

Polydoropoulou, Amalia; Tsirimpa, Athena

**Article**

## Women's time use with ICT and physical travel in Greek urban and rural areas

SPOUDAI - Journal of Economics and Business

**Provided in Cooperation with:**

University of Piraeus

*Suggested Citation:* Polydoropoulou, Amalia; Tsirimpa, Athena (2012) : Women's time use with ICT and physical travel in Greek urban and rural areas, SPOUDAI - Journal of Economics and Business, ISSN 2241-424X, University of Piraeus, Piraeus, Vol. 62, Iss. 1/2, pp. 72-91

This Version is available at:

<https://hdl.handle.net/10419/96192>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*



University  
of Piraeus

SPOUDAI  
*Journal of Economics and Business*

Σπουδαί

<http://spoudai.unipi.gr>



## Women's Time Use with ICT and Physical Travel in Greek Urban and Rural Areas

By

*Amalia Polydoropoulou<sup>a</sup>, Athena Tsirimpa<sup>b</sup>*

<sup>a</sup> Professor, Department of Shipping, Trade and Transport, University of the Aegean  
Korai 2a, 82100, Chios, Greece, Email: [polydor@aegean.gr](mailto:polydor@aegean.gr)

<sup>b</sup> Researcher, Laboratory of Transportation and Decision Making, Department of Shipping,  
Trade and Transport, University of the Aegean, Korai 2a, 82100, Chios, Greece,  
Email: [a.tsirimpa@stt.aegean.gr](mailto:a.tsirimpa@stt.aegean.gr)

### Abstract

Information and Communications Technologies (ICT) can contribute to the modification and development of new patterns of behaviour by individuals in their everyday lives. The implementation of e-activities such as teleworking, tele-education or tele-shopping cut down the need for physical mobility thus enabling individuals to manage and tailor their time to their optimum advantage. On the other hand, e-activities can be complementary to physical activities or can even bring up derived demand for travel for new activities. This paper seeks to obtain more insight into how women in Greece allocate their time during a typical weekday/week to various types of activities while, it explores the role of ICT during the activities being conducted. A computerized telephone (CATI) survey took place in 2009 and involved the collection of 500 questionnaires. The analysis of the data collected shows that women living in less favourable regions, prefer to use traditional means of transport for their usual activities, mainly due to their limited familiarity with the use of computers and to the smoother traffic conditions. Moreover, women with children tend to use e-means for longer periods, when executing specific activities during a typical weekday/week. The future scenarios show that under certain conditions (i.e. ICT accessibility, traffic conditions, governmental incentives) the activity may bring more utility if carried out via ICT than by physical travel. For some women, "virtual mobility" offers attractive advantages in the context of much of their administrative personal business (administrative chores, financial transactions, comparison shopping, etc.), some of their retail trips and perhaps their daily commute.

**JEL Classifications:** R, O, Z13.

**Keywords:** Women, ICT, Activities, Time use.

## 1. Introduction

Individuals were known to perform various economic and social activities related to their work, recreation, education, shopping and banking in a certain manner, at least until, the development of Information and Communications Technologies (ICT); they are constantly initiating changes in the field, changes of which we are yet to grasp the limits.

Historically, the aforementioned activities have been associated to a continuity of travel. The trips undertaken were traditionally conducted in a specific time-location framework which has undergone manifold changes in the course of the last decades; changes brought about by the use of ICT (Andreev *et al.*, 2010; Padayhag, 2009).

The two fields traditional, old-fashioned travel and ICT, are known to sometimes complement and other times substitute each other (Choo *et al.*, 2005; Mokhtarian, 2009). In the past, it was common for people to plan their daily travel activities confounded by the classic restrictions of time and place and aided by their occasional knowledge of traffic conditions reigning in their specific area. Nowadays, the range of their activities is expanded to include possibilities such as electronic shopping, working from home or long-distance learning, thus enabling them to reduce or otherwise alter the number of trips they perform daily.

The use of ICT has the potential to contribute more specifically to the development of areas such as the suburbs or (in the case of Greece or similar countries) rural areas and islands, as they offer new opportunities for residential location and teleworking (Kitrinou *et al.*, 2010). Women in general are expected to benefit from such offers, but those who live in these areas are likely to reap more substantial benefits. In order take to advantage of new technologies, women should have ready access to information usage.

Despite the considerable attention e-economy seems to attract, still the path along which it will develop remains uncertain, and its impact on women's patterns of activity relatively unknown.

More precisely, the present research aims to shed light of the impact of ICT developments on the patterns of activities and daily travel specific to women. To this effect a review of the State-of-the-Art is presented in Section 2. Section 3 presents the data collection methodology and the results of a study case conducted in Greece. Finally, Section 4 features the paper's conclusions.

## 2. State of the art

The recent growth of interest in understanding the travellers' decision-making process has drawn particular attention to the timing and duration of their participation in activities (Bayarma *et al.*, 2010).

Presently, ICT have altered the way people perform different economic and social activities, such as work, education, entertainment, shopping, banking, etc., since they can perform them electronically, thus having the opportunity to alter the number of daily trips performed (Wang and Law, 2007; Hjorthol, 2008; Bonsall and Shires, 2006; Douma *et al.*, 2004; Ferrell, 2005).

Andreev *et al.* (2010) studied the role of ICT in personal activity and travel patterns. They reviewed about 100 studies on the impacts of ICT on personal activities and on travel, via ICT applications such as telecommuting, teleshopping, and teleleisure<sup>1</sup>. Substitution was found as the most prevalent impact for telecommuting, while complementarity was a major outcome of teleshopping and teleleisure. In addition more than 50% of all reviewed articles investigated telecommuting, with much fewer studies directed to teleshopping and teleservices and an even smaller number to teleleisure. The majority of studies regardless teleactivity type investigated ICT impacts in the short term while in the long term ICT impacts are still indefinite. Furthermore, cumulative impacts of teleactivities remain unstudied, for instance, investigating how telecommuting impacts teleleisure or vice versa.

