driver categories.

Substantial research has been conducted recently on the travel patterns of elderly drivers as their population is anticipated to increase (Holmes *et al.*[9]). Bauer *et al.*[10] investigated the influence of age and gender on the driving patterns of older adults and noted that driving decreased with age and female gender. Vance *et al.*[11] identified predictors of driving exposure and driving avoidance for elderly drivers, the main of which included age, gender, health, cognition and physical performance. Several correlations between travel patterns and age were noticed (Collia *et al.*[12]) when

comparing travel characteristics of elderly drivers to those of the rest of the driving population. Research on travel patterns has also been employed to identify ways to increase elderly drivers' mobility (Case[13]).

Another field of application of driver mobility studies involves vehicle insurance issues (Parry[14]). Litman[15] discussed the implementation, benefits and costs of a pay-as-you-drive insurance. Findings on driver mobility patterns have also been related to the design of carpooling (Steininger *et al.*[16]; Burkhardt and Millard-Ball[17]), transportation (Johansson-Stenman[18]) and road pricing (O'Mahony *et al.*[19]) strategies.

Although several studies need information on driver mobility to investigate other issues, there is still a gap in knowledge in this particular field. Charlton and Baas[20] provided patterns of car use in relation to driver and trip characteristics and related these patterns with the driving risk, in a study that was conducted in New Zealand. An indirect utility model relating car ownership with car use expressed in annual distance was developed by De Jong[21] for Dutch households without a car or with only one private car. In this study, household size, age and gender of the household head were the model variables. Several studies addressing complex travel behaviour issues (Recker *et al.*[22, 23]; Golob[24, 25]) have been conducted but they are focused on the number and type of trips or activities (Mackett[26]) rather than distance driven.

This research attempts to provide insight on the travel behaviour of passenger car drivers mainly focusing on the similarities and differences arising from different driver age groups. In particular, three driver age groups – namely, young (18-24 years old), adult (25-64 years old) and elderly (65 and over years old) are examined. These three driver groups are anticipated to demonstrate different travel patterns, as they have

different characteristics and needs. Travel patterns are investigated through the average annual distance driven, which is calculated using data from a national survey conducted in Greece. In the first section of the paper, the methodology consisting of the data collection and analysis is described, whereas in the second section the correlation between driver age and driver experience is discussed. In the third section, drivers travel patterns are analysed and their dependency on driver age is illustrated also in relation to other variables. Finally, the main findings of this research are summarised in the fourth section of the paper.

2. Methodology

2.1 Data collection

Qualitative methods for studying travel behaviour include interviews, focus groups studies and participant-observer techniques (Clifton and Handy[27]). In this study the data extracted from a national CATI (Computer Assisted Telephone Interviewing) survey, which was conducted to determine the mobility of drivers in Greece, was employed. A Simple Random Sampling (SRS) technique was used to collect the necessary information. The only quota applied in the sampling process concerned the national coverage of all area types, including large metropolitan areas, urban areas and rural areas. The survey target population was all active drivers of passenger cars or two-wheelers, aged above 16 years (18 for passenger car drivers), however in the particular study only passenger car drivers are examined. Active drivers were defined as driving license holders who had driven in the past six months and on the previous day of the

interview. As a means for describing driver travel patterns the annual distance, expressed in driven kilometres, is used.

First, the respondent was asked whether he was an active driver, and if his answer was positive the survey continued. The questionnaire comprised three parts. In the first part, general questions on the respondents' characteristics were asked, such as gender, age, education level etc. Respondents were then asked of the number and type of vehicles they use; if they used more than one (e.g. a passenger car and a moped), the interviewer chose randomly one of the vehicles and proceeded with the interview on this vehicle. The following two parts of the questionnaire involved this particular vehicle. Questions on the second part of the questionnaire concerned vehicle characteristics such as vehicle age, engine capacity etc. Finally, the latter part of the questionnaire comprised questions on the length of trips (in terms of distance travelled) of the respondent. Participants were also asked of the time of day, day of week and the type of road network in which the trips were made. The survey was carried out during the period May-June 2004, a period which can be considered representative of the yearly patterns, as all kinds of trips (work-related, recreational, long distance etc.) can be observed.

