

**The Effect of Family Structure on Parents' Child Care Time  
in the United States and the United Kingdom**

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Preliminary Draft: Do Not Cite without Permission  
June 2006

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## Abstract:

The time that parents devote to caring for their children represents an enormous, yet sometimes under-appreciated, investment in human capital. In this study, we use time-diary data from the 2003 and 2004 American Time Use Surveys (ATUS) and from the 2000 United Kingdom Time Use Study (UKTUS) to investigate the determinants of mothers' and fathers' time investments in child care in the U.S. and the U.K.. Our particular focus is on the effect of family structure (whether respondents are married, cohabiting, or single-parents) on time use. As both family structure and size (the number of children) are choice variables, we estimate systems of equations that control for the endogeneity of these choices. Time spent on primary child care, passive child care, and market work are modeled using correlated tobit equations to handle non-negativity constraints and the constraints imposed by the 24 hour diary time limit. We find little difference in the time investments of married and cohabiting parents. The most substantial cross-country differences arise in the time spent on market work by single as opposed to couple-based households. Single parents in the U.S. spend more time on market work relative to their coupled counterparts, while single parents in the U.K. spend less time on market work relative to their coupled counterparts.

## **The Effect of Family Structure on Parents' Child Care Time in the United States and the United Kingdom**

### I. Introduction

The time that parents devote to caring for their children represents an enormous, yet sometimes under-appreciated, investment in human capital. These investments in time are invaluable in terms of keeping children safe and healthy and in furthering their physical, emotional, and intellectual development. Recent trends in family structure and in women's employment may, however, put these investments at risk. The rise in single-parent households means that fewer families can rely on the services of two adults to provide for child care. Even the rise in cohabiting as opposed to married households may have a detrimental effect given the generally weaker intrahousehold ties and the shorter duration of cohabiting relationships. Women's increasing labor force attachment and the trend towards dual career households introduce additional time constraints that may negatively influence time devoted to child care. In contrast, declining family size may act to increase effective investments.

In this study, we use time-diary data from the 2003 and 2004 American Time Use Surveys (ATUS) and from the 2000 United Kingdom Time Use Study (UKTUS) to investigate the determinants of mothers' and fathers' time investments in child care. Our particular focus is on the effect of family structure on these time use measures. Unlike previous economic studies, such as Kooreman & Kapteyn (1987) and Hallberg & Klevmarken (2003), which have analyzed alternative child care activities but only among two-parent families, we examine differences among married, cohabiting, and single-parent families. As both family structure and size (the number of children) are choice variables, we estimate systems of equations that control for the likely endogeneity of these choices. The relatively large size of these surveys (over 20,000

diaries in each) and the balanced weekday/weekend reports allow us to investigate these relations separately for men and women, for weekdays and for weekends. Finally, the time diary nature of the data offer distinct advantages over data based on narrowly-structured activity recall questions. The diaries record both all the primary activities in which people are engaged and who else is present during these activities. Thus, we are able to identify time spent on primary care activities – activities such as playing with a child or changing a diaper which are done for the direct benefit of a child – and time spent on passive care – activities done with a child present that do not directly involve the child such as shopping – and time spent on employment. Thus, we jointly model both child care and employment as a function of family structure and other control variables.

We employ a system of correlated tobit equations to model the time parents spend in primary child care, passive child care, and market work. The tobit framework accounts for the modest proportions of people who report spending no time in each given activity on a particular day. We estimate correlated specifications because multiple uses of time are reported by every respondent and because each respondent's total daily time allotment is constrained to 24 hours. It is this correlation that permits work time and child care time to be related. For the UKTUS, which records two diaries for each person and provides information for both parents in two-parent households, we modify our estimation procedure to account for additional clustering in the data. Finally, in the specification that controls for endogeneity of family structure and size, we incorporate further equations for the type of relationship (married/cohabiting/single) and for the number of children in specific age groupings (0-1, 2-3, 4-6, 7-11, and 12-17).

The rest of this paper is organized as follows. We discuss conceptual models of time use, most notably the economic household production model, in the next section and briefly review

previous studies on time allocation. We describe the ATUS and UKTUS data sets in Section III and discuss how we construct our measures and select our observations for the empirical analysis. In Section IV we present our econometric specification. Estimation results are reported and analyzed in Section V. Concluding remarks appear in Section VI.

## II. Literature Review

The primary conceptual framework that economists use to analyze people's use of market and non-market time is Becker's (1965) time allocation, or household production, model. In this model, people derive utility or satisfaction from household-produced goods such as their children's health, development, and well-being. A fundamental insight provided by this model is that the production and enjoyment of these outcomes require purchases of goods and services and contributions of time. In effect, people face a technological constraint, similar to the constraint faced by firms, regarding how inputs of goods and time can be combined to generate the desired outcomes. Alternative 'production' techniques for these outcomes are feasible. For instance, to foster their children's intellectual and emotional development, parents' possible strategies range from spending a great deal of their own time teaching and caring for their children to engaging the services of a day-care provider. As in other consumer and labor models, people also have constraints on their financial resources and time. The model assumes that people rationally choose the amounts of time that they spend in different activities, including child care and market labor, and the amounts of goods that they purchase to maximize their utility subject to the technological, financial, and time constraints they face.

Family structure is presumed to affect caregiving through a number of mechanisms in the household production model. First, changes in family structure affect resources and needs.

Adding an able-bodied adult through marriage or cohabitation increases the household's available time and money resources, which could increase the amount of caregiving, the purchase of care services, or both. An added child increases the household's need for care. Second, family structure affects the opportunities for specialization. With multiple household members, one person can focus on market work while another focuses on caregiving (Becker 1985). Marriages, by virtue of being longer lasting and more stable, are likely to promote higher levels of specialization than other relationships (Willis & Michael 1994). Third, family structure might directly influence the production of well-being outcomes by affecting the levels of stability and stress in the household (see, e.g., Wu & Martinson 1993) or by providing role models for children (see the discussion in Haveman & Wolfe 1995). Fourth, family structure could affect the amount of conflict in the household. On the one hand, co-residence helps to reduce the coordination problems in caregiving (Weiss & Willis 1985). On the other hand, adding a decision-maker to the household increases the opportunities for conflict. When we consider these mechanisms together, the net impact of family structure is ambiguous.

Gender may also affect caregiving in the household production model. The model implies that specialization is likely to occur in households with two adults if there are increasing returns to time spent in household and market activities and the adults can share or transfer their resources and output (Becker 1985). Specialization could also be a reasonable strategy if there are fixed costs (Cogan 1980) or quasi-fixed costs (Oi 1962) of labor. The economic model, by itself, does not explain the sex-typing of tasks. However, the model does suggest that small, initial differences in relative abilities or circumstances can lead to specialization. Thus, if women are brought up to have a slight advantage in caregiving or housework or, alternatively, if childbearing places them at a temporary disadvantage in the labor market, there could be

profound gender differences in specialized activities. Discrimination in the labor market could also contribute to specialization.

An analysis of the time devoted to the market and to caregiving requires that such time be measured. A number of studies have relied on responses to survey questions intended to collect information on the “typical” frequency and duration of particular activities (e.g., Aldous et al. 1998 and Muller 1995). Yet, there may be problems with these measures because people tend to over-report time when answering questions about time use in surveys (Robinson 1985). Overreporting is especially severe for tasks like child care that are performed as secondary activities (Robinson 1985, Fedick et al. 2003). Time-diary data suffer less from this recall bias than questionnaire data (Robinson 2002; Juster & Stafford 1985, 1991; Robinson & Bostrom 1994; and Marini & Shelton 1993). This is because the recall period is usually short and the diary measures actual rather than typical time spent on particular activities on a specified day or days.

