Fractional-Split Models of the Time-Use Patterns of Elderly Americans

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1. Background and Objectives

The overall ageing of the population is an important demographic trend that motivates rigorous studies of the time-use behavior of the elderly. For example, understanding the activity-travel patterns of the elderly is vital in planning the development of urban infrastructure to meet the travel needs of the future population. Similarly, such research is also of interest to public-health professionals as the physical and mental well being of people is related to their levels of mobility and social contact. In recognition of the above-discussed issues, there is a growing body of literature on understanding the activity-travel behavior of the elderly. For example, the reader is referred to Rosenbloom (2001), Collia *et al.*, (2003), Hildebrand (2003), TRB(2004), Srinivasan *et al.*, (2006), and Krantz-Kent and Stewart (2007),

The objective of this research is to contribute to this growing body of literature. This study presents a detailed, disaggregate (individual-level), econometric analysis of the time-use patterns of the elderly (age >= 60 years). Specifically, this study will model the fraction of daily time allocated to different kinds of activity pursuits. The activities will be classified along three dimensions: (1) purpose (such as sleep, work, leisure, maintenance, and travel), (2) location (in-home and out-of-home), and (3) companions involved (solo, spouse, family members, friends, etc.). Data from the American Time Use Surveys (ATUS) 2003-2006 will be used in this analysis.

The rest of this paper is organized as follows. Section 2 describes the fractional-split modeling methodology. Section 3 provides an overview of the dataset used in the analysis. Section 4 presents and discusses the empirical model results. Finally, Section 5 presents a summary of the paper.

2. Methodology

In this paper, we use fractional-split models to determine the allocation of daily time across different activity types (classified based on purpose of activity, location of activity, and the companions with which the activities are pursued). This approach has been used in the literature for applications such as 401(K)-plan participation (Papke and Wooldridge, 1996), VMT-mix modeling (Bhat and Nair, 2000), commodity-flow distributions (Sivakumar and Bhat, 2002) and time-use (Ye and Pendyala, 2005). In the rest of this section, a brief overview of this methodology is presented.

Let f_{qi} be the fraction of total time allocated by individual *q* to activity type *i*. Now, we require that, $0 <= f_{qi} <= 1 \ \ \forall q, i$ (note that this allows for no time being allocated to any activity as well as all the time allocated to a single activity) and $\sum_{i \in C_q} f_{qi} = 1 \ \forall q$ where C_q is the set of activity types available for person *q*. A function that satisfies the above criteria may be specified as the following:

$$f_{qi} = \frac{\exp(\beta X_{qi})}{\sum_{j \in C_q} \exp(\beta X_{qj})} + \varepsilon_{qi} = G_i(\beta, X_q) + \varepsilon_{qi}$$

In the above equation, X_q represents a vector of explanatory variables corresponding to individual *q* (with X_{qi} representing the value of the variable corresponding to alternative *i*) and β represents a vector of model parameters. ε_{qi} is an error term with no substantive behavioral interpretation.

The parameters of the above model can be estimated using the Quasi-Maximum Likelihood (QML) estimation methodology. Specifically, the following log-likelihood function is maximized:

$$LL = \sum_q \sum_{i \in C_q} f_{qi} \left\{ \ln G_i(\beta, X_q) \right\} = \sum_q \sum_{i \in C_q} f_{qi} \left\{ \beta X_{qi} - \ln \left[\sum_{i \in C_q} \exp(\beta X_{qj}) \right] \right\}$$

The above log-likelihood function and the corresponding gradient functions were coded in the GAUSS programming language and used to estimate the model (using the “maxlik” library of functions).

3. Data

This research study uses data from the American Time Use Survey. This survey, conducted by the Census Bureau under contract with the Bureau of Labor Statistics, collects detailed individual-level daily time use information. The sample is drawn from a subset of households responding to the Current Population Survey (CPS) interviews. One individual aged 15 years or older is selected from each sampled household for the survey. Data collection began in January 2003 and has continued yearly since. Additional details on American Time Use Survey and the resulting data can be obtained from the ATUS website, http://www.bls.gov/tus/home.htm.

