Gendered mobility in Malta: Influencing factors on travel choices

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ABSTRACT

Malta is one of the smallest member states, but has also one of the highest rates of motorization, in Europe. In 2010, the number of private vehicles per thousand population stood at 555. Seventy-one percent of all trips were carried out by car and only a small percentage of trips (22.6%) were carried out by other means (mainly bus and on foot). Malta's economic development has progressed steadily since joining the European Union in 2004, and the islands have managed to avoid the impact of the global financial crisis, mostly due to island insularity. Heavy car dependence is a cause for concern as it is increasing congestion and pollution, and putting significant strain on infrastructure in an island with limited land and space resources. Gender differences in transport and mobility patterns are high. The 2010 Household Travel Survey reported that, whilst 60 per cent of frequent bus users were female, 61 per cent of non-bus-users were male. This gender disparity is also reflected in the population of licensed drivers and the car ownership patterns. The research aims to (i) study the mobility patterns of men and women in the islands and identify the changes that occurred over the 12-year period between 1998 and 2010, (ii) examine the relationships between transport patterns and selected socio-economic characteristics of females and men such as age, status and employment, and (iii) discuss the policy implications for future transport policy. This research uses the data of the 1998 and 2010 Household Travel Surveys to study the mobility patterns of men and women in the islands. In answering the research questions, descriptive statistics, correlations, co-variance and regression will be used. The research will provide a first ever review of gender based transport patterns in Malta and will highlight some of the more pressing concerns supporting future mobility. The study will conclude with a discussion on the policy implications for future transport as well as some interesting avenues for further research.

KEYWORDS: Gender; Mobility; Malta.

1. INTRODUCTION

Aspects of society and lifestyles are responsible for the demands placed on our transport systems (*1*). Therefore understanding such aspects and studying their impact might provide useful insights into sustainable future transport policies. One aspect that has gathered interest over the past decades has been the patterns of mobility of men and women within the context of different societies and lifestyle choices. Early studies identified gender differences in travel behaviour (*2, 3*) and female transport disadvantage (*4, 5*), whilst later studies provided insights into various societal patterns (*6*). In the summary to the 4th International Conference on Women's Issues in Transportation, Hanson et al. (2009) identify the need for more research into the historical evolution of gender and transport relationships (*7*), whilst Murakami et al. (2009) identify the need to study mobility in relation to gender and socio-demographic variables and the implication of such on policy (*8*).

Malta joined the European Union in 2004 and has experienced a steady economic growth, managing to a certain extent avoid the impact of the global financial crisis, mostly due to island insularity (*9*). The islands have a total area of 318 km^2 and are home to a population of just over 400,000 people and over a million tourists visiting every year, making them some of the most densely populated areas in the world. Malta's public transport system is based on buses, taxis and ferry services. Rail and tram services provided by the British stopped operating in the 1930s, due to the flexibility and service offered by the bus. In 2010 however the rate of motorization stood at 555 passenger cars per 1,000 inhabitants, a relatively high rate when compared to the EU27 2009 estimated average of 473 (*10-12*). The high car ownership reflects a very car dependent society where 71 per cent of all trips are carried out by car and only a small percentage of trips (22.6%) are carried out by other means (including bus and on foot) (*13*). This car dependence however is not gender equal. The 2010 National Household Travel Survey reported that, whilst 60 per cent of frequent bus users were women, 61 per

cent of non-bus users were male (*13*). This is mirrored in the statistics for driving licences where 78 per cent of males are licensed drivers but only 49 per cent of females are licensed drivers (*14*), and most probably in the actual car ownership even though this is harder to quantify from official statistics.

This paper reports on the findings from two National Household Travel Surveys carried out in the islands in 1998 and 2010. The research aims to (i) study the mobility patterns of men and women in the islands and identify the changes that occurred over the 12-year period, (ii) examine the relationships between transport patterns and selected socio-economic characteristics of females and men such as age, status and employment, and (iii) discuss the policy implications for future transport policy. As such, Section 2 will review the relevant academic literature. Section 3 will present the case study and discuss the methodology adopted for the research. Section 4 will present the results of three research questions which were formulated to analyse the household travel survey data, and Section 5 will conclude the paper with some suggestions for further research in this area, necessary to assist in policy making.