Even with time diary data, however, there exists some debate regarding the measurement of time. Many time diaries collect information on both primary and secondary activities. Some even collect information on a third simultaneous activity. All typically also collect information on the other persons present. While these are usually not viewed as important issues for measuring the amount of market work, they are acutely relevant for measuring child care activities, which can range from physically caring for or interacting with a child to loose monitoring or simply providing custodial care. Empirical research has tended to distinguish between two types of child care activities: primary child care, which involves direct interactions with or activities on behalf of a child, and passive child care, which encompasses all other

activities performed in the presence of a child.<sup>1</sup> Each is important in its own right. Bianchi (2000) has argued that primary child care time is an important measure of quality time spent with children and that by this measure, there has been little change in child care time over time or between two-career and one-career couples. At the same time, she reports that time spent in the presence of children does differ with the employment status of the mother. Mothers who work outside the home spend substantially less time in the presence of their children than do other mothers.

The limited availability of time-diary data means that only a few multivariate studies of child care have employed such data. Kooreman and Kapteyn (1987) used U.S. time-diary data from the 1975-1981 Time Use Longitudinal Panel on married couples to estimate models of time spent in child care and other activities. They found that higher wages for fathers increased care provided by mothers, that mothers' provision of care did not respond to changes in their own wages, and that fathers' provision of care did not respond to changes in either's wages. Examining married parents from the same survey, Nock and Kingston (1988) regressed aggregate time with children and time spent in particular care activities against measures of mothers' and fathers' work schedules, reporting that mothers' employment, especially employment during after-school hours, decreased their time spent with children. However, the effects on children were partially mitigated because the reductions were concentrated in secondary activities with children and not in child and baby care *per se*. There was little evidence that fathers compensated by increasing their direct care activities or substituting among activities.

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<sup>1</sup> Folbre, Yoon, Finnoff, and Fuligni (2005) argue for an even more inclusive measure that includes time spent while the child is sleeping. Bianchi (2000) and Kalenkoski, Ribar, and Stratton (2005) look at time spent on secondary child care.

Bryant and Zick (1996) used a larger U.S. sample of two-parent, two-child families and estimated instrumental variable models that attempted to account for the endogeneity of mothers' employment. They also found that the hours that mothers spent in market labor reduced the time that they devoted to child care; however, this effect appeared mainly for older children. Like Nock and Kingston, they found little evidence that fathers compensated with more child-care time of their own. Finally, Hallberg and Klevmarken (2003) used Swedish data on dual-earner, married and cohabiting couples to investigate the determinants of child care, instrumenting for the parents' wages, the parents' market time, and the children's time spent in external care. They found that the time a spouse spends in child care has a positive impact on own time spent in child care, that neither own nor spousal wages affect child-care time, that own hours worked have a negative effect on own time spent in child care, and that spousal hours worked have a positive effect.

These studies all focus on couple households. Few compare couple and single-parent households. One exception is Sandberg and Hofferth (2001) who examine time spent in the presence of children and find that single-parent households spend substantially less time with children. Another is Kalenkoski, Ribar, and Stratton (2005) who use British data to jointly examine primary and secondary child care time as well as time in market work. They find that married and cohabiting parents allocate their time similarly while single parents spend more time on child care and less time in market work. This paper is an extension of the latter work to include US as well as British data and to distinguish further between weekday and weekend days.

### III. Data

American Time Use Survey. The ATUS is one of two key sources of data for the empirical analysis. It is an ongoing national survey that has been conducted monthly by the U.S. Bureau of the Census for the U.S. Bureau of Labor Statistics since January 2003. For this study, we use data from 2003 and 2004. Subjects for the ATUS are drawn from households in their last month of participation in the Current Population Survey (CPS). One person aged 15 or over within each outgoing CPS household is randomly selected to participate in the ATUS.

The most distinctive feature of this survey is its time-use component which consists of a short (24-hour), retrospective time diary describing how an individual spends his or her time, including time spent working in the labor market and caring for children. Respondents describe what they were doing at different times during the day, and the descriptions are later coded into standardized activities with three levels of detail. The information for each primary activity includes a descriptive code for the activity, the duration and location of the activity, and who else was present during the activity. The interviews are conducted every month of the year and every day of the week, with a higher proportion of interviews occurring on weekends to achieve an approximate balance between weekday and weekend reports.

The survey also collects household roster and demographic information. The survey subjects are asked to identify who else lives in the household and to list the members' genders, ages, and relationships to the subject. The respondent is also asked questions regarding his/her individual characteristics such as employment, earnings, and demographic information to update some of the information from the CPS survey.

In 2003 there were a total of 20,720 respondents to the ATUS and in 2004 there were 13,973, for a total of 34,693. However, we do not use all of these observations. Because of the

difficulty in identifying parent-child relationships in complex households, we exclude observations from households with multiple families, households with same-sex couples, and households where a child's caregiver is unable to be determined due to the presence of other related or non-related individuals in the household. Because we are keenly interested in work issues, we also exclude respondents who were enrolled in school full time and those who were themselves or whose partners were at retirement age (age 62 or above). We also delete observations with allocated data or with inconsistent demographic information between the CPS and ATUS surveys. These exclusions reduce our sample to 21,023 individuals, each living in a separate household. This sample is used to estimate family structure equations for parents' living arrangements and numbers of children in different age ranges.

The time use sample is a subset of the sample used to estimate the family structure equations and includes 10,979 parents of co-resident children under the age of 18 or the spouses or unmarried partners of parents. These individuals are in the risk set for caregiving.

For our empirical analyses, we focus on three uses of time: primary child care, passive child care, and market work. Primary child care activities are defined with respect to household children and include physical care, reading, playing (including sports), arts and crafts, talking/listening, helping/teaching, organizing and planning, supervising, attending events, waiting, picking up or dropping off, and travel related to caring for or helping children. We construct the corresponding time-use measure by summing up all minutes spent on child care as a primary activity. Our measure of passive care is constructed by summing up all time spent with children aged 14 and under (to be comparable to the UK measure to be discussed) that is not spent in child care as a primary activity, excluding time spent sleeping, working in the market, or in personal care activities. Our market work measure includes time spent at a main job or other

jobs, time spent in security procedures related to work, time spent in work-related activities such as socializing that is part of a job, and time spent in other income generating activities. Time spent searching or interviewing for jobs is not included in the market work measure.

Time use is analyzed separately by gender and by day of week. Holidays are treated like weekend days. Key conditioning variables are the respondent's living arrangement (married, cohabiting, or single), the number of other adults in the household, and the number of children in different age ranges in the household. Controls for the season of the year are included as time of year likely affects children's need for care. In addition to these measures, the empirical analysis utilizes other standard demographic variables, including race/ethnicity, age, and educational attainment of the potential caregiver, and geographic information, including the region of residence, non-metro status, and the state unemployment rate as controls. Finally, we include a dummy variable to identify those interviewed in 2004.