2.2 Data analysis

The recorded survey sample included 2,500 active passenger car drivers and two-wheeler riders. The present study involves the travel patterns of passenger car drivers, the initial sample of which was 2,139 drivers. However a number of them had to be excluded from the sample as they had not provided all the information required for the analysis,

and the resulting final sample used in this research is 1,855 drivers (the number is smaller in the analysis of vehicle engine size).

From the respondents' answers the average annual distance driven was computed for the different age groups. Other variables were also investigated including driver experience and gender, and vehicle engine size. Further to that, the annual distance driven was also calculated in relation to the time of the trip (weekday/weekend and daytime/night-time) and the type of area or road (residential/non-residential and motorway/non-motorway) that the trip was conducted.

Descriptive statistical analysis was performed to provide a rough description of the travel patterns of the different driver age groups. Further to that, the influence of driver age on travelling behaviour was investigated. The chosen methodology mainly involved analysis of variance (ANOVA) for which the null hypothesis was that the investigated variable is influenced by driver age.

As noted in the previous section, the 2,139 drivers were randomly selected and are assumed to be representative of the Greek passenger car driver population. Further analysis using data provided by the national statistical service of Greece indicated that the sample was representative of the distribution of driver population in Greece. This resulted in a significant inequality in sample sizes – namely the sample consisted of 129 young drivers, 1,553 adult and 173 elderly drivers. Unequal variances of the different distance categories were also observed, and in some cases greater variances resulted from larger sample sizes which highlighted the possibility of heteroscedasticity in the sample. An F-statistic test between the minimum and maximum observed variances was conducted and results in most cases confirmed the assumption of unequal variances. Hence, for these

cases the standard ANOVA test is no longer suitable as its assumptions are violated. An adjusted analysis of variance to investigate the influence of driver age and/or any other investigated variable on driver mobility was adopted using the Welch[28] test, which is appropriate for data of unequal sample sizes and variances for cases where heteroscedasticity is observed.

In the case where influence of driver age on travel patterns was observed, appropriate post-hoc tests (in relation to whether the sample presented heteroscedasticity) were conducted to identify the specific interactions between the different examined categories. The chosen post-hoc tests were the Tukey test when the ANOVA assumptions were not violated and in the all other cases the Games-Howell[29] test was used which is suitable for data with unequal sample sizes and variances.

The analysis focused on the examination of the combined effect of pairs of variables (i.e. driver age and another factor) on mobility. It is worth mentioning, though, that higher order effects (i.e. combination of three factors and more) were also investigated, but none of them was found to be significant. More precisely, an attempt to model travel behaviour was made applying general linear modelling techniques and using a number of the available variables from the survey data. Non significant estimates of all higher order effects, together with low values of model fit (R^2) in all alternative model designs, indicated that although the factors examined did have an effect on distance driven by age group, their combined consideration did not reveal additional effect.

3. Driver age and driver experience

In this section, the correlation between driver age and driver experience is investigated. First, the hypothesis that these two parameters are related is tested. Figure 1 illustrates the respondents' characteristics in relation to driver age and experience.

******* Please insert Figure 1 here*******

Figure 1. Driver experience and driver age

The plot of the X-Y pairs indicates correlation between the two parameters, as was expected. Usually, a young driver is also a novice and an older one is experienced, hence the relationship demonstrates a linear shape which is also confirmed by the data. Possible linear correlation between driver age and experience was tested using the bivariate Pearson mean product correlation (which can be used for continuous interval data). Despite the contradicting cases that can be observed (Figure 1), driver age and experience are highly correlated (at 95% confidence level) with a correlation coefficient equal to 0.852.