2. LITERATURE REVIEW

Sustainable futures have been associated with shifts towards less energy and carbon intensive transport modes and often towards less, rather than more mobility (*15-17*). However literature has pointed towards the need for a better understanding of mobility patterns today and in the past, in order to manage transport demand in the future (*18, 19*). This is particularly true for the need to understand mobility patterns taking into consideration variables such as gender, age, family composition and employment. Frändberg and Vilhelmson (2011) analyse gender and age as determinants of mobility in Sweden (*18*) and even earlier, Uteng and Cresswell (2008) identify gender differences in activities and travel behaviour (*20*).

More recent studies have also highlighted the role of the women within society, with particular reference to family and employment as having an impact on travel behaviour (*21, 22*). Whilst others looked in detail at aspects of gendered travel mode, given specific socio-cultural conditions in the households (*23*).

Although many studies concurred in the 'disadvantage' associated with female mobility (*24*, *25, 4*) and find support in various studies linking differences to, for example, intention of owning and using a car (*26, 27*), the presence of children in the family (*28*), employment and commuting patterns (*29*), there is also evidence of convergence in some societies between genders (*30-34*). Scheiner and Holz-Rau (2012) are cautious in their assessment of gender differences and also find some evidence in their study of convergence (*23*). However it is also noted that in the case of car-deficient households, the effect of preference and agreement between partners on who uses the car might be an influencing factor which cannot be extracted from travel data. This might have significant impact on the view of inequality between genders, as portrayed by some (*35, 5*).

Aspects related to society and lifestyles have also been considered in the literature as affecting transport choices. The changes to the population are a major contributor; however, increased changes in women's participation in the workforce have been documented as a major determinant. Best and Lanzendorf (2005) note a 23 per cent increase in female employment in Germany between 1975 and 2002 (*22*), whilst in the UK Biggart and O'Brien (2010) report an increase of female employment from 56.4 per cent in 1971 to 69 per cent in 2008 (*36*). This and other factors as highlighted by Lyons et al. (2002), to include amongst others the birth rate, male and female life expectancy, household size and status (married, divorced or single), all contribute directly or indirectly to the future demands for transport (*1*). It is therefore relevant and particularly important for this study to capture that development and project such indicators in the future to direct policy accordingly.

3. CONTEXT AND METHODOLOGY

Malta experienced a dramatic modal shift over a relatively short period of time. Figure 1 shows the changes in modal share between 1989, 1998 and 2010, with the largest shift occurring from bus to car during the 1990s and from walking to more car driving during the first decade of this century. This, similar to trends experienced in many other European countries, counters any efforts by the Government to move towards sustainable mobility and its implications on quality of life and overall sustainable development, an important objective for the European Union.