Bayarma *et al.* (2010) studied the relationship between ICT and travel behaviour through identifying the causal relationships between ICT and the fragmentation of paid work and travel, controlling for confounding factors such as socio-demographics. The analysis showed that the relationship between ICT and personal travel is highly complex, mediated mainly by the temporal and spatial fragmentation of paid work. Wang and Law (2007) found that the wide application of ICT can lead to more travel, while other studies mention that ICT usage can substitute (Viswanathan and Goulias, 2001) or other times complement (Mokhtarian, 2002; Kitrinou *et al.*, 2010) travel. Padayhag (2009) studied the relationship and effects of ICT use on time planning, social activity participation, social network and travel behaviour, using data from university students and workers collected in Metro Manila, Philippines. The results of this study indicate that ICT use may have only an indirect effect on travel behaviour and that travel may be related and directly affected by social network, social activity participation and time planning. According to Hjorthol (2008), time planning and ICT use (mobile phones) are positively correlated and this relationship might ultimately generate new travel patterns.

## 2.1 Telecommute and Travel

The principal focus of research pertaining to telework, seems to be the direct impact of travel demand. What is more, the current method consists of trying to predict the degree of substitution of commuting by telecommuting, the number

of telecommuters, the frequency of occasions for telecommuting and the potential economy on travels (Nagurney *et al.*, 2001; Farag *et al.*, 2007; Ha and Stoel, 2009; Rotem-Mindali, 2010).

An ever growing body of research literature places emphasis on the effects of teleworking on the timing of trips, modes of travel, and activity programs. Studies were even dedicated to the possibility of non-work related trips increasing proportionately to the decreasing opportunities to travel (Ming-Hsiung, 2009; Rotem-Mindali and Salomon, 2007).

## **2.2 e-Shopping and Travel**

Another growing body of research focuses on the impact of e-shopping on conventional shopping trips (Casas *et al.*, 2001; Ferrell, 2005). An anticipated effect of e-shopping on transportation demand is the reduction of shopping trips (substitution effect) and the subsequent availability of “free” travel time to be allotted to other purposes/activities or trips (complementarity effect). However, the e-shopping effects of substitution and/or complementarity vary among case studies and the impact of e-shopping activities on transport network conditions is still unknown (Papola and Polydoropoulou, 2006).

Gould and Golob (1997) and Gould *et al.* (1998), found that working women increase the time devoted to shopping or other out-of-home maintenance activities on account of time saved due to e-shopping. Bhat *et al.* (2003) found that the effects of ICT on activity–travel patterns are mediated by individual socio-demographic and locational factors, as well as by unobserved individual characteristics.

## **2.3 Summary Conclusions**

The substitution and/or complementarity effect of e-activities vary among case studies and their impact on transport network conditions is still unclear. It is easily understood that under such conditions, in the context of relevant literature, the aspects of impact when examined specifically for activities performed by women is even more unclear. The objective of this study is to gain more insight into how women allocate their time during a typical weekday and explore the role of ICT on the way that these activities are being conducted.

The research was specifically funded to study women’s behaviour in depth. It addresses a specific need identified by the Greek Ministry of Education, to study women’s behavior in order to propose policies and guidelines for the improvement of their quality of life, including topics such as travel, ICT and entrepreneurship.

In this paper the information on women’s activities participation in urban and suburban areas is collected and analysed, while a set of scenarios have been de-

veloped, referring to future situations with respect to the evolution of the e-economy and ICT (i.e. opportunities of tele-working, tele-education, etc.). The choice between physical travel and virtual activities implementation currently and in future hypothetical conditions is being analysed.

### **3. The case of Greece**

#### **3.1 Data Collection Methodology**

A personalized questionnaire was designed with the intent to reveal women's decision making behaviour concerning the use of ICT for conducting their activities. This questionnaire is composed of five parts. In the first part, respondents are asked questions relevant to their working conditions, tele-working activities, and factors influencing their career development. The second part includes questions relevant to their characteristics and perception, as well as, choice of residential location. In the third part women are asked to define the activities they perform on a typical weekday from a predefined activity list. The list included only activities that could also be implemented with the use of ICT, such as work, education, shopping, and recreation. Other activities such as eating, sleeping, grooming, household maintenance, etc. were not asked in this study. In the fourth part their level of education along with their knowledge in computers and ICT, and e-learning activities are identified. Data of stated preferences is then collected using a number of scenarios describing future situations in order for respondents to indicate the way they would conduct their activities. These future scenarios are described in five categories of characteristics, which are the following:

1. Internet Speed Connection
2. Monthly Internet Cost
3. Telephone Cost
4. Commuting time
5. Commuting Cost

The data collection methodology took place in 2009 and involved the collection of 500 questionnaires via telephone interviews in a randomly selected sample of the population -by creating numbers on a random basis of the population using a telephone number generator. In case a telephone number proved invalid, it was replaced by the next one produced by the generator.

The total population out of which the sample was derived corresponds to 3.707.234 women aged between 15 to 64 years old, (National Statistical Authority, 2001 Population Census), while the sample consists of 106 respondents from islands, 366 from the Attika region and 28 from the rest mainland.

## **3.2 Data Analysis**

### **3.2.1 Sample Characteristics**

The information has been selected from a number of varied Greek provinces in order to reflect a sample diversity true indication of the population (21.13% from Islands, 73.24% from Attica region and 5.63% from the rest mainland). The average age was 42 years old and the monthly income was 500-1500 Euros (70%) in a categorical scale. According to the responses, 80% of the women work, with 55% of them working in the private sector and 45% in the public. Three quarters of the respondents work full time and just 25% are working part time. An issue of significant importance is the fact that only 15% are involved in a business enterprise either, part-time or full time, compared to 27% out of total business owners in Norway, 26% in Germany and Sweden, and 63% in the US (Mayoux, 2001). This is an indication of how challenging the development of business initiatives is for the contemporary Greek woman. Additionally, the level of education is quite high (70% has at least a bachelor degree) and they have several years of work experience. Most of them have stated that their knowledge is at least average in the case of PCs (75%) and Internet awareness (80%), while a significant amount of women have Internet access, both from work (73%) and home (56%), which is another indicator of female familiarization with ICT. Note that, the level of education and ICT knowledge/usage of this sample is high compared to a 45% for both figures (in 2009) as per the Greek National Statistical Agency. This is expected due to the fact that the percentage of women being able to respond to an ICT-related survey via the telephone should be of higher education. However, given that the penetration of ICT knowledge/use has been increasing rapidly over the past years, it is believed that the results obtained in this study reveal the current and future behaviour of the population of interest under consideration.