However, there are cases which demonstrate the opposite. A number of older drivers (>60 years old) who have a few years of experience is observed. This however does not denote that these drivers should be classified as novice drivers. The question imposed at the survey participants was "when was your driving licence issued?" rather than "how many years have you been driving?". Greek legislation requires drivers over 65 years old to renew their driving licence by sitting the driving licence exams. Hence, it is presumed that most – if not all – of the older drivers above 60 years of age with only a few years of driving experience had had their licence renewed and answered the issue date of their renewed licence rather than that of their initial one. This assumption is

confirmed by further analysis of the data as most of these drivers own a vehicle for more years than the experience that was derived from their answers.

Nevertheless, although one would expect novice drivers to be less than 30 years old, there is still a number of older drivers that are novice, and do not fall within the above described category. These are drivers who obtained their driving licence at a later age than the usual one. Further analysis of the data illustrates the age at which drivers obtained their driving licence also in relation to driver gender, and the results are illustrated in Figure 2.

******* Please insert Figure 2 here*******

Figure 2. Distribution of the age for obtaining a driving licence

A tendency is observed showing females obtaining their driving licence at a greater age than males. The gender distribution of drivers obtaining their driver licence at the age of 18 is 69% (169) men and 31% (77) women. At the age of 28, the distribution is completely different with 31% (28) being men and 69% (44) women. Generally, female drivers comprise 40% of the sample population; however, they comprise 45% of drivers obtaining their driving licence between 30 and 50 years old.

4. Driver mobility

4.1 Driver mobility and driver characteristics

First, driver mobility is estimated in relation to driver age. The possibility of dependency between driver age (as a continuous variable) and driver mobility was initially tested (using ANOVA), however no relationship was identified at a 95% level of significance. Driver age was then classified into three groups – namely young, adult and

elderly drivers. Young drivers were defined to be between 18 and 24 years old, adult between 25 and 64 and elderly over 64 years old. The mobility of the three different driver groups is presented in Table 1.

Table 1. Annual distance driven (km) by driver age group

	18-24	25-64	65+
Sample	129	1,553	173
Mean	13,718	15,196	11,366
Std. error	1,427	588	1,021
Welch-Test	df1/2	F	p(F)
Between Groups	2/281.532	4.605	0.011

Elderly drivers demonstrate the lowest mobility than the two other age groups, being followed by young drivers. The Welch test results reveal association between driver age and driver mobility. However, the F-statistic is not very high indicating a not so strong influence of driver age on driver mobility.

The same analysis was performed to investigate the relationship between driver experience and mileage driven. The possibility of a relationship between driver experience (as a continuous variable) and driven distance was tested, using the Pearson mean product correlation, but no correlation was found. Driving experience was then classified into five experience groups – namely less than 1 year, 1-2, 3-5, 6-10, and over 10 years of experience. Novice drivers are considered to have less than 6 years of experience, and drivers into this group are sub-divided into three sub-groups. Experienced drivers are considered those whose experience exceeds 10 years whereas the

group with 6-10 years of experience comprises an intermediate group. Annual driven distance was also examined in relation to driving experience (as a categorical variable) and the results are illustrated in Table 2.

Table 2. Annual distance driven (km) by driver experience group

	< 1	2-3	4-6	6-10	> 10
Sample	13	90	173	289	1290
Mean	8,644	11,577	13,579	14,848	15,148
Std. error	2195	2233	1180	1356	632
Welch test	df1/2		F		p(F)
Between Groups	4/86.812		2.553		0.045

Annual distance driven increases with experience, however, the Welch test did reveal only a slight influence of driver experience on driver mobility, as both the computed F-statistic is rather low, and the probability value marginally lower than 0.05. This may result from the fact that the vast majority of elderly drivers – who drive generally less than the other two driver groups – is classified under the fifth driver experience category, hence under the same category which is comprised by a great number of drivers (belonging to the 2nd driver age group) who demonstrate high mobility. Thus, one can assume that for driver mobility driver age is a more important factor than driver experience.

Last, the mobility of the different driver groups was investigated in relation to driver gender, and the results are presented in Table 3.