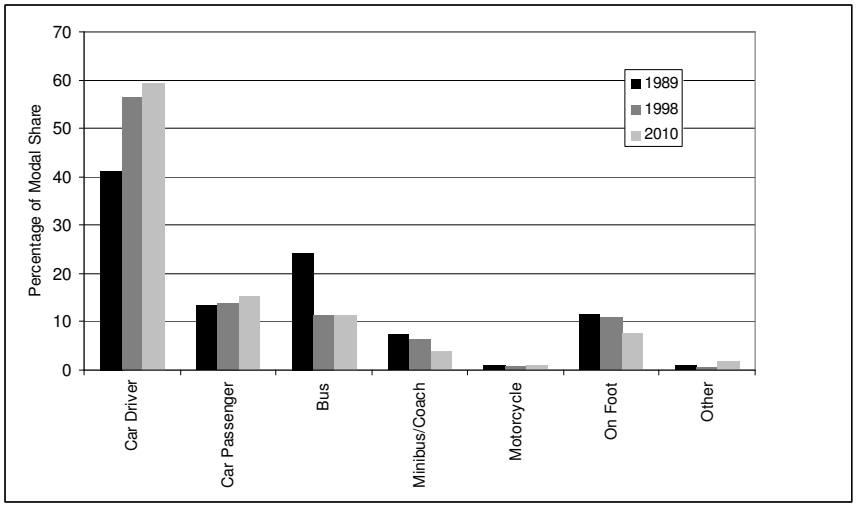

FIGURE 1. The modal share in Malta for 1989, 1998 and 2010 (*13*).

Malta's high car ownership and car dependence stem from a number of factors. Over the past two decades, households have seen an increase in the amount of disposable income, a decline in the number of children and therefore smaller households, a higher rate of female participation in employment (even though still lower than the EU average), declining quality of service in public transport infrastructures coupled with an increase in the status symbol associated with driving a car (as opposed to riding a bus) (*37-39*). Table 1 presents an overview of key indicators between 2000 and 2010.

TABLE 1. Malta socio-demographic and economic indicators 2000-2010 (*40, 41)*

Description of Indicator	2000	2010
Total land area (incl. Gozo and Comino)	316 km^2	316 km^2
Percentage of built-up land	23.6%	26.5%
Population	391,415	417,617
Population density per km^2 of built up area	5,275	4,983
Female participation in employment	27%	32%
Crude Birth Rate	11.4	9.6
Average Household Size	2.9 (2005)	2.9
Number of occupied households	119,479 (1995)	139,178 (2005)
Household Disposable Income	€16,549 (2005)	€25,968
Ratio of female to male licensed drivers	1 : 1.8 (2001)	1 : 1.6
Licensed vehicles on the road	246,825	304,705
Percentage private vehicles	75%	76%
Private passenger vehicles per 1,000 inhabitants	473	555
Estimated annual vehicle km for private vehicles	9,000 km	9,840 km
Share of car as percentage of all trips	70%	71%
Public transport modes	bus, ferry, taxi	bus, ferry, taxi
Public transport patronage in million passengers	31.2	32

The data in Table 1 reflects aspects of Maltese society and lifestyles. It is evident that over the 10-year period a number of significant changes occurred, which in turn have affected the transport system in the islands. The increase in Household Disposable Income, women's participation in the labour force and the declining birth rate are probably significant. However the increase in the number of vehicles and the increase in the dependence on the car are also worth pointing out. Despite some indicators showing a decline, such as the crude birth rate, the average household size remained unchanged between 2005 and 2010. The slight increase in public transport patronage is due to tourist increases over the years and the booming cruise liner sector,

with thousands of patrons visiting the islands and touring the islands in a day by bus. These key indicators set the scene for the analysis which this study aims to highlight.

This research is relevant for a number of reasons. Primarily, it is the first such study for the islands of Malta. This research will shed light on the development of travel mobility patterns in a fast developing state in the European Union. Second, it is significant for the policy development in transport and land use development in Malta. The future demographic projections in Malta point towards an increased elderly population with a greater percentage of female elderly citizens (54% of people over the age of 60 in 2025 and 53% in 2060) (*42*), and this study will highlight aspects of gendered mobility, critical for the success of future transport policy and systems. Thirdly, the rapid rise in car dependence experienced in Malta is occurring in other island states across the world and also in similarly sized cities in Europe and beyond. The use of islands as small scale spatial laboratories for more complex politics of larger countries has been highlighted by Enoch and Warren (2008) and earlier King (1993), who used islands as case studies for policies and development studies (*43, 44*).