## **4. Analysis of Findings**

This section presents the data analysis and findings of the case study.

### **4.1 Time Use and Geographical Distinctions**

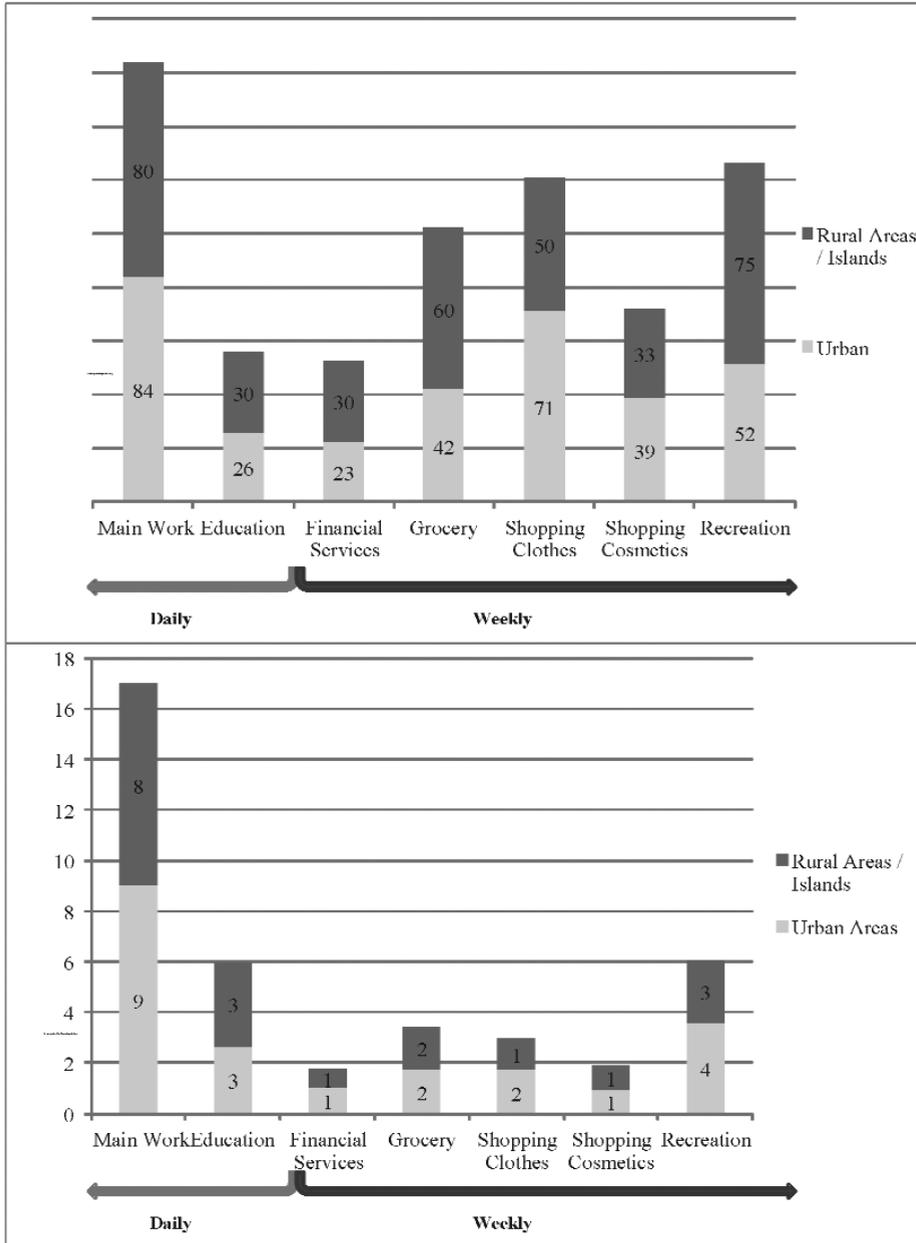
This section presents how women from various geographical regions in Greece allocate their time during a typical weekday. Figure 1 presents the average time (hours/day) that women from urban and rural areas/islands spend on each activity and the proportion of women that participate in each activity.

As it can be seen, the percentage of women that live in rural areas/islands and participate in recreational activities (such as, hang out with friends and/or relati-

ves, go for a coffee or drink, etc.) is significantly greater than the corresponding percentage of women that live in urban areas (75% vs 52%), but the duration of the activity is slightly higher for urban women. A substantial majority of women that live in rural/island areas (68%) state that they do not work overtime, nor take work home. On the contrary women in urban areas work on average 1 hour/day more (overtime) and approximately 11% takes work at home. Similarly, women in rural/island areas seem to implement less shopping activities (clothes, cosmetics) and more grocery shopping, on a weekly basis leading to the conclusion that there is indeed a different lifestyle among urban and rural/island women.

Figure 2 presents women's activity participation as a function of their marital status and the presence of children. As it is shown women with children (married or single) in both urban and rural areas tend to commit themselves to fewer daily activities compared to those who either do not have children or are single. In rural/island areas the proportion of women that are married with children and do not work, is significantly greater than the corresponding percentage of urban women. This is consistent with the social norms that exist in rural areas and states that women should stay home and take care of the children and men should be the "providers" of the households

**FIGURE 1**  
Activity Participation and Average Activity Duration



**FIGURE 2**

Activity participation per Marital Status and Children Presence in Urban and Rural/Island Areas