Table 3. Annual distance driven (km) by driver age and gender

	18-24		25-64		65 +	
	Male	Female	Male	Female	Male	Female
Sample	77	52	885	668	158	15
Mean	15,631	10,886	19,301	9,759	11,620	8,690
Std. error	2,006	1,882	910	584	1,099	2,119
Welch test	df1/2		F		p(F)	
Between Groups (gender)	1/1,834.380		76.437		0.00	
Between Groups (age/gender)	5/114.999		16.534		0.00	

Male drivers travel more than female ones, as was anticipated, for all three age groups. The difference in mobility is significant for adult drivers, in which case male drivers drive about twice as much as female ones. Female mobility decreases with age, whereas male mobility increases with age (from young to older drivers) and decreases again for elderly drivers. The anticipated pattern would be the one observed for the male drivers, hence young drivers would drive less than older ones but more than elderly drivers. The most probable reason for the low adult female mobility is that in that age group older women are less independent than younger ones. Hence, in situations (which also increase with age) where their co-traveller is a man (colleague, partner etc) it is more likely that they will be a passenger rather than the driver.

Driver gender is a factor influencing driver mobility to a significant degree (F-statistic=76.437), as expected. Yet, as results indicate driver gender in combination with

driver age is still an influencing factor even though it is weaker than the gender itself. Further analysis of the specific interactions indicated that differences exist between adult male drivers and the rest of the driver groups excluding the young males category.

4.2 Driver mobility and vehicle characteristics

In this section driver mobility is investigated in relation to vehicle characteristics. The attribute that is used is the engine capacity of the vehicle. Statistical analysis (both descriptive and ANOVA) was performed and a variable combining driver age and vehicle engine size categories was introduced. The distribution of the annual distance for the different driver groups across the engine capacity categories along with the ANOVA results is presented in Table 4. In the examined case, the Welch test could not be performed because of small sample size in one of the investigated categories. However, because the ANOVA results provided high values of F-statistic and very low ones for probability p(F), they can be adopted having in mind that there can be a slight error in the values presented.

Table 4. Annual distance driven (km) by driver age and engine capacity

			18-24		
	-1200	1201 - 1400	1401 - 1600	1601 - 2000	2000 -
Sample	25	47	20	1	-
Mean	17,701	13,229	10,629	18,250	-
Std. error	3,974	2,520	2,112	-	-
			25-64		
Sample	273	631	438	174	45

Mean	10,258	13,385	16,064	22,466	34,662
Std. error	951	786	1,155	2,145	6,594
			65 +		
Sample	35	56	48	22	8
Mean	13,191	9,244	8,244	19,357	16,080
Std. error	3,219	1,057	1,460	3,983	3,102

ANOVA	df1	F	p(F)
Between groups (CC)	4	17.400	0.00
Between groups (age/CC)	13	6.682	0.00

Results identify the existence of specific trends for young and adult drivers. In particular, young drivers drive less with the increase of vehicle size, whereas older drivers drive more with the increase of vehicle size. No clear pattern could be identified for the elderly drivers, as driven distance oscillates between low and high engine size values. One would expect that increase in vehicle size would result in increase in mobility. The main reason behind that is that such vehicles can perform better and are more comfortable for driving more and longer distances. In addition, drivers who would choose such vehicles usually consider driving a thoroughly enjoyable experience and hence an aim on its own, and would drive more. This hypothesis is justified by the results that the adult driver category presents.

The results diverge from this hypothesis for the other two categories. A reasonable explanation for the young driver group is that the majority of young drivers in Greece do not own their own vehicle, and hence the vehicle that they use belongs to their

parents. The higher the vehicle size, the more expensive the vehicle (which might also be an indicator of the household financial situation), and hence ownership rates for young drivers decrease. Drivers generally use their vehicle in a different way when they do not own it, and might drive less. Furthermore, sharing a vehicle would normally result in less usage possibilities. Further analysis of the data, taking into account the year of obtaining the drivers' licence in relation to purchase year of the vehicle, indicated that at least 50% of the young drivers use vehicles that they do not own.