United Kingdom Time Use Survey. The UKTUS is a national household-based study that has multiple questionnaire and time diary components. The questionnaires ask about household characteristics including income and family composition and individual characteristics of the household members, including their educations, employment status, earnings and other demographic information. Time diary data were also collected for each household member age 8 and older. These diaries identify primary and secondary time activities, the location of the activity, and who else was present during the activity for every 10-minute interval during two 24 hour periods: one weekday and one weekend day. In sum, the UKTUS obtained 20,981 time diaries from 11,664 people living in 6,414 households.

We employ sample selection criteria as similar as possible to that used for the ATUS. Same sex couples, households with missing intrahousehold relationship data, individuals not

reporting age or education, individuals less than age 18, individuals who were themselves or were partnered with someone at or above retirement age (60 for women and 65 for men), individuals who were still in school, and individuals with own children under age 18 as well as grandchildren under age 18 were dropped from the sample. All households living in Northern Ireland were also excluded as information regarding the local unemployment rate as well as urbanicity is unavailable for this sample. In an effort to exclude roommates as is done in the ATUS, all persons less than age 23 who were living with unrelated 16 or 17 year olds were excluded. Finally, all multifamily households including children other than the respondent's or other than siblings (when a parent and no own children are present) are excluded. The resulting sample consists of 6848 individuals. This is the sample used to estimate the family structure equations.<sup>2</sup>

The time use sample consists of that subset of the family structure sample that has own or partner children under the age of 18. We also exclude diaries containing fewer than five different activity codes and those missing more than one hour of information. These various exclusions reduce the final sample to 4998 diaries for 2642 adults living in 1597 households. In contrast to the US data, the UK data are designed to include multiple diaries per respondent and diaries for both partners in the household.

As with the analysis of the ATUS data, we focus on three uses of time: primary child care, passive child care, and market work. Primary child care activities are defined here to include physical care, teaching, playing, talking, escorting, and transporting children living in

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<sup>2</sup> An advantage of The UKTUS over the ATUS is that all intrahousehold relationships are identified. Thus, it is possible to 'fix' misreported relations using other information in the sample and to accurately identify all children of cohabiting partners. In this respect, the UKTUS sample will be 'cleaner' than the ATUS sample. However, a comparison of the UKTUS sample used here with another constructed using the same restrictions imposed upon the ATUS reveals only minor differences. Most notably, less than 40 households with unrelated children and only 1 adult (who might reasonably be considered the legal guardian) are excluded from our UKTUS sample but would be included under ATUS rules.

one's own household (child care for others is excluded) as well as transportation to and from educational activities. Our measure of passive child care time includes all time spent with household children age 14 or younger that is not reported as time spent primarily engaged in child care or time spent in sleep, market work, or personal care activities. Note that the age restriction on children for this variable differs from our general definition. While we generally define a household with children as one having children below the age of 18, the UKTUS only codes information on who else is present during an activity by general category and there is no category for household children age 15-17. That passive time is not extended to include time spent sleeping or working or in personal care activities is driven by restrictions in the ATUS data for which the presence of others is not reported for most such activities. In addition, one should note that although a measure of 'active' secondary time spent on child care is available within the UKTUS, it is clear that this measure captures something far different from passive child care. The sample mean for this variable indicates that on average 47 minutes are spent on this activity. By comparison, the US measure of passive child care indicates that on average 283 minutes are spent on this activity. Market work activities are always coded as a primary activity and are specified to include first and second jobs, travel related to work (not commuting time), and lunch/coffee breaks.

As with the ATUS, our analysis will estimate separate time use equations by gender and weekday/weekend (or holiday) status of the diary day and will focus on caregiving as a function of living arrangements, the number of children in different age ranges in the household, and the number of other adults present in the household. Other covariates common to the ATUS include seasonal dummies, own age and education, residence in a rural area, and the local unemployment rate. In lieu of residence in an urban area, we control for residence in London. Information on

race/ethnicity is not employed.

Descriptive Statistics. Table 1 reports the average daily minutes spent on primary child care, passive child care and market work by gender (female/male), living arrangement (single, cohabiting, married), and day of the week (weekday/weekend). Panel A reports these statistics for the US sample, while Panel B reports these statistics for the UK sample.

The number of diaries for each gender-day combination is substantial for both samples: exceeding 1,000 for each combination. The distribution by living arrangement is, however, quite different by country. Within our US sample, about 71% of the women were married, 3% were cohabiting, and 26% were single. The corresponding numbers for men were roughly 90%, 3% and 8%. By contrast, in the UK sample, over three times as many parents were cohabiting (11% of the women and 13% of the men). A comparison of the UK sample distribution with statistics for the UK population at large indicates that this sample distribution is a close match for the population.<sup>3</sup> A substantial fraction of the cross-country differences are driven by cross-country differences in cohabitation rates. National figures indicate that only 5.7% of all American children less than age 18 lived in households with unmarried partners in 2000 and this overstates the fraction living with cohabiting parents.<sup>4</sup>

A comparison of the time use measures across countries indicates some interesting similarities and differences. Gender differences are similar and substantial in both countries. Women report spending over twice as much time on primary child care as men on weekdays and, on weekends, over 40% more in the United States and over 70% more in the United Kingdom.

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<sup>3</sup> According to comparable statistics for dependent children published by the Office of National Statistics in the UK (<http://www.statistics.gov.uk/cci/nugget.asp?id=1163>), in 2004, 67% of the women (men) were married, 11% were cohabiting, and 22% were single. The corresponding figures for men were 84%, 14%, and 2.5% respectively.

<sup>4</sup> National statistics for the United States come from the Bureau of the Census, <http://www.census.gov/prod/2004pubs/censr-14.pdf> Table 3.

Passive child care time is more evenly distributed on weekends, but still predominantly a female activity on weekdays, when women report contributing over 60% more time. In both countries, women devote substantially less time to market work as compared to men, somewhat more than half as much in the United States and somewhat less than half as much in the United Kingdom. On average, on weekdays parents in the United States spend more time on primary child care and less time on passive care than parents in the United Kingdom.

Descriptive statistics for the other variables used in the analysis are reported in Appendix A. A very important set of these variables is the number of children of specific ages: 0-3, 4-6, 7-11, and 12-17 as we expect that primary child care time will fall as children get older. For example, infants need far more attention than teenagers. A somewhat greater fraction of households in our U.S. sample have infants than in our British sample, and a greater fraction of the British sample has teenagers.

#### IV. Econometric Specification

In our multivariate analyses of the ATUS and UKTUS samples, we estimate systems of censored regression (Tobit) models of mothers' and fathers' daily allocations of time to primary child care, passive child care, and market work. Our use of a system approach is motivated by the fact that each person in our sample reports on several uses of time. Unmeasured person-specific characteristics, such as unmeasured needs, resources, abilities or preferences, will lead to correlations in the daily reports. Correlations may also arise because the time allocations are non-overlapping and jointly constrained by the length of the day.

Our empirical analyses focus on the relationship between family structure—whether the parents are single, cohabiting or married and the number and age distribution of their children—

and time use. Because parents' living arrangements and family sizes are behavioral outcomes, we are mindful of the possibility of endogeneity bias when these outcomes are included as explanatory or conditioning measures. Accordingly, we model these outcomes together with the time use reports in a Full-Information Maximum Likelihood (FIML) specification. Below, we describe the time use and family structure components of our system.