For the current paper, data collected from individuals 60 years or older in the years 2003 through 2006 are used. Overall, the analysis sample comprises 13,922 individuals. Table 1 presents a brief summary of the socio-economic characteristics of the individuals in the sample by age-cohort. The following observations can be made. First, with increase in age, we have a greater proportion of females in the sample. Second, greater proportions of older individuals have lower education levels. Third, there are slightly higher proportions of older individuals who are Caucasians and native citizens. Fourth, as would be expected, the fraction of individuals employed drops substantially with increase in age. Fifth, older individuals are more likely to live in single-person households (or equivalently, a spouse is less likely to also be living in the households). Sixth, greater proportions of the "younger" old people live in the southern-region whereas a greater proportion of the "older" old people live in the mid-west region. Finally, the distributions across the days of the week and across the years appear to be the same for all age cohorts. Further, it is also useful to note that ATUS over-samples the weekend-days and hence 50% of all data correspond to weekend days (25% each for Saturday and Sunday) and the remaining 50% of the data are equally distributed over the other days of the week.

Table 2 presents descriptive statistics on the time-use allocations across activity types. Specifically, this table presents the average (across all individuals within the age cohort and corresponding to either weekday or weekend day) fraction of time invested in each of 13 different activity types (six in-home activity types, six out-of-home activity types, and travel). Note that the standard deviations are presented in italics. The values are provided separately for weekdays and weekend-days and for each of three age cohorts. Overall, the reader will note a decreasing time allocation to out-of-home activities and travel and an increase in the in-home

time allocation with increase in age. These trends hold for both weekdays and weekend days. On further disaggregating the in-home time use by activity type, we find the increasing trend for all activity types with the exception of personal business and household chores. In the case of out-of-home activities, the time allocation decreases with increase in age for all activity types. Further, for most of the activity purposes and age cohorts, the magnitudes of average time allocations appear to be the same for both weekdays and weekend days. The largest differences are observed in the case of work (with weekdays having higher magnitudes than weekend days), out-of-home chores (also weekday greater than weekend) and religious/civic activities (weekends greater than weekdays).

Table 3 presents descriptive statistics on the time-use allocations across activities classified based on location (in-home, out-of-home, and travel) and companion type (solo, household members, non-household family members, and non-household non-family members). The overall structure of this table is similar to that of Table 2. We find that the total solo time increases with increase in age. This is primarily because of increase in in-home solo time as the amount of time spent alone out-of-home (either in activities or in travel) decreases with increase in age. On examining the time-investments in activity participation jointly with others, we find a general decreasing trend with age (irrespective of the activity location as well as the day of the week). The only exceptions are that the average fraction of daily in-home time spent with non-household non-family members increase with age. Finally, it is also interesting to note that the total time (in-home, out-of-home, and travel) spent with non-household non-family members during weekdays increases with increase in age. In contrast, the total joint time with non-household non-family members during weekend days decreases with increase in age.

4. Empirical Results

This research develops two models of the time-use patterns of the elderly Americans. In the first model, the time allocations across different activity types are examined. This model is presented and discussed in Section 4.1. In the second model, the time allocations with different types of companions are examined. This model is presented and discussed in Section 4.2

4.1 Fractional Time Allocation across Activity Types

As already discussed in Section 3, the activities undertaken by an individual during a day are classified into 13 categories (six in-home activity types, six out-of-home activity types, and travel). A fractional-split model describing the time allocation across these thirteen categories is discussed in this section. For the sake of presentation convenience, the model parameters corresponding to the in-home activity types are presented in Table 4 and those corresponding to out-of-home activity types are presented in Table 5 (although all the model parameters were estimated together). The travel activity is taken as the "reference" or the "base" category and hence the parameters corresponding to this category are set to zero. The model parameters which are not statistically significant at at-least 95% confidence level (*i.e.,* t-statistics < 1.95) are given in italics.

On examining the marginal impact of age, we find that older individuals allocate more time to all types of in-home activity types. In the case of time allocated to out-of-home activities, we find that older people spend more time in eating/drinking and religious/civic activities compared to younger individuals. However, there appears to be no statistically significant impact of age for the other out-of-home activity types.