In general, the engine size of a vehicle does influence driver mobility. Furthermore, a set of classifications was made combining driver age and vehicle engine size categories. Their combination is also an influencing factor for driver mobility, as expected. In general, conduction of post-hoc tests (Games-Howell) revealed interactions between most of the engine size categories. No specific interactions were identified between "adjacent" vehicle categories. Post hoc analysis could not be performed for the combined variable age/engine size, as in some categories the sample was rather low.

4.3 Driver mobility and trip characteristics

4.3.1 Time of trip

In this section driver mobility is investigated in relation to the time (weekday/weekend and daytime/night-time) the trips take place. Table 5 shows annual distance driven during a weekday and at a day during the weekend, as well as the results of the Welch test.

Table 5. Annual distance driven (km) by driver age and day of week

Weekday	18-24	25-64	65 +

Sample	129	1,553	173
Mean	9,517	11,130	8,944
Std. error	1,173	507	921
Welch test	df1/2	F	p(F)
Between Groups	2/273.933	2.541	0.081
Weekend	18-24	25-64	65 +
Sample	129	1553	173
Mean	4,201	4,066	2,422
Std. error	541	204	305
Welch test	df1/2	F	p(F)
Between Groups	2/278.832	10.628	0.000

Driver mobility in relation to the day of the week illustrates certain differences in the trip patterns of the different age groups. In general, one can presume that the majority of travel during weekdays is related to work trips (or other non-leisure trips) whereas during the weekend to recreational trips. The distribution of the driven weekday distance driven across the different driver age groups is similar to that of the total driven distance. More specifically, highest mobility is demonstrated by adult drivers and lowest by elderly drivers. The mobility pattern during weekends is somewhat different. Young drivers drive more than the other two driver groups during the weekend, which can be exemplified by the fact that younger drivers would make more leisure trips than other drivers, and hence more trips during the weekend. Furthermore, the reduction of mobility during the weekends for elderly drivers is quite high once again representing a significant

reduction of leisure trips for this age group. Analysis of variance revealed influence of driver age on mobility during the weekend at a 95% significant level; further analysis on pair-wise comparisons (Games-Howell test) indicated that differences on the calculated annual distance means exist between the elderly drivers and the other two driver groups.

The second investigated attribute involved whether trips are made during daytime or night-time. Daytime was considered to be from half hour before sunrise until half hour after sunset. Subsequently, night-time was considered to be from half hour after sunset until half hour before sunrise. Daytime trips mainly consist of work related trips whereas night-time trips are mainly comprised by leisure trips (however work related trips are also included). The survey took place during May and June, hence night-time trips may have included a number of work-related trips, as well as leisure trips, because of the increased duration of daylight during this period. Annual driven distance in relation to the time of day is presented in Table 6.

Table 6. Annual distance driven (km) by driver age and time of day

Day	18-24	25-64	65 +
Sample	129	1553	173
Mean	10,154	12,933	10,230
Std. error	1,164	534	922
ANOVA	df	F	p(F)
Between Groups	2	2.378	0.093
Night	18-24	25-64	65 +
Sample	129	1553	173
Mean	3,566	2,262	1,136

Std. error	599	154	255

Welch test	df1/2	F	p(F)
Between Groups	2/256.586	10.494	0.000

Mobility during the night demonstrates a reduction for all three driver age group categories. Greater reduction is identified for elderly drivers and the smallest reduction for the young drivers. Furthermore, young drivers drive more than the other two age groups during the night, confirming the previous assumption that young drivers make more (and/or longer) leisure trips than the rest of the drivers. Driver age is an influencing factor of driving during the night at a 95% significance level, with the computed F-statistic being quite large for driving during the night. Further analysis of mobility during the night on pair-wise comparisons (Games-Howell) indicated interactions between elderly drivers and the other two driver groups.

To comprehend in greater detail the different mobility patterns for the three driver categories in relation to the time the trip is performed, the distribution of annual distance across all combined categories weekday/weeknight and daytime/night-time was computed, and is presented in Table 7.