Time use specifications. Our models include 12 distinct specifications for time use, which are particular to the type of activity, the gender of the person performing it, and the type of day on which it occurs. For a given family, let  $P_{g,d}$ ,  $S_{g,d}$ , and  $H_{g,d}$  represent the daily minutes that parent  $g$  on day  $d$  reports performing primary child care, passive child care, and market work activities, respectively. Parents are indexed by their gender, female ( $g = f$ ) or male ( $g = m$ ), and days are indexed by whether they are regular weekdays ( $d=1$ ) or weekends or holidays ( $d=2$ ).

All of the reported uses of time must be non-negative. To incorporate this constraint, we assume that the actual reports are related to a set of continuous latent variables,  $P_{g,d}^*$ ,  $S_{g,d}^*$ , and  $H_{g,d}^*$ , such that each of the reports equals the corresponding latent variable if the latent variable is positive and equals zero if the latent variable is zero or negative (e.g.,  $P_{g,d} = P_{g,d}^*$  if  $P_{g,d}^* > 0$  and  $P_{g,d} = 0$  otherwise). We then write our multivariate time use models in terms of the latent variables.

Let  $L$  be a vector of measures describing the parent's living arrangements; let  $K$  be a vector of measures describing the number and age distribution of the children; let  $X_{g,d}$  be a vector of other person- and day-specific measured characteristics; let  $e_{P,g,d}$ ,  $e_{S,g,d}$ , and  $e_{H,g,d}$  be random variables that represent unmeasured activity, person-, and day-specific characteristics; and let  $\alpha$ ,  $\beta$ , and  $\gamma$  (with appropriate activity, gender and day subscripts) be vectors of coefficients. We

assume that the latent time spent in each activity is a linear function of the observed and unobserved variables such that

$$P_{g,d}^* = \alpha'_{P,g,d} L + \beta'_{P,g,d} K + \gamma'_{P,g,d} X_{g,d} + e_{P,g,d} \quad (1)$$

$$S_{g,d}^* = \alpha'_{S,g,d} L + \beta'_{S,g,d} K + \gamma'_{S,g,d} X_{g,d} + e_{S,g,d} \quad (2)$$

$$H_{g,d}^* = \alpha'_{H,g,d} L + \beta'_{H,g,d} K + \gamma'_{H,g,d} X_{g,d} + e_{H,g,d} \quad (3)$$

The specifications of these relationships, along with the specification of how actual minutes are reported conditional on the latent variables, describe a set of censored regression models. For each daily diary report for each parent in our sample, we jointly estimate all three models, allowing for correlations among the  $e_{P,g,d}$ ,  $e_{S,g,d}$ , and  $e_{H,g,d}$  terms.

Family structure models. In addition to the time use models, we also estimate discrete-choice models of the determinants of people's living arrangements (elements of  $L$ ) and of the number and age distribution of their children (elements of  $K$ ). For living arrangements, we examine three outcomes: being single, cohabiting, and being married. Let  $V_S^*$ ,  $V_C^*$ , and  $V_M^*$  denote the indirect utilities associated with each of these outcomes. For convenience, we normalize  $V_S^* = 0$  so that  $V_C^*$ , and  $V_M^*$  represent the difference in indirect utilities between cohabiting and being married relative to being single.

Let each of these indirect utilities be a linear function of observed family-specific variables,  $Z$ , and unobserved variables,  $u_C$ , and  $u_M$ , such that

$$V_C^* = \delta'_C Z + u_C \quad \text{and} \quad V_M^* = \delta'_M Z + u_M \quad (4)$$

where  $\delta_C$  and  $\delta_M$  are vectors of coefficients. We assume that people choose the living arrangement with the highest indirect utility.

For the number and age distribution of children, we assume that people have a latent,

desired number of children in each of several age categories, which we denote  $K_j^*$  where  $j$  indexes the age categories. We consider four age categories—ages 0-3, ages 4-6, ages 7-11 and ages 12-17—with corresponding subscripts  $j = 1, 4$ . We assume that each  $K_j^*$  is a linear function of observed characteristics,  $Z$ , and unobserved characteristics,  $w_j$ , such that

$$K_j^* = \psi_j' Z + w_j. \quad (5a)$$

The actual number of children depends on  $K_j^*$  being above or below different thresholds. For example, the number of children in the 0-3 (first) age category is given by

$$K_1 = \begin{cases} 0 & \text{if } K_1^* \leq 0 \\ 1 & \text{if } 0 < K_1^* \leq \tau_{1,1} \\ 2 & \text{if } \tau_{1,1} < K_1^* \leq \tau_{1,2} \\ 3 & \text{if } \tau_{1,2} < K_1^* \end{cases} \quad (5b)$$

In these ordered categorical specifications, the coefficients,  $\psi_j$ , in the latent index equations and the thresholds,  $\tau_{j,t}$ , in the reporting models are estimated.

Specification of the error terms. We assume that the unobserved terms in the time use and family structure models are composites consisting of a common family-specific factor,  $\mu$ , and various outcome-specific components as follows

$$e_{a,g,d} = \lambda_{a,g,d} \mu + \varepsilon_{a,g,d} \quad \text{for } a = P, S, H; \ g = f, m, \text{ and } d = 1, 2 \quad (6a)$$

$$u_b = \lambda_b \mu + v_b \quad \text{for } b = C, M \quad (6b)$$

$$w_j = \lambda_j \mu + \eta_j \quad \text{for } j = 1, 4 \quad (6c)$$

where the  $\varepsilon$ ,  $v$ , and  $\eta$  terms are the outcome-specific errors and the  $\lambda$  terms are coefficients, or factor loadings, on the family-specific error. The presence of the common family-specific factor in the composite errors leads to correlations among the errors. In alternative specifications, we allow  $\mu$  to follow either a discrete distribution, in which we estimate both points of support and

their associated probabilities, or a normal distribution, in which we estimate the variance.

For each parent on each day, we allow for additional correlations in unobserved determinants of their activities by allowing the activity-specific error components to be jointly normally distributed with an unrestricted covariance structure

$$\begin{bmatrix} \boldsymbol{\varepsilon}_{P,g,d} \\ \boldsymbol{\varepsilon}_{S,g,d} \\ \boldsymbol{\varepsilon}_{H,g,d} \end{bmatrix} \sim N \left( \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \sigma_{P,g,d}^2 & \rho_{PS,g,d} \sigma_{P,g,d} \sigma_{S,g,d} & \rho_{PH,g,d} \sigma_{P,g,d} \sigma_{H,g,d} \\ \rho_{PS,g,d} \sigma_{P,g,d} \sigma_{S,g,d} & \sigma_{S,g,d}^2 & \rho_{SH,g,d} \sigma_{S,g,d} \sigma_{H,g,d} \\ \rho_{PH,g,d} \sigma_{P,g,d} \sigma_{H,g,d} & \rho_{SH,g,d} \sigma_{S,g,d} \sigma_{H,g,d} & \sigma_{H,g,d}^2 \end{bmatrix} \right) \quad (7)$$

This specification, which is akin to a Seemingly Unrelated Regressions framework, accounts for the overarching time constraint that may require individuals spending more time on one activity to spend less time on another. It also accounts for other similarities across the person's activity reports.