Men are estimated to allocate less time (compared to women) to all types of in-home activities except TV watching (in the latter case, men spend more time than women). Men also allocate lesser time to out-of-home activities such as chores, shopping, and religious/civic. In contrast, men allocate higher fractions of time to out-of-home leisure activities than women.

Ethnic differences in time-allocation patterns are also observed. For example, Caucasians appear to spend lesser time in in-home TV watching or in OH religious activities but spend more time in chores and eating/drinking activities, both in-home and out-of-home.

Individuals with high-school education or lower are found to spend more time (compared to individuals with higher education levels) in all types of in-home activity types. Similarly, they are also found to spend more time to several out-of-home activity pursuits. A plausible reason for this effect does not appear to be readily apparent especially because the model also controls for the employment status of the individual, which in turn could be determined by the education levels. Further examination of this variable will be undertaken.

The employment status of the individual has a strong impact on their time use patterns. In general we find that employed individuals spend lesser time in-home in all activity types except personal business. In the latter case, the time investment increases possibly because work

undertaken in-home was classified as “personal business”. The reader will also note that full time workers spend lesser amounts of time than part-time workers in all in-home activity types other than personal business. The employment status is also found to constrain individuals’ time allocation to all out-of-home non-work activity types. The only exception is that full time workers spend more time in OH eating/drinking activities than either part-time or unemployed individuals. It is also useful to note here that the “work” activity type is assumed to be unavailable to unemployed individuals and hence the model necessarily allocates zero work time to individuals who are not employed.

The time-allocation patterns also vary based on the composition of the household. Specifically, we find that individuals in single-person household spend lesser time eating in-home but more time eating out-of-home. Further they also spend lesser time in in-home chores but spend more time in out-of-home leisure activities. These patterns appear to be intuitively reasonable. In the case of couple households, individuals spend less time in-home watching TV or in OH work activities. The reader will also note that both single person and couple households spend more time in out-of-home eating activities compared to household types in which other members (such as children) are present. In addition to the presence of a spouse, his/her employment status also influences the time-allocation of individuals. Specifically, we find that individuals with employed spouses spend lesser time in predominantly all types of in-home activities. However, there appears to be no impacts of the employment status of the spouse on the relative time invested in different types of OH activities.

Finally, the day of the week is also found to have a strong impact on the time allocation of individuals. In general, more time is allocated on weekend days to rest and relaxation type activities and less time to work or maintenance-type activities.

4.2 Fractional Time Allocation across Companion Types

The companions with whom activities and travel may be pursued are broadly classified into the following four categories: solo (or no companions), household members (predominantly spouse, children/grandchildren are the next major types of household members), non-household family members, and non-household non-family members (such as friends and neighbors). Each of in-home, out-of-home, and travel activities may be pursued with each of the four different types of companions resulting in a total of 12 different categories. A fractional-split model

describing the time allocation across these twelve categories is discussed in this section. For the sake of presentation convenience, the model parameters corresponding to the in-home activity types are presented in Table 6, those corresponding to out-of-home activity types are presented in Table 7, and those corresponding to travel activities are presented in Table 8 (although all the model parameters were estimated together). In-home solo activities are taken as the "reference" or the "base" category and hence the parameters corresponding to this category are set to zero. The model parameters which are not statistically significant at at-least 95% confidence level (*i.e.,* t-statistics < 1.95) are given in italics.

As individuals age, they are found to spend more time in-home with household members, (if such members are available) and lesser time in-home with non-household family members. It is useful to note here that activity/travel participation with household members is assumed to be not available for individuals in single-person households. As individuals age, they are also found to spend less time in out-of-home activities and travel with any companion type. Perhaps this is reflective of an overall reduction in out-of-home time as individuals age.

Men are found to spend more time participating in activities and travel either solo or with household members. In contrast, men spend lesser time with non-household family members (in all of in-home, out-of-home and travel pursuits).