Table 7. Annual distance driven (km) by driver age and day of week and time of day

	18-24			
	Weekday		Weekend	
	Day	Night	Day	Night
Sample	129	129	129	129
Mean	6,967	2,553	3,187	1,014
Std. error	955	568	483	148
	25-64			
Sample	1,553	1,553	1,553	1,553
Mean	9,673	1,456	3,260	806

Std. error	473	130	174	67
		65 +		
Sample	173	173	173	173
Mean	8,200	744	2,030	392
Std. error	847	204	253	124

The three driver groups present the same mobility pattern. In particular, highest mobility is observed during daytime on weekdays, followed by daytime at weekends, night-time on weekdays and the lowest mobility is observed at night-time during the weekends. Differences are however identified in the relative mobility patterns. Young drivers drive 34% of a weekday distance during the night, whereas the corresponding weekend distance decreases to 32%. On the other hand, adult and elderly drivers drive less during the night on weekdays than at weekends. The corresponding percentages are 15% and 25% for adult drivers, and 9% and 19% for elderly drivers. Hence, young drivers drive at night relatively more on weekdays than during the weekend indicating that a significant proportion of night-leisure trips also take place during the week. On the other hand, older (adult and elderly) drivers make the majority of night-leisure trips during the weekend. Furthermore, in terms of absolute values, young drivers drive less than the other groups during the day on weekdays but more (with one exception) during night-time on weekdays and during the weekends. Once again, this is exemplified by the specific habits of young people. Dependencies were identified for all examined categories with the ones for driving at night on weekdays and during the weekends being the most significant ones. This confirms the association between driver age and trip purpose. Furthermore, the Games-Howell test revealed different pair-wise interactions between the driver categories, which did not reveal a specific trend.

4.3.2 Road type of trip

Next the type of areas in which drivers drive is investigated. Table 8 illustrates annual distance driven in and out of residential areas for the three driver age groups.

Table 8. Annual distance driven (km) by driver age and type of area

Residential	18-24	25-64	65 +
Sample	129	1553	173
Mean	7,005	7,073	5,769
Std. error	739	224	554
ANOVA	df	F	p(F)
Between Groups	2	1.767	0.171
Non-Residential	18-24	25-64	65 +
Sample	129	1553	173
Mean	6,713	8,124	5,597
Std. error	1,046	517	814
ANOVA	df	F	p(F)
Between Groups	2	1.567	0.209

Mobility is distributed more or less equally between residential and non-residential areas, and no significant differences can be identified. Furthermore, distance driven is also equally distributed across the different driver age categories. In general, adult drivers drive somewhat more in non-residential areas, whereas the other two types of drivers drive more in residential areas. Moreover, analysis of variance did not reveal any relationship between driver age and mobility in residential and non-residential area.

The driving habits of the investigated driver groups in relation to the type of road – namely motorway or non-motorway were also examined. Parameters that could influence the choice of road type could be the purpose of the trip, as an important number of leisure trips take place on motorways (during the weekend), and road safety issues, as higher speeds are adopted on motorways compared to other roadway environments. The distribution of the annual distance driven in relation to the type of road is presented in Table 9.

Table 9. Annual distance driven (km) by driver age and type of road

Motorway	18-24	25-64	65 +
Sample	129	1553	173
Mean	4,230	4,580	3,477
Std. error	826	356	551
Welch test	df1/2	F	p(F)
Between Groups	2/284.205	1.409	0.246
Non-Motorway	18-24	25-64	65 +
Sample	129	1553	173
Mean	9,488	10,616	7,889
Std. error	911	389	775
Welch test	df1/2	F	p(F)
Between Groups	2/267.666	5.110	0.007

The mobility distribution in relation to the two investigated types of roads does not present significant differences between age groups. In general, the distance driven on motorways is reduced, around 0.44 times in relation to distance driven on other types of roads, for all driver categories. Statistical analysis showed no significant differences for driving on motorways between the three driver age groups, however influence of driver age was observed on driving on the rest of the road categories. The Games-Howell test indicated interactions between the adult and elderly driver categories.