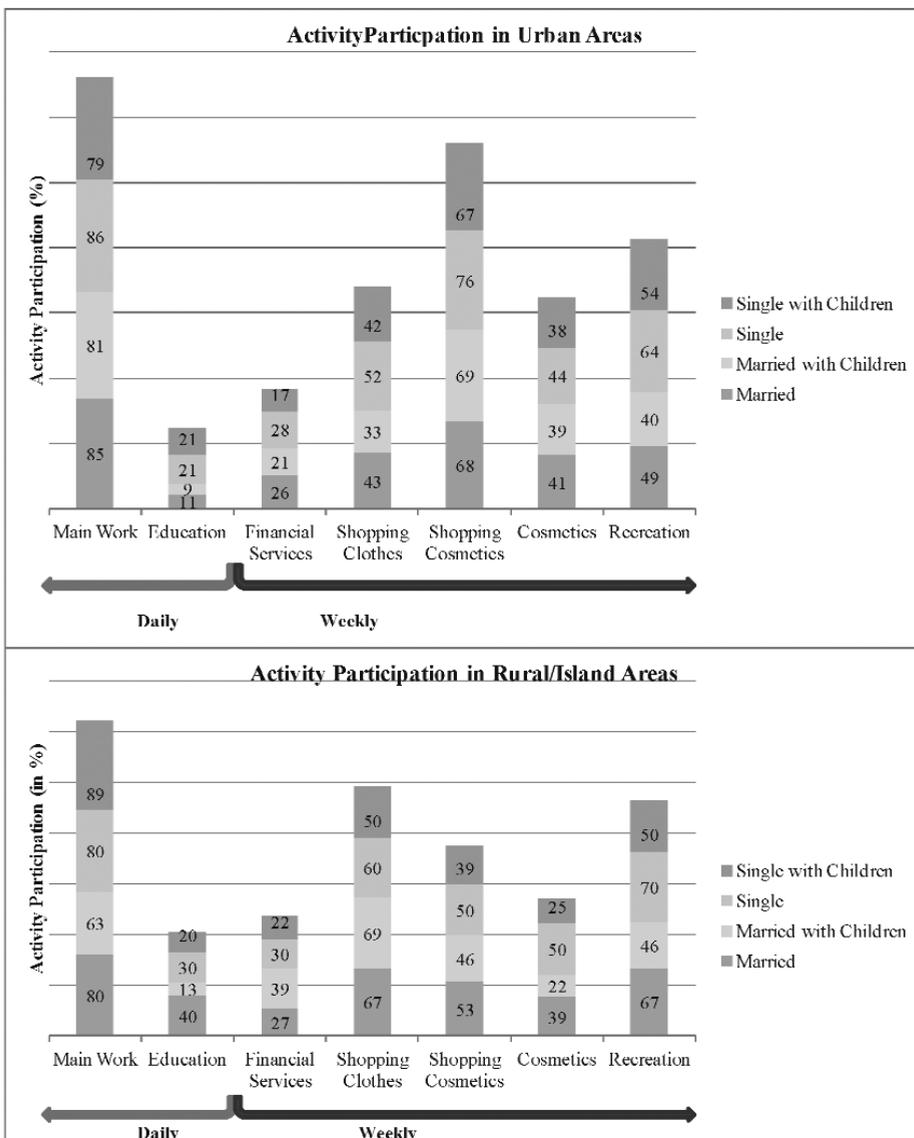


Table 1 presents the time of day that women begin their daily activities. As it can be seen, the majority of the activities, both in urban and rural/island areas, begin either during the morning or afternoon hours, while recreation is the only activity that most women start during the night. The latter was expected since at night is when most women’s daily obligations end (work, grocery shopping, pick up/drop off kids to activities, etc.). Interestingly, women in rural areas may do their shopping activities throughout the day, while women in urban areas tend to shop either at the beginning of their day (morning) or in the afternoon, mostly after finishing work. This can be attributed to the shorter distances that women need to travel in rural/island areas and to the traffic conditions, which flow significantly smoother.

**TABLE 1**  
Starting Time of the Activity

Activity	Urban Areas				Rural Areas/Islands			
	Morning	Noon	Afternoon	Night	Morning	Noon	Afternoon	Night
Main Work	45.0 %	12.5%	32.5%	10.0%	63.0%	10.0%	15.0%	12.0%
Lessons	20.0%		60.0%	20.0%			50.0%	50.0%
Financial Services	60.0%	10.0%	20.0%		100.0%			
Grocery	36.4%		63.6%		20.0%	60.0%	20.0%	
Clothes	20.0%		80.0%		25.0%	50.0%	25.0%	
Cosmetics	65.0%		35.0%		25.0%	50.0%	25.0%	
Recreation			16.7%	83.3%			33.3%	66.7%

As it was found by Kitrinou *et al.* (2009) it is shown in Table 2, that only a small percentage of women are currently tele-working, despite the fact that the female awareness on personal computers and Internet usage is at high levels (according to the Hellenic Statistical Authority (2009), 43% of Greek women use personal computers and 38% used internet). Moreover, the vast majority of the activities performed, in both urban and rural/island areas are implemented outside the home and thus require physical transport. Overall, it is apparent that women in urban areas tend to pursue more activities from their home, compared to women in rural/island areas. This difference could be possibly attributed to the traffic congestion that most of the urban areas in Greece face, which make travelling quite unpleasant, or to the habits or cultural differences among the areas.

Even so, however, the use of transport modes (such as tram, metro, car, bus, etc.) is significantly greater than the use of electronic means (such as, Internet and email) in both geographical regions. It also appears that in rural/island areas activities that are related to shopping occur only with the physical travel of women, by a traditional transport mode. This could also be due to the fact that in rural/island areas some tele-services are still at an infant stage (such as e-grocery and in general orders from home) and therefore, the percentage of women using electronic means for groceries is significantly lower than the corresponding percentage of urban women (30.8% vs 16.7%). The activities that most women appear to use electronic means for, are hanging out with friends (through chat rooms, social networks, etc.) in rural/island areas and lessons (e-learning) in urban areas. Finally, as it can be seen in Table 2 only main work combines both out of house activities that require physical travel and the use of email and/or web, in both rural/island and urban areas, showing the complementarity between ICT usage and travel for work related activities. However, it is expected that as the use of third and fourth generation mobile devices increases, the use of ICTs while conducting out of house activities will be increased and be expanded to other type of activities.