Caucasians allocate a greater fraction of time for activity/travel participation with household members compared to individuals from other ethnicity. Further they also spend more time out-of-home either solo or with non-household family members.

Individuals with high-school education or lower allocate a smaller fraction to their time for undertaking activities and travel with non-household non-family members. Similarly, they also spend lesser time in solo out-of-home activities and travel. In contrast, they spend more time with non-household family members in both in-home and out-of-home activities.

Individuals who are employed spend more time alone and lesser time with any type of companion as indicated by negative coefficients on all non-solo categories. This appears reasonable as the work times may limit workers ability to co-ordinate joint activity participation. Further, it also useful to note that work episodes are assumed to be "solo" in this analysis.

Individuals living in single-person households spend more time in out-of-home activities and travel with non-household members (both family and non-family). Further they also spend more time traveling alone. Undertaking activities and travel with household members is not an

option for single-person households and, as already indicated, this constraint is enforced in the model. Individuals in couple households spend more time with family members (both household and non-household) in activity participation and travel. The presence of an employed spouse limits the in-home time spent jointly with household members (as the spouse is often the other household member) but increases the time spent out-of-home activities and travel with non-household family members.

Finally, weekend days are found to be ore conducive for joint activity participations as is indicated by positive coefficients on all non-solo categories.

5. Summary

This paper developed fractional split models of the time-use patterns of the elderly Americans. Data from the American Time Use Surveys were used to understand the elderly individuals' allocation of time across activity types and companion types. The empirical model highlights the statistically-significant effects of several socio-economic variables on the time-use patterns. We envision these preliminary results to inform the development of richer empirical specifications by fully segmenting the population into age cohorts. In addition, the enhanced specifications will also control for the influence of residential location on the time-use patterns. Further, as highlighted by the descriptive statistics in Table 1, the elderly of the future might have different characteristics than the elderly of today. For example, they could be more educated, living in a different part of the country, and more likely to be non native-citizens. Hence, it would be useful to examine the temporal trends in the time-use patterns of the elderly.

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Table 1. Sample Characteristics

	Age 60-69 years	Age 70-79 years	Age 80 years and above	Total
Number of Respondents	6675	4805	2442	13922
Gender				
Male	42.95	38.63	32.02	39.54
Female	57.05	61.37	67.98	60.46
Highest Level of Education				
High school or lower	50.92	59.15	63.35	55.94
High school through bachelor's degree	38.02	31.47	30.47	34.43
Masters degree or higher	11.06	9.39	6.18	9.63
Ethnicity				
White	83.33	86.43	89.03	85.40
Other	16.67	13.57	10.97	14.60
Citizenship				
By birth	91.34	93.05	94.27	92.44
By naturalization or non citizen	8.66	6.95	5.73	7.56
Employment Status				
Full time	27.90	7.16	2.62	16.31
Part time	14.29	8.39	3.11	10.29
Not employed	57.81	84.45	94.27	73.40
Spouse Present in Household				
Yes	58.10	45.45	24.41	47.82
No	41.90	54.55	75.59	52.18
Employment Status of Spouse (if present)				
Full time	16.91	3.45	0.70	9.42
Part time	6.26	2.93	0.78	4.15
Not employed	34.92	39.06	22.93	34.25
Household Structure				
Single person	32.64	46.14	66.38	43.22
Couple	47.46	40.73	22.93	40.83
No spouse but other members present	9.26	8.41	9.21	8.96
Spouse and other members present	10.64	4.72	1.47	6.99
Residential Location				
North-East region	19.61	20.50	20.84	20.13
Mid-West region	24.09	23.73	28.17	24.68
South region	37.89	38.48	33.82	37.38
Western region	18.41	17.29	17.16	17.81
Day of the Week				
Sunday	25.29	26.26	25.47	25.66
Monday	10.53	11.20	10.61	10.77
Tuesday	10.49	11.07	8.80	10.39
Wednesday	10.02	9.84	10.65	10.07
Thursday	10.31	9.43	10.73	10.08
Friday	9.90	9.72	9.83	9.83
Saturday	23.46	22.48	23.91	23.20
Year				
2003	33.75	34.46	31.53	33.61
2004	24.87	23.66	22.97	24.12
2005	20.63	20.83	22.40	21.01
2006	20.75	21.04	23.10	21.26