The data used in this research comes from national household travel surveys conducted by the Malta Environment and Planning Authority and Transport Malta, the government's regulatory authorities for environment and land use planning and transport. National household travel surveys in Malta have been carried out in 1989, 1998 and 2010. This study uses the data from the 1998 and 2010 surveys to compare the last two decades when increased private motorization and car dependence occurred. In both surveys, one day travel diaries were solicited by post from a number of households to collect data on trips carried out on a typical week day. In 1998 the survey was conducted to reflect the travel patterns of Tuesday the 25th of November and in 2010 the survey day was Wednesday the 26th of May. There was a good response rate in both surveys with 7,855 households responding to the survey in 1998 (approximately 6.25% of occupied dwellings) and 6,666 responses received in 2010 (approximately 4.8% of occupied dwellings). In 1998, a total of 21,000 individual travel diaries were collected recording 51,329 trips, whilst in 2010 a total of 16,952 individual travel diaries were collected translating into 41,771 trips (*13, 45*).

Information on trips made on the survey day was collected from all household members aged 11 and over in the form of trip diaries. The diaries included place and time of departure and arrival, mode of transport used and purpose. A questionnaire complemented the trip diaries and included questions about personal and household characteristics, including household size, car ownership, public transport use and the socio-demographic attributes of the residents and place of work or education.

In 1998 the sample of households was apportioned directly at local council level. For the 2010 sample, the local council electoral register was used for the selection and was proportioned to a statistically representative number of households at a district level. The data was ultimately compiled into a MS Access Database and made available for this study by Transport Malta and the Malta Environment and Planning Authority's Transport Planning Unit.

In order to fulfill the objectives of this research a number of questions were posed and a series of tests were run on the 1998 and 2010 Household Travel Survey data. Travel patterns were determined through assessing modal choice, trip purpose and travel times. A number of variables were defined as affecting travel behaviour and used in the analysis of this research. These included gender, age, marital status and employment. A justification for the choice of variables is given in Section 3 below. More specifically, the study sought to answer the following three research questions (RQs) empirically:

RQ1: What mode of transport (car[115], bus, on foot[116]) would travelers use given their gender, age, marital status, employment status and purpose of trip? Does this pattern change over time?

RQ2: Do significant gender differences exist in the proportions of travelers travelling (i) by car, (ii) by bus, and (iii) on foot in 1998 and 2010? If so, do the gender proportions across the three modes of transport change significantly over time?

RQ3: Does travel time vary as a function of gender during (i) shopping trips, (ii) working trips, and (iii) leisure trips, even after statistically controlling for any effects of age, employment and marital status?

[115] Car here refers to private passenger car which includes small truck, pick-ups and SUV's if registered for private use.

[116] These three modes are the main modes of transport in the island with ferry and cycling having recorded insignficant levels in the overall modal choice.

To answer RQ1, we used multinomial logistic regression. This statistical technique makes it possible to determine which of the following five independent variables – gender (male/female), marital status (married/other), age (11-17, 18-40, 41-60, 61+), employment status (yes/no), and purpose of trip (shop, work, leisure) – could predict three modes of transport (car, bus, on foot). For RQ2, we used cross-tabulations and z-tests to determine how the proportions of those travelling by car, by bus, and on foot varied by gender (male, female) and across time (1998, 2010). In investigating RQ3, we employed analyses of variance (ANOVAs) to determine whether travel time varied as a function of gender during (i) shopping, (ii) working and (iii) leisure related trips. In the presence of a significant F statistic in ANOVA, we used hierarchical regression analysis to determine whether the gender difference was still statistically significant after controlling for any effects of age, employment and marital status. In the presence of a non-significant F statistic in ANOVA, we used stepwise regression analysis to determine whether age, employment and marital status emerged as significant predictors of travel time. It is worth noting that since the 2010 Household Travel Survey did not contain information on the marital status of the respondents, marital status was included as a variable only with the 1998 Household Travel Survey data.

4. RESULTS

The data sets for Household Travel Surveys of 1998 and 2010 were analysed and this section outlines the main results and comparisons.

RQ1: What mode of transport (bus, car, on foot) would travelers use, given their gender age, marital status, employment status, and purpose of trip? Does this pattern change over time?