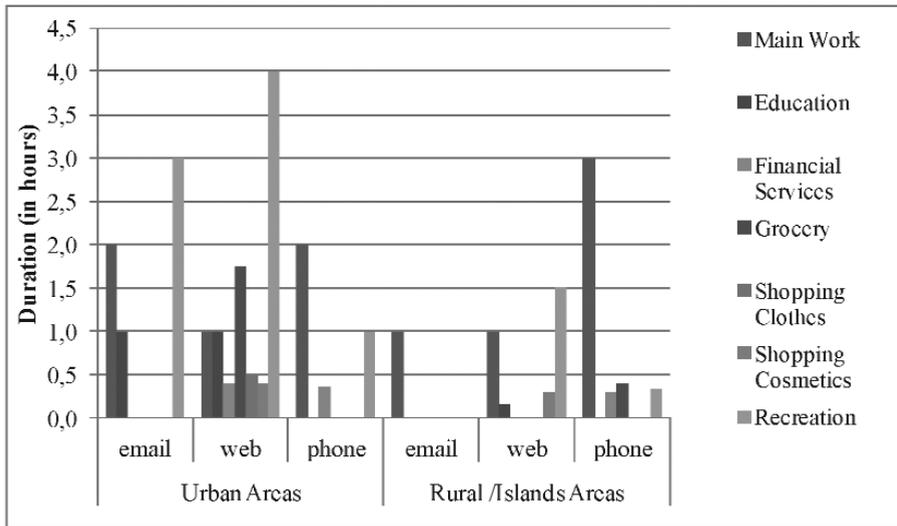
**TABLE 2**  
Activity Implementation in Urban and Rural Areas/Island

	Activity Type	In – House Activities with the use of email and/or web	Out of House Activities that Require Physical Travel and No use of email and/or web	Out of House Activities that Require Physical Travel and Use of email and/or web
<b>Urban Areas</b>	Main Work	7.7%	70%	22.3%
	Lessons (eg. Foreign language)	62.5%	37.5%	-
	Financial Services	14.3%	85.7%	-
	Grocery	30.8%	69.2%	-
	Clothes	27.3%	72.7%	-
	Cosmetics	16.7%	83.3%	-
	Recreation	25%	75%	-
<b>Rural / Island Areas</b>	Main Work	5%	75%	20%
	Lessons (eg. Foreign language)	33.3%	66.7%	-
	Financial Services	29.7%	70.3%	-
	Grocery	16.7%	83.3%	-
	Clothes	-	100%	-
	Cosmetics	12%	88%	-
	Recreation	50%	50%	-

Figure 3 presents the average duration of women’s activities both from home and elsewhere while, using electronic means (such as, email, web and phone). In urban areas women tend to use electronic means to a greater extent, with web services coming first, followed by email services and then phones. The average duration of email usage is 2 hrs, of Internet usage is 1 hr and 50 minutes and of phone usage is 1 hr. On the other hand, ICT usage in rural/island areas is more restricted and women are more likely to use phone instead of web and email services for their activities. The average duration of email usage is 1 hr and of Internet and phone usage is 1hr and a half each.

It is worth mentioning here, that the new generation of Greek women is more computer literate and in the future we expect to witness more and more activities being conducted via the Internet.

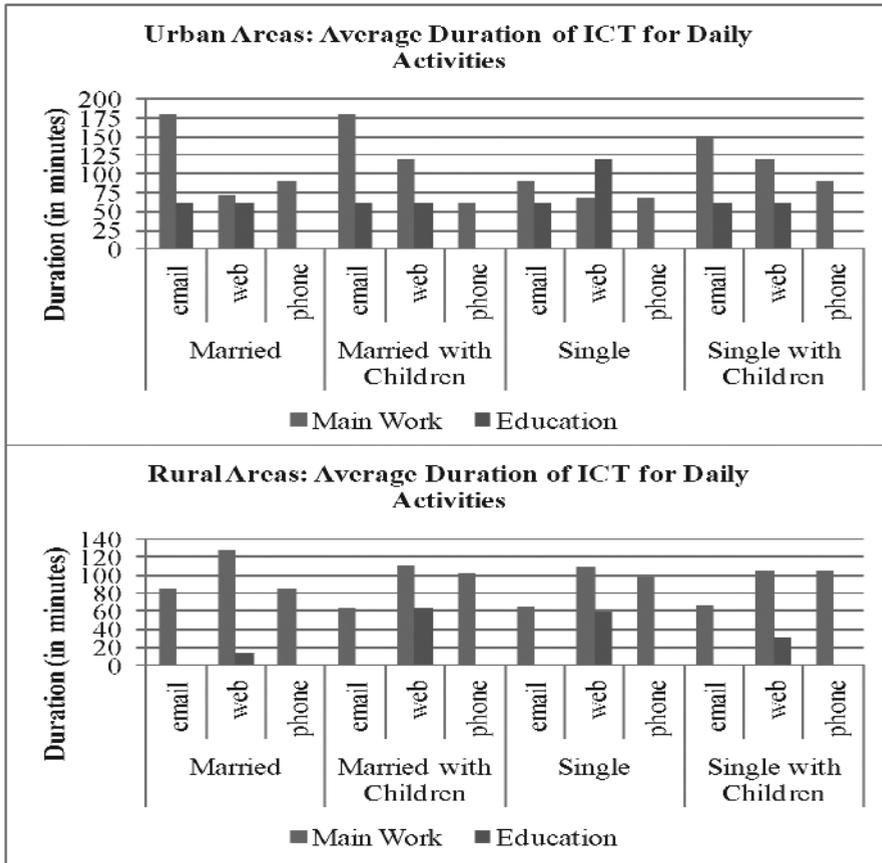
**FIGURE 3**  
Average Duration of ICT Usage



Figures 4 and 5 present the average duration of ICT usage for the following activities: work, financial services, recreation and grocery shopping, conducted by urban and rural/island women separately, based on their marital and parental status. As it is shown in Figure 4, women with children (married and single) in urban areas tend to use more ICT in their main work compared to rural/island women. The latter appear to use mainly the web and phone when conducting their work and less e-mail, which is widely used from urban women.