Table 2. Descriptive Statistics on Time-Allocations by Activity Type

		Weekday			Weekend		
		Age 60-69 years	Age 70-79 years	Age 80 years and above	Age 60-69 years	Age 70-79 years	Age 80 years and above
	Travel	4.85 *5.61*	4.12 *5.44*	2.66 *3.62*	4.76 *5.99*	3.61 *4.96*	2.78 *4.42*
In-Home Activities	Sleep	35.11 *8.50*	36.45 *8.18*	38.44 *8.79*	37.02 *8.60*	37.66 *8.87*	39.08 *9.22*
	Personal Business	4.58 *7.31*	3.69 *5.85*	3.51 *4.54*	4.22 *6.55*	3.89 *5.30*	4.00 *6.10*
	Household Chores	10.47 *11.24*	11.71 *11.05*	10.78 *10.26*	10.90 *11.44*	9.81 *10.72*	8.53 *9.32*
	Eat/Drink	3.49 *3.05*	4.24 *3.25*	4.60 *3.49*	3.49 *3.25*	3.88 *3.13*	4.36 *3.46*
	Television	13.30 *12.89*	16.11 *13.27*	17.83 *13.63*	14.99 *13.90*	16.92 *14.26*	17.53 *14.31*
	Leisure	8.29 *9.64*	11.37 *10.97*	13.48 *11.61*	9.45 *10.34*	12.15 *11.27*	14.67 *13.01*
	Total In-Home	75.26 *19.29*	83.57 *15.53*	88.65 *13.21*	80.08 *17.23*	84.30 *15.26*	88.18 *13.60*
Out-of-Home Activities	Personal / Household Chores	1.49 *4.04*	1.49 *3.96*	1.30 *3.58*	0.85 *3.03*	0.60 *2.67*	0.52 *2.64*
	Work	9.38 *15.42*	2.34 *7.96*	0.67 *4.55*	2.16 *7.93*	0.87 *4.71*	0.25 *2.30*
	Shopping	1.77 *3.44*	1.78 *3.37*	1.29 *2.68*	2.07 *4.06*	1.44 *3.35*	1.03 *2.64*
	Eat/Drink	1.68 *2.77*	1.36 *2.69*	1.20 *2.61*	1.88 *3.24*	1.72 *3.02*	1.51 *2.91*
	Volunteer / Relegious / Civic	1.54 *4.75*	1.48 *4.68*	1.09 *4.07*	2.95 *6.18*	2.99 *6.10*	2.46 *5.58*
	Leisure	4.03 *7.40*	3.85 *7.21*	3.15 *6.55*	5.24 *9.11*	4.48 *8.09*	3.27 *6.92*
	Total Out-of-Home	19.89 *17.30*	12.30 *12.85*	8.69 *11.11*	15.16 *14.24*	12.09 *12.47*	9.05 *11.21*