Beyond this, we assume that the error components are independent of one another and independent within and across families. We assume that the outcome-specific components of the model for living arrangements,  $v_C$  and  $v_M$ , follow independent extreme-value distributions and that the outcome-specific components of the models for the number and ages of children,  $\eta_1, \dots, \eta_4$ , follow independent standard normal distributions.

When all of the elements are put together, our model is a large recursive system with the different types of time use depending on family structure but not vice versa. Our time use specifications are estimated for parents in the ATUS and UKTUS samples, while the family structure equations are estimated for all adults. We account for the possible endogeneity of family structure and selectivity of parenthood in the time use models by estimating the time use and family structure models jointly while allowing for correlations in the unobserved determinants of these outcomes through the common factor  $\mu$ . The use of a factor-analytic specification restricts the error covariance matrix; however, the technique has the advantage of

being computationally tractable and feasible. The system of equations is estimated using the aML software.<sup>5</sup>

## V. Results

Results from the correlated tobit model of time use in which family structure is treated as endogenous for the ATUS sample are reported in Table 2.<sup>6</sup> The parameter estimates are classified first by activity type, then by gender, then by day type. The dependent variable for the first four columns is daily minutes spent in child care as a primary activity. The first two of these columns contain the estimates for women, on non-holiday weekdays and weekend or holiday days respectively, while the second two columns contain the corresponding estimates for men. The next four columns are similarly arranged, but the dependent variable is daily minutes spent in passive child care. The final four columns refer to daily minutes spent in market work for these same combinations. Each model includes observed controls for the parents' living arrangements; the number of children in different age ranges; the number of other adults; the parents' age, age squared, race, ethnicity, and education; region of residence; whether the residence is located in a non-metro area; the statewide unemployment rate for the interview month; and dummy variables to identify in what season of the year the diary was completed. The table also includes estimates of the standard errors and correlation coefficients for the unobserved terms shown in equation (7) of the previous section.

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<sup>5</sup> Estimation actually proceeded using ordered probit models with known thresholds (60 minute intervals) as aML was unable to estimate the logit specification with family structure equations using a discretely distributed unobserved factor.

<sup>6</sup> Results for the family structure equations are not presented, nor are the exogenous family structure specifications given the lack of space. These results are available upon request from the authors.

The estimates shown include a discretely distributed unobserved factor with three points of support. We estimated the same specification using a normally distributed unobserved factor with three points of support, but the normal distribution was rejected. We also estimated the model assuming family structure was exogenously determined. A comparison of the exogenous and endogenous results indicates that the effect of marriage, cohabitation, and the number of children of all but the oldest age group (age 12-17) are overstated in the exogenous specification. All the coefficient estimates for these variables were smaller in magnitude in the endogenous specification. Tests reject the hypothesis of exogeneity.

Estimation reveals that married parents spend significantly less time in primary child care on weekdays and weekends than their single counterparts. This is also true for cohabiting men on weekdays. With respect to passive child care, married mothers spend less time than their single counterparts on the weekend while married fathers spend less passive care time on the weekdays. Cohabiting mothers also spend less time in passive care on the weekend than single mothers. These differences in results between married (and sometimes cohabiting) and single parents may reflect the ability of two-parent households to substitute each other's time in child care. With respect to market work time, married women spend less time in market work on all days while cohabiting women spend less time in market work on weekdays than single women, perhaps reflecting specialization in two-parent households. Living arrangements have no significant effect on the time fathers spend in market work.

The number of children aged 11 and younger is a statistically and substantively important determinant of time use for men and women. For both men and women, minutes spent in primary care increase with the number of children and the effect is larger for younger children. This effect is found on both weekdays and weekends, with the exception of mothers' primary

child care minutes on the weekend for children age 7-11, and is expected as increasing the number of children increases the need for child care. An additional child aged 12-17, by contrast, decreases both fathers' and mothers' primary child care time on the weekends. It may be the case that older children act as substitute caregivers for their parents' younger children when they are not in school.

The effects of having an additional child aged 11 and younger on passive child care time are not as strong as the effect on primary care. Having an additional child aged 0-3 positively affects mothers' passive care minutes on weekdays and fathers' passive care minutes on weekends. An additional child aged 4-6 increases only mothers' passive child care minutes on weekdays. Having an additional child aged 7-11, however, increases both mothers' and fathers' passive child care minutes on all days. Perhaps this time reflects supervision for children no longer in day care, but no longer requiring constant attention. The time mothers' spend on passive care over the weekend also rises with an additional child aged 12-17. Older children have no other significant effect on mothers' or fathers' passive child care time.

Additional children generally have a negative effect on parental employment time. An additional child age 0-3 negatively affects both mothers' and fathers' market work time on all days. Having an additional child age 4-11 negatively affects mothers' work time on weekdays, while only an additional child age 7-11 negatively affects fathers' time on those days. The negative effects for women are larger for younger children. Finally, only mothers spend less time in market work and then only on weekdays when there is an additional child age 12-17. An additional child in this age range does not affect fathers' market work time.

Having additional adults in the household does generally act to reduce parental time spent on child care. This effect is significant for primary child care time only for mothers on weekdays

and fathers on weekends. However, the presence of additional adults reduces the amount of passive child care time spent by both mothers and fathers on all days. Hence, it appears that other adults in the household do act as substitute caregivers, particularly as regards passive care. Mothers do work more on weekdays for each additional adult, perhaps to help pay for the assistance of the other adult or perhaps because of the child care aid provided by the other adult.

Education appears to be an important determinant of time use in the United States, too. More educated parents spend more time on both primary child care and market work than those without a high school degree and the effects are larger for greater levels of education. These results are especially interesting because, as with Bianchi's (2000) findings that primary child care time has risen somewhat over time as women's work hours have risen, they indicate that better job opportunities do not necessarily come at the expense of child care time. More educated parents appear to find a way to work more yet also provide more child care time.

Of the other variables included in the model the seasonal dummies are deserving of some attention. We find that summer is associated with significantly **less** time on primary child care, significantly more time on passive child care, and significantly less time on market work during weekdays. Given that school is out and more children are home during the weekdays in the summer, we expected to observe some seasonal difference in child care time. It is of some interest how this difference is distributed between the types of child care time. These results may reflect less time spent on helping children with homework and more time spent in family based leisure activities.

The correlation coefficients on the unobserved terms show some significant interrelationships. For example, fathers who spend more time in primary care on weekdays also spend more time in passive care on weekdays. Perhaps the unobserved component is an

inclination toward caregiving, but it could also reflect greater unmeasured needs for caregiving in these households. However, it appears that mothers trade off primary and passive time on all days. In addition, the unobserved determinants of market work are strongly, negatively correlated with the unobserved determinants of primary and passive care for both fathers and mothers. These results are likely driven by time constraint considerations.

Results from the correlated models of time use for the UKTUS sample are reported in Table 3. The format of this table is similar to that found in Table 2 for the ATUS sample. The set of explanatory variables included in these models is also largely similar to the ATUS models. This model, too, includes a discretely distributed unobserved factor, however in this case the model was estimated with five points of support. Again, we were able to reject the hypotheses that the unobserved factor was normally distributed and that family structure is exogenously determined. A comparison of the UKTUS exogenous and endogenous results indicates that the effect of marriage, cohabitation, and the number of children of all but the oldest age group (age 12-17) are generally overstated in the exogenous specification at least for the child care time equations. Estimates for the market work equation were, however, typically quite similar.