**FIGURE 4**

Average Duration of ICT for Daily Activities (Main Work and Education)

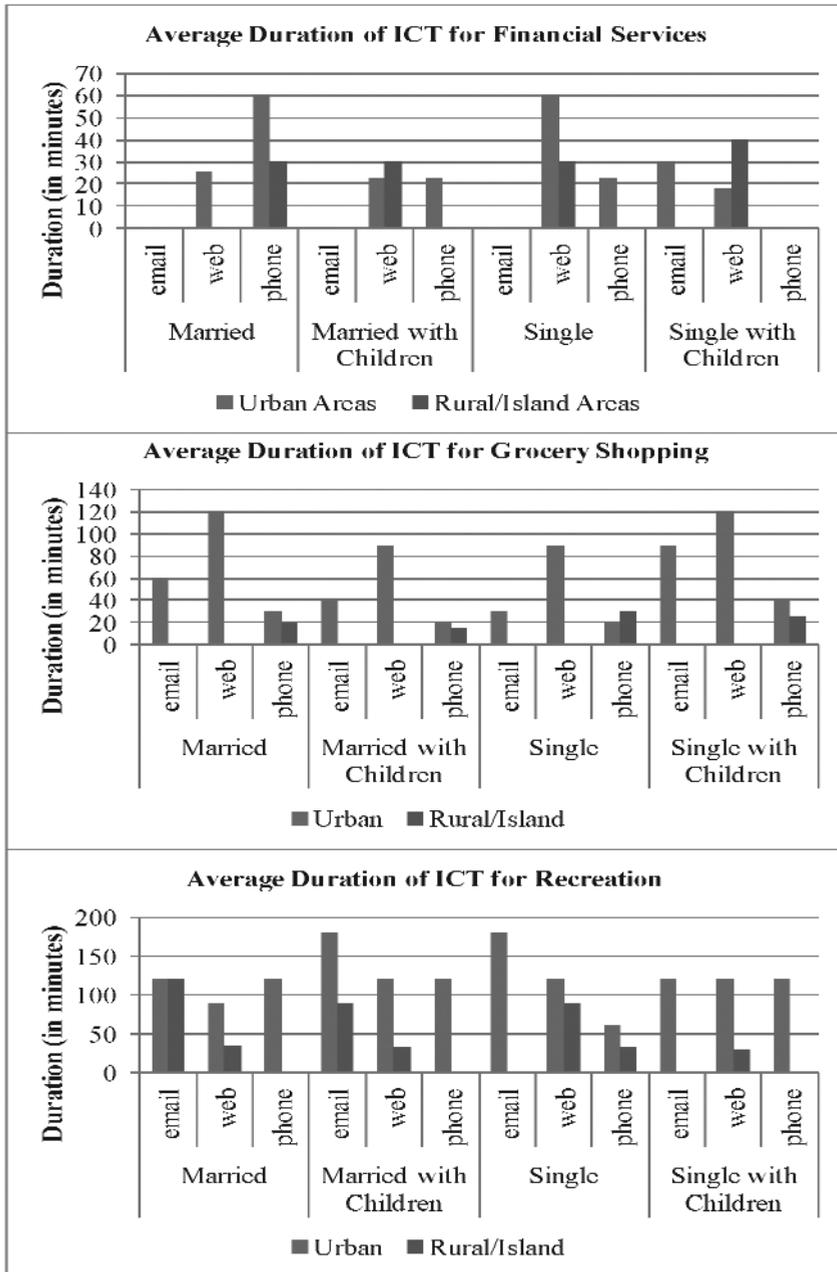


Regarding ICT usage for financial services, it appears that in rural/island areas the duration of ICT usage for banking activities is shorter, while the means that is mostly used is the phone. On the contrary, urban women tend to use e-banking for a longer period of time, especially if they do not have children. Moreover, as it can be seen in Figure 5, urban women use all kinds of electronic means for chatting and other e-recreational activities, with an average duration of 2 hrs, while rural/island women spend significantly less time and different e-means are preferred depending on their marital and parental status.

Finally, urban women, regardless of their marital status and the presence of children, choose to use ICT for their grocery shopping, with an average duration of 1 hr. On the other hand rural/island women who use ICT for their grocery shopping, use the phone and the average duration of usage is 23 minutes.

**FIGURE 5**

Average Duration of ICT for Weekly Activities (Financial Services, Grocery and Recreation)



Another important part of the questionnaire involved the scenarios which the respondents had to take into consideration in order to predict their behaviour. A total of 5 scenarios were presented to each respondent out of which the analysis presented below refers to the two most representative ones that give a clear picture of the future trends that were investigated. As illustrated, according to the first scenario the respondents were asked to express how they would plan their daily activities if their Internet connection was 25 times faster compared to today and costing 15 Euros per month, telephone costs remained the same as today, commuting time to and from work increased by 30% and the respective cost decreased by 20%. In the second scenario respondents were asked to express how they would plan their daily activities if their Internet connection was 100 times faster compared to today with no monthly cost, telephone costs were cheaper by 50% compared to today, commuting time to and from work increased by 50% and the respective cost decreased by 50%.

According to the results, scenario 2 appears to give women the highest incentives to make use of modern technologies both in urban and rural/island areas. Figure 6 presents the increase that occurs under scenario 2 compared to the present situation in the in-household activities through the use of email and web. As it can be seen, there is a significant decrease of the out of house activities which in the case of financial services reaches more than 50% in urban areas and approximately 40% in the rural/island areas. This increase in the in-household activities reveals a potential substitution of physical travel through the use of ICT (email and web).