Table 3. Descriptive Statistics on Time-Allocations by Companion Type

		Weekday			Weekend		
		Age 60-69 years	Age 70-79 years	Age 80 years and above	Age 60-69 years	Age 70-79 years	Age 80 years and above
Solo	Travel	2.75 *3.77*	2.06 *3.28*	1.25 *2.30*	1.76 *3.18*	1.37 *2.76*	0.98 *1.95*
	In-Home Activities	62.40 *19.53*	69.38 *19.30*	77.41 *18.97*	63.99 *19.20*	69.42 *19.85*	76.01 *19.36*
	Out-of-Home Home Activities	12.55 *15.94*	5.30 *9.55*	2.95 *6.96*	4.71 *9.40*	2.96 *6.40*	2.14 *5.34*
	Total Time	77.69 *17.95*	76.74 *19.30*	81.61 *18.42*	70.46 *20.11*	73.75 *20.29*	79.12 *19.49*
With Household Members	Travel	1.10 *3.39*	0.96 *2.81*	0.48 *1.89*	1.75 *4.33*	1.13 *3.14*	0.55 *2.48*
	In-Home Activities	10.02 *13.15*	11.09 *15.48*	7.67 *14.82*	12.09 *15.47*	11.05 *16.14*	8.08 *15.71*
	Out-of-Home Home Activities	1.44 *4.39*	1.38 *4.18*	0.72 *2.96*	2.35 *5.52*	1.88 *5.33*	0.77 *3.07*
	Total Time	12.56 *15.51*	13.42 *17.84*	8.88 *16.45*	16.19 *18.62*	14.06 *18.99*	9.40 *17.53*
With Non-Household Family Members	Travel	0.48 *2.01*	0.50 *2.78*	0.46 *1.88*	0.62 *2.18*	0.54 *2.17*	0.71 *2.82*
	In-Home Activities	1.86 *6.45*	1.80 *6.22*	1.52 *5.69*	2.73 *7.97*	2.51 *7.47*	2.54 *8.22*
	Out-of-Home Home Activities	1.95 *5.86*	1.72 *5.61*	1.31 *4.40*	3.31 *8.16*	2.73 *7.40*	2.50 *7.08*
	Total Time	4.30 *9.88*	4.02 *9.89*	3.29 *8.49*	6.66 *12.57*	5.78 *11.68*	5.74 *12.19*
With Non-Household Non-Family Members	Travel	0.52 *2.56*	0.61 *2.69*	0.47 *1.72*	0.62 *2.89*	0.57 *2.57*	0.55 *1.98*
	In-Home Activities	0.98 *4.21*	1.30 *5.01*	2.04 *6.45*	1.27 *5.00*	1.31 *5.25*	1.55 *5.27*
	Out-of-Home Home Activities	3.95 *7.58*	3.90 *7.54*	3.71 *7.48*	4.79 *9.22*	4.52 *8.33*	3.64 *7.21*
	Total Time	5.45 *9.72*	5.81 *10.21*	6.22 *10.30*	6.68 *11.81*	6.41 *10.93*	5.74 *9.81*

Table 4. Fractional Split Model for Time Allocation by Activity Type: In-home Activities

	Sleep		Personal Business		Household Chores		Eat/Drink		TV		Leisure	
	Param.	t stat.	Param.	t stat.	Param.	t stat.	Param.	t stat.	Param.	t stat.	Param.	t stat.
Constant	2.124	41.851	*0.062*	*0.844*	1.095	16.650	-0.272	-4.464	1.175	18.352	0.866	12.930
Age[1]												
70-79 years	0.136	5.021	0.114	2.759	*0.066*	*1.845*	0.243	7.277	0.149	4.296	0.313	8.708
>= 80 years	0.488	12.985	0.439	8.137	0.257	5.338	0.680	15.193	0.486	10.432	0.786	16.555
Male	-0.082	-3.394	-0.374	-10.085	-0.528	-15.872	-0.061	-2.044	0.191	6.213	-0.163	-5.053
White	*-0.062*	*-1.727*	-0.157	-3.095	0.195	4.092	0.181	4.165	-0.180	-4.055	*-0.035*	*-0.754*
High-school or lower education	0.271	11.596	0.087	2.562	0.192	6.135	0.138	4.790	0.486	16.050	0.083	2.708
Employment[2]												
Part time	-0.215	-6.483	0.196	3.896	-0.379	-7.898	-0.298	-6.945	-0.456	-9.971	-0.405	-8.533
Full time	-0.245	-8.255	0.294	6.035	-0.527	-11.893	-0.408	-10.385	-0.698	-16.800	-0.653	-14.855
Housheold composition[3]												
Single person	*-0.065*	*-1.811*	*0.028*	*0.521*	-0.244	-5.230	-0.186	-4.265	*-0.002*	*-0.032*	*-0.028*	*-0.587*
Couple	-0.081	-2.316	-0.110	-2.084	*-0.080*	*-1.725*	*0.024*	*0.546*	-0.130	-2.912	*0.017*	*0.364*
Spouse is employed	-0.120	-3.649	*0.010*	*0.187*	*-0.085*	*-1.814*	-0.166	-3.852	-0.222	-4.972	-0.177	-3.722
Weekend day	0.101	4.385	*0.034*	*0.990*	*-0.015*	*-0.481*	*0.028*	*0.985*	0.142	4.835	0.169	5.594