The National Household Travel Survey data set of 1998 was restricted to trips related to shopping, work and leisure. This resulted in 15,915 trips of which 66.1 per cent were work related, 23.6 per cent were for shopping and 10.3 per cent were for leisure. The most popular mode of transport was the car (79.9%), followed by the bus (10.2%) and walking (9.9%). The majority of the travelers were male (64.2%), aged 18-40 (49.4%), employed (75.8%) and married (68.0%). After specifying 'car' as the reference category in multinomial logistic regression, the following information was obtained:

- Walking versus using a car was significantly predicted by gender, age, marital status, employment status, and purpose of trip. In fact, travelers who were female, relatively older, not married, not employed and whose purpose of trip was to shop or to work rather than for leisure, were more likely to prefer walking than to use a car. The corollary holds that those who preferred to use a car rather than to walk were more likely to be male, relatively younger, married, employed and who travelled for leisure rather than for work or for shopping.
- Catching a bus versus using a car was significantly predicted by gender, age, marital status, employment status, and purpose of trip. In fact, travelers who were female, relatively older, not married, not employed, and whose purpose of trip was for shopping or for work rather than for leisure, were more likely to prefer using a bus to a car. The corollary holds that those who preferred using a car to a bus were more likely to be male, employed, married, and who travelled for leisure rather than for shopping or for work.

The same analysis was conducted using the National Household Travel Survey of 26th May 2010. In this data set, marital status was not available, and so we used four factors (gender, age, employment status, purpose of trip) in an attempt to predict the mode of transport used (car, bus, on foot). After restricting the data set to trips related to work, shopping and leisure, we ended up with 12,201 trips of which 66.9 per cent were work related, 23.0 per cent were for shopping and 15.1 per cent were for leisure. The most popular mode of transport was the car (85.6%), followed by the bus (8.2%) and walking (6.2%). The majority of the travelers were male (55.0%), aged 18-40 (41.3%), and employed (74.7%). Apart from the omission of marital status, the conclusions drawn from the 2010 data set were exactly the same as those reported for 1998. Summaries of multinomial regression output for the 1998 and the 2010 Household Travel Surveys are presented in Tables 2 and 3 respectively.

The increase in both car use and percentage of employed with the sample tallies with the national statistics of increased motorization and female participation in employment. The results from RQ1 show no significant difference in the patterns of use of particular modes of transport over time, taking into consideration socio-demographic variables. This might indicate a threshold for future mobility patterns.

TABLE 2. Multinomial Regression Parameter Estimates (1998)

Mode[a]		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
Bus	Intercept	-5.018	.168	889.900	1	.000			
	Age	.424	.041	105.973	1	.000	1.529	1.410	1.657
	[gender = female]	.939	.060	245.158	1	.000	2.556	2.273	2.875
	[gender = male]	0[b]	.	.	0	.	.	.	.
	[marital_status = not married]	.941	.061	234.849	1	.000	2.562	2.272	2.890
	[marital_status = married]	0[b]	.	.	0	.	.	.	.
	[employment_status = not employed]	.800	.078	105.888	1	.000	2.225	1.911	2.591
	[employment_status = employed]	0[b]	.	.	0	.	.	.	.
	[purpose = work]	.885	.118	56.621	1	.000	2.422	1.924	3.050
	[purpose = shop]	1.114	.115	93.731	1	.000	3.047	2.432	3.818
	[purpose = leisure]	0[b]	.	.	0	.	.	.	.
On foot	Intercept	-3.885	.150	670.652	1	.000			
	Age	.343	.040	72.352	1	.000	1.410	1.302	1.526
	[gender = female]	.931	.063	220.420	1	.000	2.536	2.243	2.868
	[gender = male]	0[b]	.	.	0	.	.	.	.
	[marital_status = not married]	.451	.065	48.082	1	.000	1.570	1.382	1.783
	[marital_status = married]	0[b]	.	.	0	.	.	.	.
	[employment_status = not employed]	.948	.077	153.081	1	.000	2.581	2.221	2.999
	[employment_status = employed]	0[b]	.	.	0	.	.	.	.
	[purpose = work]	-.236	.097	5.942	1	.015	.790	.654	.955
	[purpose = shop]	.421	.089	22.302	1	.000	1.524	1.279	1.815
	[purpose = leisure]	0[b]	.	.	0	.	.	.	.

a. The reference category is: car; b. This parameter is set to zero because it is redundant

Model χ^2 (12) = 2210.33, $p < 0.001$, $R^2 = 0.18$ (Nagelkerke).