**FIGURE 6**

**% of Change in the Percentage of In-House Activities with the Use of Email and/or Web**

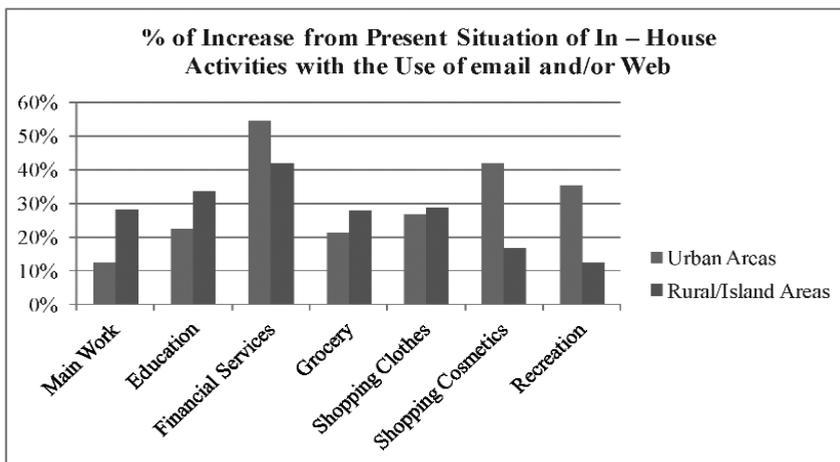


Figure 7, presents the time of day that women choose to implement their main work within the new context, described by the future scenarios. As it can be seen, women in both geographical regions would prefer to work morning hours (53,1% and 74.3%) and noon (12.5% and 10%) and less at night (3.3% and 4.4%). As the incentives for the use of ICT increase and in comparison to the current situation, what is clearly stated in the below graph is that urban women would significantly decrease the time spent on their main work during afternoon hours and most likely use it for performing of other activities.

**FIGURE 7**  
Women’s Potential Trends for Main Work Activity

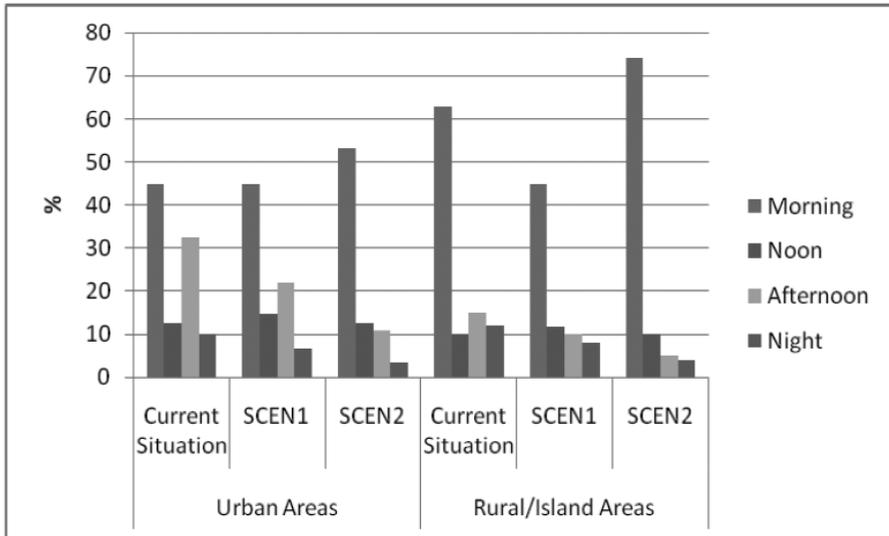


Table 3 presents the proportion of ICT usage for main work, in the future context. As it is shown, Internet higher speed along with cheaper Internet and telephone costs encourage the use of e-mail, Internet and telephone usage for the daily tasks. In addition, the more time it takes to commute the more women are willing to switch from private modes of transport to public, as they consider they would save considerable time.

**TABLE 3**

Women Potential ICT &amp; Transport Modes Usage for their Main Work Activity

		Urban Areas			Rural/Island Areas		
		Current Situation	SCEN1	SCEN2	Current Situation	SCEN1	SCEN2
ICT	Telephone	65%	53%	40%	80.0%	65%	40%
	Internet	15%	20%	26%	10.0%	13%	18%
	E-mail	20%	30%	40%	10.0%	20%	30%
Transport Modes	Private Modes	43,5%	25%	15%	51%	47%	35%
	Public Transport Modes	56,5%	65%	85%	49%	53%	65%

The results of the scenarios indicate that there is a clear relationship between policy, time use and ICT use. If policymakers focus their attention on identifying the circumstances in which ICT use and virtual mobility are attractive, then the promotion of ICT may initiate a change in the activity pattern of women in Greece, especially for those who live in urban areas. The right incentives can ultimately increase the use of ICT not only at work but in other activities as well, such as leisure, shopping etc.

Although the impact of ICT in travel is still vague, the promotion of ICT usage could decrease the isolation of rural/island areas especially during winter (through the capability of e-medicine, tele-conferencing, etc.) and change individuals' patterns in urban areas (through increased engagement in tele-activities, use of ICT means instead of physical modes, peak-spreading, etc.).

## 5. Conclusion

This paper examined the relationship between ICT and time use on a typical weekday/week for women in different geographical areas of Greece. It analyses activities that can be performed either by physical travel or by ICT.

The analysis of the revealed preference data showed that physical travel and ICT are used as complementary means, since a significant proportion of women is using ICT for implementing part of their daily activities.

Moreover, the analysis presented above identified that there exists a different lifestyle among urban and rural/island women in the way that they choose to allocate their time during a given day. The proportion of women in rural/island areas that choose to engage in recreational or grocery shopping activities within

a typical week is quite greater from the respective proportion of urban women, which prefer to spend their time on shopping clothing and cosmetics. However, both urban and rural/island women prefer physical stores instead of e-shops, particularly for the purchase of clothes and cosmetics. Grocery shopping seems to be an exception in urban areas, since approximately 30% of women choose to perform it through electronic means.

The stated preference analysis demonstrated that ICT could be used to substitute trips under certain conditions and that there is a clear relationship between policy, time use and ICT use. For example, higher speed Internet along with cheaper Internet and telephone costs, encourage the use of ICT usage for the daily/weekly tasks. Moreover, as the incentives for the use of ICT increase urban women could significantly decrease the time spent on their main work during afternoon hours. The results of the future scenarios can be used by policy makers to implement policies to promote ICT adoption that could have direct impacts on travel.

Finally, it must be noted that our understanding of the effects of ICT on time use is still limited. The sample used in this research is relatively small, highly educated and with high ICT knowledge; however the results obtained from the analyses present several avenues for future research.

Further research will focus on the development of discrete continuous model for activity participation and duration. Furthermore, dynamic data will be collected to study the activities that are being implemented from women in different geographical locations, giving special attention to the social norms that are present and ultimately modelling ICT usage impact on women's time planning. By conducting causal analysis and dynamic modelling we will be able to better understand the mechanisms by which new developments change women's behaviour and produce structurally different patterns of time allocation.