[1] base category is age 60-69 years

[2] base category is not employed

[3] base category are households in which persons other than the spouse

Table 5. Fractional Split Model for Time Allocation by Activity Type: Out-of-Home Activities

	Chores		Work		Shopping		Eat/Drink		Religious / Civic		Leisure	
	Param.	t stat.	Param.	t stat.	Param.	t stat.	Param.	t stat.	Param.	t stat.	Param.	t stat.
Constant	-0.960	-8.586	0.815	8.109	-0.862	-10.722	-1.803	-22.951	-0.720	-7.970	-0.419	-5.527
Age[1]												
70-79 years	*-0.063*	*-0.968*	*-0.068*	*-1.082*	*-0.066*	*-1.507*	0.083	2.238	0.130	2.452	*-0.063*	*-1.611*
>= 80 years	*0.092*	*1.052*	*0.090*	*0.629*	*-0.091*	*-1.553*	0.295	5.852	0.224	3.046	*-0.072*	*-1.302*
Male	-0.127	-2.178	*0.055*	*1.134*	-0.385	-9.655	*0.063*	*1.883*	-0.243	-4.980	0.115	3.206
White	0.233	2.747	*0.054*	*0.742*	0.201	3.390	0.522	9.219	-0.429	-7.180	0.171	3.190
High-school or lower education	*0.052*	*0.903*	0.386	8.142	0.108	2.847	*-0.001*	*-0.018*	0.113	2.398	0.151	4.389
Employment[2]												
Part time	-0.315	-3.639	-	-	-0.229	-3.879	*0.076*	*1.593*	-0.149	-2.102	-0.313	-5.772
Full time	-0.558	-6.740	0.674	11.231	-0.339	-6.228	0.119	2.914	-0.275	-4.214	-0.475	-9.867
Housheold composition[3]												
Single person	*-0.142*	*-1.681*	*-0.029*	*-0.422*	*-0.042*	*-0.733*	0.245	4.651	*0.067*	*0.955*	0.371	6.846
Couple	*-0.151*	*-1.753*	-0.135	-2.110	*0.023*	*0.411*	0.139	2.698	*0.052*	*0.743*	*0.083*	*1.538*
Spouse is employed	*-0.115*	*-1.384*	*-0.112*	*-1.854*	*-0.002*	*-0.040*	*0.048*	*1.040*	*-0.053*	*-0.724*	*-0.021*	*-0.388*
Weekend day	-0.654	-11.073	-1.446	-23.357	*0.048*	*1.272*	0.223	7.064	0.746	15.341	0.258	7.619

[1] base category is age 60-69 years

[2] base category is not employed

[3] base category are households in which persons other than the spouse

Table 6. Fractional Split Model for Time Allocation by Companion Type: In-Home Activities

	Solo		Household Members		Non-Household Family Members		Non-Household Non-Family Members	
	Param.	t stat.	Param.	t stat.	Param.	t stat.	Param.	t stat.
Constant			-1.795	-35.216	-3.402	-32.776	-3.825	-29.272
Age[1]								
70-79 years			0.058	2.195	-0.180	-2.756	*-0.065*	*-0.808*
>= 80 years			0.141	3.570	-0.303	-3.496	*0.065*	*0.702*
Male			0.107	4.567	-0.536	-8.417	*-0.126*	*-1.689*
White			0.305	7.159	*-0.025*	*-0.308*	*0.037*	*0.403*
High-school or lower education			0.082	3.571	0.172	3.002	-0.161	-2.432
Employment[2]								
Part time			-0.165	-4.473	*0.007*	*0.070*	*-0.159*	*-1.390*
Full time			-0.239	-7.076	*-0.147*	*-1.726*	-0.543	-4.502
Housheold composition[3]								
Single person			-	-	-0.196	-2.298	*0.183*	*1.798*
Couple			0.343	11.575	0.267	3.125	*-0.215*	*-1.958*
Spouse is employed			-0.242	-8.496	*-0.157*	*-1.691*	*0.116*	*0.913*
Weekend day			0.152	6.634	0.386	6.888	*0.032*	*0.483*