The first controls in table 3 are for living arrangement. Like the results for the U.S., married mothers and cohabiting fathers spend less time in primary child care on weekdays than their single counterparts. However, unlike the results for the U.S., married fathers do not spend less time than single fathers and, on weekends, married mothers do not spend less time than single mothers. Also like the U.S., both married mothers and fathers spend less time in passive care than their single counterparts. Unlike in the U.S., however, the effect for mothers is significant for both weekdays and weekends. Also unlike the U.S., cohabiting fathers spend less

time in passive care on weekdays, but there is no statistically significant difference in the passive care time spent by cohabiting and single mothers in the U.K.

The most important difference between the U.S. and the U.K. is with respect to time spent in market work. While married mothers in the U.S. work less than single mothers, married mothers in the U.K. work more than their single counterparts. This may result from the different welfare systems in the two countries. In particular, ample assistance provided to mothers that don't work in the U.K. discourages them from working while in the U.S. welfare-to-work requirements do just the opposite. In addition, there is some evidence of greater support in the U.K. than in the U.S. for the idea that mothers should stay home with their children (Walker and Wiseman 2003). This effect appears to carry over to fathers as well. Unlike in the U.S., married and cohabiting fathers in the U.K. spend more time in market work than their single counterparts on weekdays.

As in the U.S., additional children aged 11 and under increase time spent by both mothers and fathers in primary and passive child care, with larger effects for younger children. However, there are fewer statistically significant effects than were estimated for the U.S.. Also unlike in the U.S., an additional child age 12-17 significantly decreases primary care time spent by mothers on weekdays. With respect to market work, the results for mothers are similar between the two countries. However, unlike in the U.S., fathers in the U.K. spend less time in market work for children of all ages except 4-6.

As in the United States, the presence of other adults in the household negatively affects parents' child care time, suggesting that these other adults act as substitute caregivers. However, the timing and type of the reduction in child care time does differ. For example, mothers' time in primary care is reduced on the weekend rather than on the weekday as in the U.S. Also, both

parents' passive care is reduced only on the weekend, not on all days as in the U.S. Unlike in the U.S., an additional adult does not significantly affect either parent's market work time. In general, other adults appear to be somewhat weaker and older children somewhat stronger substitutes for parental child care in the U.K. as opposed to the U.S..

The effect of education appears to differ considerably between countries. While education is clearly a strong and significant predictor of women's weekday employment hours, as in the U.S., in the U.K. more educated men work significantly less on the weekend and there is very little link between education and child care.

Seasonal variables in general are also less significantly associated with time use in the U.K. as compared to the U.S.. Only the summer specific weekday effects for women are statistically significant. These effects are similar to those observed in the U.S., with primary child care time falling, passive child care time rising, and work hours falling in the summer.

The correlation coefficients on the unobserved terms are remarkably similar to those observed in the U.S.. Men who spend more time on primary child care on weekdays are also more likely to spend more time on passive child care on weekdays, and market work time is significantly negatively correlated with both types of child care time on all days.

Coefficient estimates from models such as this are difficult to interpret especially across samples. To that end, marginal effects are calculated using Monte Carlo simulation techniques. The marginal impact of couple status (cohabiting/married) is obtained by comparing predicted time use assuming everyone is cohabiting (or married) versus predicted time use assuming everyone is single. Other marginal impacts were determined by incrementing the relevant explanatory variable by one unit and comparing predicted time use across the sample. Table 4 presents the marginal effects for the variables representing living arrangements. Here one can

clearly see that cohabitation and marriage reduce time spent on primary child care almost across the board relative to single parenthood in both the U.S. and the U.K., but the magnitude of the difference is typically quite small. The differences are more substantial (often about 30 minutes) with respect to passive care and reach as high as 1.5 hours for men in the U.K. on weekends. The most striking cross-country differences in the effect of marriage and cohabitation on time use are on market work time. While married and cohabiting women in the U.S. spend less time on paid employment than their single counterparts on both weekdays and weekends, married and cohabiting women in the U.K. spend more time than their single counterparts. The net difference is about 2 hours per day on weekdays and a half hour per day on weekends for both partner types. The difference in the marginal effects of marital and cohabitation status as compared to single parenthood on weekdays for men between these two countries is also substantial – amounting to almost 3 hours per day. Some, but not all, of this time appears to be spent on passive child care. The marginal effect of marriage as opposed to cohabitation remains remarkably stable between countries. The key difference lies in the comparison of single versus partnered parents. Single parents in the U.S. clearly engage in significantly more market work than their U.K. counterparts who generally spend some more time on passive care.

The marginal effect of an additional child is also reported in Table 4. Younger children make the most difference – increasing time spent on primary child care and, for women, decreasing time spent on employment. The effect of children of different ages on passive child care (and on employment for men) shows a less consistent pattern. In both the U.S. and the U.K. the effect of older children (age 12-17) and other adults on child care is often negative, confirming that they may play some role as alternative caregivers.

## VI. Conclusion

The time that parents devote to caring for their children is an enormous and under-appreciated component of society's investment in human capital. However, these investments may be at risk due to the increased market work of women and the growing proportion of single parent families. In this paper we investigate the determinants of parental time investments in primary child care activities, passive child care activities, and market work using newly-available time-diary data from the 2003 and 2004 American Time Use Study (ATUS) and data from the 2000 United Kingdom Time Use Study (UKTUS). We focus in particular on the effects of parents' living arrangements (married, cohabiting, or single) because previous economic studies using time diary data have analyzed only two-parent families. Furthermore we allow parents' living arrangement to be endogenously determined. We then ask how whether a child lives with a single parent or with married or cohabiting parents affects the allocation of time to child care and to employment by his or her parents. Because of the richness of the data, we are able to examine this separately by the gender of the caregiver and by whether or not the activities occur on a nonholiday weekday or holiday/weekend.

We estimate correlated tobit models of the time parents spend in primary child care, passive child care, and market work, while simultaneously controlling for the endogenous nature of both the family living arrangements and the number and ages of the children. These models account for reports of multiple uses of time in a day by a single individual and, for the UKTUS sample, reports for multiple days by a single households. In conclusion, we find no evidence that cohabiting as compared to married parents allocate different amounts of time to child care in either country. Nor do we find evidence that single parenthood has a substantially different effect on the time devoted to primary child care between countries. However, there are some

substantial cross-country differences in the time allocation decisions of single versus partnered parents. Both single mothers and single fathers in the U.K. spend substantially less time in market work (particularly on weekdays) compared to their partnered counterparts than do single mothers and fathers in the U.S.. Some of this time appears to be spent on passive child care rather than market employment. There is some evidence that this differential may be attributed to cross-country differences in the welfare system which is more supportive of stay-at-home parents in the U.K. and more supportive of employed parents in the U.S..