## **Acknowledgment**

This research was funded from the Greek Ministry of Education, EPEAEK III program «Pythagoras III».

## **References**

- Andreev, P., Salomon, I. and Pliskin, N., 2010. Review: State of Teleactivities. *Transportation Research Part C*, Volume 18, pp. 3-20.
- Bayarma, A., Dijst, M. and Ettema, D., 2010. Working from 9 to 6? An analysis of in-Home and Out-of-Home Working Schedules. *Transportation*, Volume 37, Number 3, pp. 505-523.
- Bonsall, P.W. and Shires, J.D., 2006. Employers' Expectations for Commuting & Business-Related Travel in an ICT-Rich Environment. *Transportation Research Record 1977*, pp. 268-276.

- Bhat, C.R., Sivakumar, A. and Axhausen, K.W., 2003. An Analysis of the Impact of Information and Communication Technologies on Non-Maintenance Shopping Activities. *Transportation Research Part B*, 37, pp. 857-881.
- Casas, J., Zmud, J. and Bricka, S., 2001. Impact of Shopping via Internet on Travel for Shopping Purposes. Paper Presented at 80th Annual Meeting of the Transportation Research Board, Washington, DC.
- Choo, S., Mokhtarian, P.L. and Salomon, I., 2005. Does Telecommuting Reduce Vehicle-Miles Traveled? An Aggregate Time Series Analysis for the US. *Transportation* 32, pp. 37-64.
- Douma, F., Wells, K., Horan, T.A. and Krizek, K.J., 2000. ICT and Travel in the Twin Cities Metropolitan Area: Enacted Patterns Between Internet Use and Working and Shopping Trips. Paper presented at The Transportation Board 83rd Annual Meeting. Washington, D.C. January 11-15 paper number 04-3783.
- Farag, S., Schwanen, T., Dijst M. and Faber, J., 2007. Shopping Online and/or in-Store? A Structural Equation Model of the Relationships Between e-Shopping and in-Store Shopping. *Transportation Research Part A: Policy and Practice*. Volume 41, Issue 2, February 2007, pp. 125-141.
- Ferrell, C.E., 2005. Home-based Teleshopping and Shopping Travel: Where do we Find the Rime? *Transportation Research Record*, 1926, pp. 212-223.
- Gould, J. and Golob, T.F., 1997. Shopping Without Travel or Travel Without Shopping? An Investigation of Electronic Home Shopping. *Transport Reviews* 17, pp. 355-376.
- Gould, J., Golob, T.F. and Barwise, P., 1998. Why Do People Drive to Shop? Future Travel and Telecommunications Tradeoffs. UCI-ITS-AS-WP-98-1, Institute of Transportation Studies, University of California, Irvine.
- Ha, S. and Stoel, L., 2009. Consumer e-Shopping Acceptance: Antecedents in a Technology Acceptance Model. *Journal of Business Research*, Volume 62, Issue 5, May 2009, pp. 565-571.
- Hjorthol, R., 2008. The Mobile Phone as a Tool in Family Life: Impact on Planning of Everyday Activities and Car Use. *Transport Reviews*, Vol. 28, No 3, pp. 303-320.
- Mayoux, L., 2001. Jobs, Gender and Small Enterprises: Getting The Policy Environment Right, ILO Working Papers 346709, International Labour Organization.
- Kitrinou, E., Polydoropoulou, A. and Bolduc, D., 2010. Development of Integrated Choice and Latent Variable Models for the Residential Relocations Decision in Island Areas. *Choice Modelling: The State of the Art and the State of Practice*. Chapter 27, pp. 593-618. ISBN: 978-1-84950-772-1.
- Kitrinou, E. and Polydoropoulou, A., 2009. Modeling the Impact of ICT-Use and Teleworking on Residential Relocation Decision in Island Areas. *Statistical Review, Journal of the Greek Statistical Association*.
- Ming-Hsiung, H., 2009. Shopping Mode Choice: Physical Store Shopping versus e-Shopping. *Transportation Research Part E: Logistics and Transportation Review*, Volume 45, Issue 1, January 2009, pp. 86-95.
- Mokhtarian, P.L., 2002. Telecommunications and Travel: The Case for Complementarity. *Journal of Industrial Ecology* 6, 2: 43-57.
- Mokhtarian, P.L., 2009. If Telecommunication is Such a Good Substitute for Travel, Why Does Congestion Continue to Get Worse? *Transportation Letters: the International Journal of Transportation Research*, Issue 1, pp. 1-17.
- Nagurney, A., June Dong and Mokhtarian, P.L., 2001. Teleshopping Versus Shopping: a Multi-criteria Network Equilibrium Framework. *Mathematical and Computer Modelling*, Volume 34, Issues 7-8, October 2001, pp. 783-798.
- Padayhag, G.U., 2009. The Effect of ICT Use on Time Planning of Social Activities: The Experience in Metro Manila, Philippines. *Proceedings of the International Association of Transportation behavioral Research IATBR*, Jaipur, India.

- Papola, A. and Polydoropoulou, A., 2006. Shopping-Related Travel in a Rich ICT Era: A Case Study on the Impact of e-Shopping on Travel Demand. Paper Presented at the 85th TRB Meeting, January 22nd-26th, Washington DC, 2006.
- Rotem-Mindali, O., 2010. E-tail versus Retail: The Effects on Shopping Related Travel Empirical Evidence from Israel. *Transport Policy*, Volume 17, Issue 5, September 2010, pp. 312-322.
- Rotem-Mindali, O. and Salomon, I., 2007. The Impacts of E-retail on the Choice of Shopping Trips and Delivery: Some Preliminary Findings. *Transportation Research Part A: Policy and Practice*, Volume 41, Issue 2, February 2007, pp. 176-189.
- Viswanathan, K. and Goulias, K.G., 2001. Travel behavior implications of information and communications technology ICT in Puget Sound region. *Transportation Research Record*, 1752, pp. 157-165.
- Wang, D. and Law, F., 2007. Impacts of Information and Communication Technologies ICT on Time Use and Travel Behaviour: A Structural Equation Analysis, *Transportation*, Vol. 34, No 4, pp. 513-527.