TABLE 3. Multinomial Regression Parameter Estimates (2010)

mode[a]		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
Bus	Intercept	-6.490	.302	460.714	1	.000			
	Age	.126	.049	6.780	1	.009	1.135	1.032	1.248
	[gender = female]	.869	.075	134.305	1	.000	2.385	2.059	2.762
	[gender = male]	0[b]	.	.	0	.	.	.	.
	[employment_status = not employed]	1.287	.103	156.825	1	.000	3.622	2.961	4.431
	[employment_status = employed]	0[b]	.	.	0	.	.	.	.
	[purpose = work]	3.085	.272	128.424	1	.000	21.878	12.831	37.305
	[purpose = shop]	3.171	.266	142.081	1	.000	23.828	14.147	40.136
	[purpose = leisure]	0[b]	.	.	0	.	.	.	.

TABLE 3 (continued). Multinomial Regression Parameter Estimates (2010)

mode[a]		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
On foot	Intercept	-4.957	.209	565.147	1	.000			
	Age	.227	.056	16.671	1	.000	1.254	1.125	1.399
	[gender = female]	.919	.088	108.130	1	.000	2.507	2.108	2.981
	[gender = male]	0[b]	.	.	0	.	.	.	.
	[employment_status = not employed]	1.185	.113	110.556	1	.000	3.270	2.622	4.078
	[employment_status = employed]	0[b]	.	.	0	.	.	.	.
	[purpose = work]	.702	.144	23.746	1	.000	2.019	1.522	2.678
	[purpose = shop]	1.123	.127	77.779	1	.000	3.074	2.395	3.945
	[purpose = leisure]	0[b]	.	.	0	.	.	.	.

a. The reference category is: car; b. This parameter is set to zero because it is redundant.

Model χ^2 (10) = 1457.77, $p < 0.001$, $R^2 = 0.18$ (Nagelkerke).

RQ2: Do significant gender differences exist in the proportions of travelers travelling (i) by car, (ii) by bus, and (iii) on foot in 1998 and 2010? If so, do the gender proportions across the three modes of transport change significantly over time?

The question sought to determine how the proportion of those travelling by car, by bus, and on foot varied by gender (male, female) and across time (1998, 2010). A series of cross tabulations and z-tests for two population proportions revealed that:

- a significantly higher proportion of men than women use the car to travel, while a significantly higher proportion of women travel by bus or on foot, with the same pattern emerging in both 1998 and 2010.
- a significantly higher proportion of men and women are using the car in 2010 when compared to 1998, while a significantly lower proportion of men and women are travelling by bus or on foot in 2010 when compared to 1998.

A detailed summary of statistical output is presented in Table 4.

TABLE 4. Comparing population proportions (Summary of Cross tabulation and z-test output)

	Mode of transport								
	Car			Bus			On foot		
Gender	*1998*	*2010*	*z*	*1998*	*2010*	*z*	*1998*	*2010*	*z*
Women	65.4%	78.6%	-15.46*	17.0%	12.0%	7.63*	17.5%	9.5%	12.44*
Men	88.0%	91.4%	-6.99*	6.3%	5.2%	3.15*	5.7%	3.4%	6.64*
Women Men	65.4% 88.0%		-20.08*		17.0% 6.3%	21.44*	17.5% 5.7%		23.20*
Women Men		78.6% 91.4%	-34.09*	12.0% 5.2%		13.57*		9.5% 3.4%	13.80*

* Statistically significant at $p < 0.001$

These results might not suggest convergence between the sexes; however, the increase in use of the car by females might indicate a greater number of female drivers in the future as socio-economic characteristics within the population change (for example, participation in paid employment).