[1] base category is age 60-69 years

[2] base category is not employed

[3] base category are households in which persons other than the spouse

Table 7. Fractional Split Model for Time Allocation by Companion Type: Out-of-Home Activities

	Solo		Household Members		Non-Household Family Members		Non-Household Non-Family Members	
	Param.	t stat.	Param.	t stat.	Param.	t stat.	Param.	t stat.
Constant	-2.962	-50.348	-3.801	-37.671	-3.930	-35.538	-2.982	-40.258
Age[1]								
70-79 years	-0.197	-5.687	*-0.009*	*-0.155*	-0.273	-4.695	-0.133	-3.324
>= 80 years	-0.472	-8.562	-0.336	-3.712	-0.549	-6.990	-0.392	-7.383
Male	0.195	6.679	0.248	4.946	-0.337	-6.117	*0.061*	*1.637*
White	0.111	2.638	0.288	3.271	0.283	3.769	*0.087*	*1.725*
High-school or lower education	-0.068	-2.329	-0.104	-2.083	0.190	3.756	-0.242	-6.905
Employment[2]								
Part time	1.501	37.037	*-0.007*	*-0.094*	*0.054*	*0.683*	*0.011*	*0.189*
Full time	2.070	59.073	-0.144	-2.093	*-0.004*	*-0.056*	*0.033*	*0.657*
Housheold composition[3]								
Single person	*0.062*	*1.467*	-	-	0.203	2.465	0.379	6.771
Couple	*-0.052*	*-1.262*	0.342	5.306	0.277	3.418	0.213	3.722
Spouse is employed	*0.047*	*1.160*	*-0.011*	*-0.172*	0.171	2.179	*0.050*	*0.862*
Weekend day	-0.888	-28.047	0.441	8.928	0.516	10.325	0.129	3.791

[1] base category is age 60-69 years

[2] base category is not employed

[3] base category are households in which persons other than the spouse

Table 8. Fractional Split Model for Time Allocation by Companion Type: Travel Activities

	Solo		Household Members		Non-Household Family Members		Non-Household Non-Family Members	
	Param.	t stat.	Param.	t stat.	Param.	t stat.	Param.	t stat.
Constant	-3.591	-53.954	-4.079	-40.318	-5.046	-34.796	-4.760	-22.695
Age[1]								
70-79 years	-0.166	-4.815	-0.144	-2.535	*-0.173*	*-1.971*	*-0.119*	*-1.295*
>= 80 years	-0.661	-13.949	-0.385	-4.047	*-0.195*	*-1.902*	-0.475	-4.474
Male	0.323	10.663	0.126	2.492	-0.466	-5.407	*-0.106*	*-1.231*
White	*0.034*	*0.761*	0.397	4.655	*-0.025*	*-0.261*	*-0.152*	*-1.342*
High-school or lower education	-0.339	-11.318	-0.216	-4.292	*0.114*	*1.477*	-0.373	-4.822
Employment[2]								
Part time	0.585	13.445	*0.021*	*0.267*	*-0.131*	*-1.185*	*-0.069*	*-0.573*
Full time	0.688	18.230	*-0.028*	*-0.380*	*-0.049*	*-0.492*	*0.110*	*0.969*
Housheold composition[3]								
Single person	0.329	7.231	-	-	0.354	3.403	0.739	5.114
Couple	*-0.090*	*-1.947*	0.358	5.354	0.311	2.747	*-0.026*	*-0.185*
Spouse is employed	0.163	3.611	*-0.035*	*-0.569*	0.324	2.755	*0.075*	*0.511*
Weekend day	-0.444	-14.885	0.393	7.848	0.213	2.919	*0.053*	*0.681*

[1] base category is age 60-69 years

[2] base category is not employed

[3] base category are households in which persons other than the spouse