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Table 1

Average Minutes Spent on Child Care and Employment  
by Gender, Union Status, Day of Week, and Country

Panel A: United States

|         |                         | Women |                    |            |         |      |                    | Men        |         |  |  |
|---------|-------------------------|-------|--------------------|------------|---------|------|--------------------|------------|---------|--|--|
|         |                         | All   | Living Arrangement |            |         | All  | Living Arrangement |            |         |  |  |
|         |                         |       | Single             | Cohabiting | Married |      | Single             | Cohabiting | Married |  |  |
| Weekday | Primary Child Care Time | 130   | 105                | 122        | 139     | 60   | 69                 | 37         | 60      |  |  |
|         | Passive Child Care Time | 209   | 182                | 228        | 218     | 129  | 124                | 164        | 128     |  |  |
|         | Work Time               | 249   | 296                | 222        | 233     | 440  | 378                | 353        | 448     |  |  |
|         | # of Obs.               | 3172  | 820                | 114        | 2238    | 2242 | 176                | 54         | 2012    |  |  |
|         | % of Obs.               | 100%  | 25.9%              | 3.6%       | 70.6%   | 100% | 7.9%               | 2.4%       | 89.7%   |  |  |
| Weekend | Primary Child Care Time | 93    | 70                 | 98         | 101     | 65   | 36                 | 62         | 68      |  |  |
|         | Passive Child Care Time | 352   | 329                | 326        | 361     | 316  | 232                | 280        | 325     |  |  |
|         | Work Time               | 59    | 78                 | 46         | 53      | 108  | 85                 | 125        | 109     |  |  |
|         | # of Obs.               | 3187  | 835                | 83         | 2269    | 2378 | 181                | 74         | 2123    |  |  |
|         | % of Obs.               | 100%  | 26.2%              | 2.6%       | 71.2%   | 100% | 7.6%               | 3.1%       | 89.3%   |  |  |

Table 1 - Continued

Panel B: United Kingdom

|                         | Women |                    |            |         | Men  |                    |            |         |
|-------------------------|-------|--------------------|------------|---------|------|--------------------|------------|---------|
|                         | All   | Living Arrangement |            |         | All  | Living Arrangement |            |         |
|                         |       | Single             | Cohabiting | Married |      | Single             | Cohabiting | Married |
| Weekday                 |       |                    |            |         |      |                    |            |         |
| Primary Child Care Time | 109   | 113                | 130        | 104     | 39   | 51                 | 38         | 38      |
| Passive Child Care Time | 280   | 295                | 311        | 271     | 162  | 254                | 158        | 160     |
| Work Time               | 191   | 148                | 184        | 205     | 411  | 248                | 399        | 418     |
| # of Obs.               | 1420  | 297                | 146        | 977     | 1070 | 30                 | 137        | 903     |
| % of Obs.               | 100%  | 20.92%             | 10.28%     | 68.80%  | 100% | 2.80%              | 12.80%     | 84.39%  |
| Weekend                 |       |                    |            |         |      |                    |            |         |
| Primary Child Care Time | 81    | 72                 | 113        | 79      | 47   | 19                 | 59         | 46      |
| Passive Child Care Time | 374   | 363                | 395        | 374     | 317  | 304                | 304        | 320     |
| Work Time               | 53    | 45                 | 48         | 57      | 109  | 120                | 133        | 105     |
| # of Obs.               | 1441  | 299                | 154        | 988     | 1067 | 31                 | 146        | 890     |
| % of Obs.               | 100%  | 20.75%             | 10.69%     | 68.56%  | 100% | 2.91%              | 13.68%     | 83.41%  |

**Table 2. Coefficient Estimates from Correlated Tobit Models of Time-Use: ATUS Sample  
Endogenous Family Structure**

|                                | Daily Minutes of Primary Child Care |                 |                 |                 |                 |                 | Daily Minutes of Passive Child Care |                 |                 |                 |                 |                 | Daily Minutes of Market Work |                 |                 |                 |                 |                 |
|--------------------------------|-------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                                | Women                               |                 |                 | Men             |                 |                 | Women                               |                 |                 | Men             |                 |                 | Women                        |                 |                 | Men             |                 |                 |
|                                | Weekday                             | Weekend         |                 | Weekday         | Weekend         |                 | Weekday                             | Weekend         |                 | Weekday         | Weekend         |                 | Weekday                      | Weekend         |                 | Weekday         | Weekend         |                 |
| Intercept                      | -99.5 *                             | -276.4 ***      | (51.1)          | -196.1 ***      | -402.6 ***      | (89.8)          | 81.5                                | -203.3 **       | (99.1)          | 111.6           | -538.2 ***      | (141.6)         | -519.8 ***                   | -858.7 ***      | (276.8)         | (160.1)         | -610.5 **       | (282.8)         |
| Cohabiting                     | -16.7                               | 8.7             | (15.0)          | -98.1 ***       | -7.6            | (28.0)          | 0.3                                 | -60.1 *         | (32.4)          | -31.6           | -33.9           | (44.7)          | -106.6 **                    | -102.1          | (43.9)          | 71.1            | (82.2)          |                 |
| Married                        | -14.9 **                            | -22.5 ***       | (6.3)           | -61.4 ***       | -38.6 **        | (18.8)          | -14.2                               | -70.1 ***       | (12.6)          | -68.0 ***       | -35.6           | (27.3)          | -129.9 ***                   | -92.6 ***       | (27.5)          | 26.8            | (54.3)          |                 |
| Children 0-3                   | 88.0 ***                            | 86.8 ***        | (4.2)           | 33.9 ***        | 75.2 ***        | (7.1)           | 71.0 ***                            | 0.9             | (9.4)           | 8.7             | 23.0 *          | (12.7)          | -158.5 ***                   | -79.4 ***       | (24.9)          | -28.6 **        | (24.5)          |                 |
| Children 4-6                   | 43.6 ***                            | 34.6 ***        | (4.1)           | 26.2 ***        | 38.0 ***        | (6.9)           | 40.0 ***                            | -5.1            | (7.9)           | 12.7            | 5.4             | (12.9)          | -104.7 ***                   | -5.4            | (13.7)          | 10.5            | (23.8)          |                 |
| Children 7-11                  | 23.1 ***                            | 2.4             | (3.5)           | 9.1 **          | 13.4 **         | (5.6)           | 45.8 ***                            | 23.1 ***        | (7.2)           | 17.3 ***        | 45.2 ***        | (9.5)           | -85.7 ***                    | -25.4           | (10.3)          | -22.7           | (18.3)          |                 |
| Children 12-17                 | 1.6                                 | -13.0 ***       | (3.9)           | -2.8            | -18.6 ***       | (6.0)           | 17.0 ***                            | -2.8            | (7.9)           | -4.0            | 4.4             | (10.1)          | -33.9 ***                    | 22.0            | (10.8)          | 14.5            | (18.6)          |                 |
| Other Adults                   | -19.5 ***                           | -0.4            | (5.5)           | -3.9            | -30.4 ***       | (10.2)          | -20.1 **                            | -33.5 ***       | (8.3)           | -13.9 *         | -37.4 ***       | (13.9)          | 29.1 *                       | 29.3            | (14.6)          | 10.7            | (28.5)          |                 |
| High School Graduate           | 18.8 **                             | 23.1 **         | (8.8)           | 33.3 ***        | 31.9 **         | (15.3)          | -7.7                                | -23.5           | (16.8)          | -9.0            | -30.3           | (23.5)          | 130.8 ***                    | 55.0            | (23.8)          | 133.6 ***       | (47.3)          |                 |
| College + Graduate             | 42.0 ***                            | 64.9 ***        | (9.6)           | 42.7 ***        | 79.6 ***        | (16.2)          | -22.8                               | -8.8            | (19.0)          | -9.8            | -11.4           | (25.5)          | 177.6 ***                    | 111.7 **        | (26.0)          | 124.6 **        | (50.5)          |                 |
| Winter                         | -17.1 ***                           | -8.9            | (6.3)           | -5.8            | -6.4            | (10.1)          | 23.5 **                             | 0.7             | (13.3)          | 29.9 ***        | 33.6 *          | (17.4)          | -26.0                        | 9.2             | (18.4)          | -4.5            | (33.3)          |                 |
| Spring                         | -9.8                                | 0.3             | (6.6)           | -31.8 ***       | 3.4             | (10.6)          | 26.0 **                             | -13.6           | (13.7)          | 5.0             | 13.0            | (18.3)          | -24.8                        | 11.3            | (20.6)          | 44.3            | (33.4)          |                 |
| Summer                         | -45.8 ***                           | -13.2 *         | (6.4)           | -35.0 ***       | -9.0            | (10.4)          | 56.3 ***                            | 13.2            | (13.7)          | 26.4 **         | 20.1            | (17.7)          | -39.6 *                      | -45.7           | (19.6)          | -8.6            | (33.2)          |                 |
| Variance and covariance terms: |                                     |                 |                 |                 |                 |                 |                                     |                 |                 |                 |                 |                 |                              |                 |                 |                 |                 |                 |
| Transitory Error               | 117.2 ***                           | 130.4 ***       | (1.5)           | 113.2 ***       | 153.6 ***       | (2.8)           | 183.4 ***                           | 234.4 ***       | (3.0)           | 166.7 ***       | 275.4 ***       | (6.2)           | 377.5 ***                    | 492.3 ***       | (9.8)           | 287.9 ***       | 472.5 ***       | (15.9)          |
| Variance                       | $\rho_{PS,J,1}$                     | $\rho_{PS,J,2}$ | $\rho_{PS,m,1}$ | $\rho_{PS,m,2}$ | $\rho_{PM,J,1}$ | $\rho_{PM,J,2}$ | $\rho_{PM,m,1}$                     | $\rho_{PM,m,2}$ | $\rho_{SM,J,1}$ | $\rho_{SM,J,2}$ | $\rho_{SM,m,1}$ | $\rho_{SM,m,2}$ | $\rho_{SM,J,1}$              | $\rho_{SM,J,2}$ | $\rho_{SM,m,1}$ | $\rho_{SM,m,2}$ | $\rho_{SM,J,1}$ | $\rho_{SM,J,2}$ |
| Transitory Error               | -0.038 *                            | -0.191 ***      | (0.022)         | 0.092 ***       | -0.026          | (0.031)         | -0.376 ***                          | -0.116 ***      | (0.019)         | -0.382 ***      | -0.220 ***      | (0.033)         | -0.592 ***                   | -0.476 ***      | (0.016)         | -0.569 ***      | -0.484 ***      | (0.027)         |
| Correlations                   | (0.022)                             | (0.024)         | (0.026)         | (0.031)         | (0.026)         | (0.031)         | (0.019)                             | (0.030)         | (0.022)         | (0.022)         | (0.022)         | (0.033)         | (0.016)                      | (0.024)         | (0.018)         | (0.018)         | (0.018)         | (0.027)         |
| Log Likelihood                 | -118005.91                          |                 |                 |                 |                 |                 |                                     |                 |                 |                 |                 |                 |                              |                 |                 |                 |                 |                 |