RQ3: Does travel time vary as a function of gender during (i) shopping trips, (ii) working trips, and (iii) leisure trips, even after statistically controlling for any effects of age, employment and marital status?

The analysis carried out for the 1998 dataset revealed the following results.

Leisure. The average time for a leisure related trip was 17.72 minutes (SD = 8.43). Females (M = 18.62, SD = 8.95) travelled longer (on average) during leisure trips than males (M = 17.16, SD = 8.78) and ANOVA revealed that the difference in travel time was statistically significant ($F_{1, 1516} = 9.88$, $p = 0.002$). When age, marital and employment status were entered in the first step of hierarchical logistic regression, only age provided a significant effect on travel time (B = -0.61, SE (B) = 0.29, t = 2. 06, p = 0.039). When gender (B = -1.61, SE (B) = 0.48, t = -3. 36, p = 0.001) was entered in the second step, it provided a significant improvement to the previous model ($F_{4, 1512} = 4.02$, $p < 0.003$). Hence, travelers tend to travel longer in leisure related trips if they are female and relatively older.

Shopping. The average time for a shopping related trip was 18.25 minutes (SD = 10.21), while males (M = 18.26, SD = 9.89) and females (M = 18.24, SD = 10.40) did not differ significantly from each other ($F_{1, 3380} = 0.003$, $p = 0.955$). When gender, age, marital and employment status were entered as predictors of travel time in stepwise multiple regression ($F_{2, 3375} = 10.21$, $p < 0.001$), travel time during shopping trips was significantly predicted by employment status (B = -1.39, SE (B) = 0.36, t = -3.85, $p < 0.001$) and marital status (B = -1.07, SE (B) = 0.41, t = -2.72, p = 0.009). Thus, travelers tend to travel longer during shopping trips if they are not employed and not married.

Work. The average time for a work related trip was 18.52 minutes (SD = 9.61). Females (M = 18.83, SD = 9.95) travelled longer (on average) during work related trips than males (M = 18.40, SD = 9.49) and ANOVA revealed that the difference in travel time was statistically significant ($F_{1, 10471} = 3.86$, $p = 0.023$). When age, marital and employment status were entered in the first step of hierarchical logistic regression ($F_{3, 10448} = 1.64$, $p = 0.177$), they did not produce any significant effect on travel time. Thus, we could conclude that travelers tend to travel longer during work related trips if they are female.

The analysis carried out for the 2010 dataset revealed the following results.

Leisure. The average time for a leisure related trip was 15.95 minutes (SD = 8.43). Males (M = 16.60, SD = 8.37) travelled longer (on average) during leisure trips than females (M = 15.54, SD = 8.44) and ANOVA revealed that the difference in travel time was statistically significantly ($F_{1, 1781} = 6.70$, $p = 0.01$). However, when age and employment status were entered in the first step of hierarchical logistic regression ($F_{2, 1780} = 9.40$, $p < 0.001$), travel time during leisure trips was significantly predicted by age (B = 1.22, SE (B) = 0.30, t = 3.99, $p < 0.001$) and employment status (B = 0.99, SE (B) = 0.41, t = 2.42, p = 0.016) while gender did not provide any significant improvement in explained variance when it was entered in the second step (B = 0.37, SE (B) = 0.46, t = 0. 81, p = 0.421). The beta coefficients revealed that travelers tend to travel longer during leisure trips if they are older and employed.

Shopping. The average time for a shopping related trip was 18.26 minutes (SD = 10.22), while females (M = 18.28, SD = 10.15) and males (M = 18.21, SD = 10.34) did not differ significant from each other ($F_{1, 2755} = 0.03$, $p = 0.862$). When gender, age and employment status were entered as predictors of travel time in stepwise multiple regression ($F_{1, 2755} = 19.81$, $p < 0.001$), travel time during shopping trips was significantly predicted by employment status (B = -1.84, SE (B) = 0.41, t = -4.45, $p < 0.001$). Thus, travelers tend to travel longer during shopping trips if they are not employed.