Further analysis was conducted to segregate the distance driven on motorways and non-motorways into weekday and weekend distance. Results indicated two different trends for the proportion of motorway distance in relation to the non-motorway one. The first is a slightly descending trend in relation to driver age for distance driven on weekdays – the corresponding percentages being 38%, 35% and 34% for young, adult and elderly drivers. The second one, observed during the weekends is the exact opposite, hence a rising trend with the corresponding percentages being 61%, 70% and 93% respectively for the three driver age groups. This means that as age increases drivers drive relatively less on motorways on weekdays and relatively more during the weekend. Factors that might influence driver mobility on motorways also involve the characteristics of the road environment such as road lighting, geometry (number of lanes, existence of road infrastructure-hardware dividing the two directions etc), vehicle speeds, and other issues related to road safety. One would anticipate that novice and elderly drivers would drive less on highways as they are not perceived as safe.

5. Conclusions

Within this research travel patterns of passenger car drivers of three distinct age groups are investigated through analysis of variance (ANOVA) mainly by the use of the Welch-test. Driver age and driver experience, two important parameters affecting drivers travel patterns, were found highly correlated. as expected and the analysis of variance indicated that driver age influences driver mobility at a higher degree than driver experience.

According to the findings of this research, adults drive more during a year than young and elderly drivers, and young drivers drive more than elderly drivers. Gender also comprises a significant parameter of driver mobility, with male drivers driving considerably more than female ones. An irregularity was observed at the distribution of the driven distance across driver age groups for the female population. Female mobility decreases with age, hence the adult female drivers drive less than the young female ones, which can be attributed to the fact that adult females may more often be passengers than drivers, in contrast to younger females.

Driver travel patterns were also investigated in relation to vehicle engine size. Two different patterns were identified. The first, which would be the “normal” pattern was observed for the adult driver category, in which increase in the vehicle engine size results in increase in distance driven. For the young driver category, the opposite pattern was found – namely, distance decreases with the increase of vehicle engine size. The difference in these two travel patterns could be explained by the different ownership patterns between these two age groups, i.e. younger drivers seldom own a large vehicle, but may occasionally have access to one. No clear pattern could be identified for elderly drivers.

Next, mobility in different times (day of week and time of day), areas and road types was investigated in relation to driver age. Driver age is a significant factor for driver mobility during the weekends and night-time driving, whereas it is not for the mobility during weekdays and at daytime. This type of travel segregation mainly arises from the different existing trip purposes. In particular, work related trips are mainly conducted at daytime on weekdays, whereas leisure trips are mainly observed at night-time on weekdays and during the weekend. A reduction in driving during the non-work related periods is observed for adult and elderly drivers, whereas an increase is observed for young drivers corresponding to their life patterns.

Driver age is not a relevant parameter for travel behaviour in relation to different types of areas and road networks. The distribution of driven distance on residential and non-residential areas and on motorway networks seems to be similar for all age groups, however a pattern was identified for driving on motorways during the weekend, showing that the proportion of driving on motorways on weekdays decreases with age whereas it increases with age during the weekends.

Driver travel patterns – as expressed by average annual distance driven – comprise a field on which not much research has been conducted, although they form a basic element for the development of road safety and transport policy strategies. This study attempts to provide insight on the influence of driver age on driver mobility, indicating the similarities and differences of travel behaviour between young, adult and elderly drivers, also in relation to other user, vehicle and road features. The identified distinction of driver mobility should be taken into account by practitioners and policy makers when designing road user related strategies.

Last, the findings of this study could be a starting point for further research on driver mobility and the specification of the related determinants. More specifically, surveys should also be conducted in different months (to check possible differences under adverse weather and different work-hour patterns), more transport modes (e.g. motorcycles, bicycles) should be examined, further disaggregations should be sought (e.g. urban areas can be further analyzed as residential or commercial etc) and more variables could be considered (e.g. income, education, trip purpose etc) as additional socio-economic variables that may have an impact to drivers' travel behaviour could allow for identification of other combined effects. The development of an appropriate model, quantifying all the effect and their interactions would be interesting within this framework.

6. References

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