Work. The average time for a work related trip was 20.23 minutes (SD = 10.25). Females (M = 20.60, SD = 10.42) travelled longer (on average) during work related trips than males (M = 20.04, SD = 10.16) and ANOVA revealed that the difference in travel time was statistically significant ($F_{1, 7702} = 5.15$, $p = 0.023$). However, when age and employment status were entered in the first step of hierarchical logistic regression ($F_{2, 7701} = 8.58$, $p < 0.001$), travel time for work related trips was significantly predicted by age (B = -0.76, SE (B) = 0.19, t = -3.92, $p < 0.001$) but not by employment status (B = 0.36, SE (B) = 0.53, t = 0.68, p = 0.495). When gender was entered in the second step, it did not provide any significant improvement in explained variance (B = -0.42, SE (B) = 0.25, t = -1.68, $p < 0.094$). In fact, the beta coefficients revealed that travelers tend to travel longer during work related trips if they are younger.

In the above analysis, the Levene test was used prior to ANOVA to ensure that the equal variances assumptions could be assumed. In fact, in all cases, the F statistic (which ranged from 0.184 to 2.67) was not statistically significant. In multiple regression analysis, the Durbin Watson statistics which ranged from 1.802 to 1.820 were close to 2, indicating that the assumption of independent errors was tenable *(46)*. Additionally, the VIF statistics were all close to 1 (ranged from 1.03 to 1.12) suggesting that the issue of multicollinearity was of no concern here *(46)*.

Differences were only noted in leisure trips over time. More significantly there were no gender differences in travel time for work and shopping trips between 1998 and 2010. These results do not point towards significant impacts on transport policy, at least looking at the development of mobility over the period 1998 and 2010. The study suggests other socio-demographic factors or maybe household composition as having an influence on the travel patterns of individuals and families (see *35, 36)*.

5. CONCLUSIONS

The analysis of the household travel survey data shows a complex relationship between demographics and transport that changed very little over time. There is evidence of increased car dependence in both female and males, even though some transport "disadvantage" is noted when travel mode is analysed. The higher percentage using walking and public transport are females, and strong relationships are established between mobility choices and particular socio-economic indicators such as employment status and age. This is the first ever study in Malta to highlight such difference. Over the period 1998-2010 there has been some evidence of convergence with females travelling almost as much as males, and using cars as their main mode of transport.

Malta's steady economic development and rapid motorization during the 90s has had significant impact on the travel patterns of the population. It is evident from the results of this study that the use of the car is pervasive and popular among all sectors of the population and for a variety of purposes. This poses challenges to future policy making in terms of infrastructure provision and cost, accessibility and social inclusion, equity, and environmental and public health. A reversal of trends witnessed during the last decade is necessary to shift the population to more environmentally friendly modes of transport, as well as to relieve the current pressures on the limited transport infrastructure on the island, which as reported in the local press, is increasingly becoming congested throughout the whole day *(47)*.

The results of this study highlight that demographics alone will not have any significant impact on the desired modal shift. Other more restrictive measures will have to be adopted in order to reverse the process of car dependence and growth in private mobility.

This study has also raised interesting questions for future research in this area, such as investigating the potential impact of land use distribution on travel time, and to what extent are residential and work location choices affecting behaviour. It has also raised significant questions with respect to other variables that might influence travel patterns, apart from those identified in this study. Further investigations into the role of children in the household, for example (similar to *35, 36*), are necessary to explain further specific patterns of travel behaviour observed in this study and in lieu of Malta's declining birth rate.

Malta's case study analysis has shown how, despite being an island, it displays patterns of mobility and car dependence similar to other cities in Europe and beyond. And therefore using such statistical analysis to understand the role played by various socio-demographic and economic indicators in the future is important, as will be their impact on transport policy.

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