NOTE: Asymptotic standard errors in parentheses;  
Significance: \* $\leq$ 10%; \*\* $\leq$ 5%; \*\*\* $\leq$ 1%.

Also included in the specification are controls for race, ethnicity, region of residence, the unemployment rate, and a quadratic in respondent age.

**Table 3. Coefficient Estimates from Correlated Tobit Models of Time-Use: BTUS Sample  
Endogenous Family Structure**

|                                | Daily Minutes of Primary Child Care    |  |   |                                       | Daily Minutes of Passive Child Care        |  |  |  | Daily Minutes of Market Work               |  |  |  |
|--------------------------------|--|--|---|---------------------------------------|--|--|--|--|--|--|--|--|
|                                | Women                                  |  | Men                                       |                                       | Women                                      |  | Men  |  | Women                                      |  | Men  |  |
|                                | Weekday                                | Weekend                                | Weekday                                   | Weekend                               | Weekday                                    | Weekend                                    | Weekday                                    | Weekend                                    | Weekday                                    | Weekend                                    | Weekday                                    | Weekend                                    |
| Intercept                      | 38.8<br>(75.4)                         | -141.3<br>(86.6)                       | 7.7<br>(95.6)                             | -182.1 *<br>(102.7)                   | -441.8 *<br>(253.7)                        | 1135.1 ***<br>(417.6)                      | -154.9<br>(222.3)                          | -752.9 *<br>(416.4)                        | -631.0 **<br>(309.5)                       | 36.9<br>(539.6)                            | -479.7<br>(297.2)                          | -838.5<br>(648.5)                          |
| Cohabiting                     | -20.1<br>(13.4)                        | 0.7<br>(15.2)                          | -57.1 *<br>(29.3)                         | 17.4<br>(42.2)                        | -47.1<br>(29.1)                            | -43.5<br>(41.4)                            | -160.3 ***<br>(61.1)                       | -113.3<br>(89.3)                           | 111.5 **<br>(49.0)                         | 45.3<br>(96.1)                             | 190.8 **<br>(89.0)                         | 44.2<br>(193.3)                            |
| Married                        | -17.3 *<br>(8.9)                       | -15.3<br>(10.5)                        | -41.5<br>(27.3)                           | 19.2<br>(41.0)                        | -67.9 ***<br>(19.3)                        | -73.7 **<br>(30.8)                         | -162.6 ***<br>(57.8)                       | -105.0<br>(84.4)                           | 90.2 ***<br>(32.1)                         | 116.3 *<br>(65.7)                          | 226.0 ***<br>(81.9)                        | -1.6<br>(181.2)                            |
| Children 0-3                   | 85.4 ***<br>(7.7)                      | 82.2 ***<br>(8.6)                      | 45.0 ***<br>(8.0)                         | 49.7 ***<br>(9.7)                     | 91.4 ***<br>(16.5)                         | -12.1<br>(27.3)                            | 24.3<br>(17.5)                             | -40.7<br>(30.0)                            | -206.6 ***<br>(34.7)                       | -173.7 ***<br>(66.4)                       | -60.5 **<br>(30.2)                         | -1.6<br>(68.4)                             |
| Children 4-6                   | 36.7 ***<br>(7.7)                      | 18.3 **<br>(8.8)                       | 26.3 ***<br>(8.7)                         | 13.0<br>(9.3)                         | 8.4<br>(15.3)                              | -2.5<br>(25.5)                             | 14.4<br>(17.6)                             | 4.6<br>(28.5)                              | -89.6 ***<br>(29.9)                        | -48.7<br>(62.7)                            | -35.4<br>(30.0)                            | 58.4<br>(62.0)                             |
| Children 7-11                  | 7.7<br>(6.1)                           | -3.3<br>(6.5)                          | 9.7<br>(6.1)                              | -4.7<br>(7.0)                         | 41.2 ***<br>(10.9)                         | 4.5<br>(17.5)                              | 25.2 **<br>(12.7)                          | 21.3<br>(19.4)                             | -65.5 ***<br>(21.5)                        | -18.9<br>(41.1)                            | -44.0 **<br>(21.3)                         | -42.8<br>(52.7)                            |
| Children 12-17                 | -14.6 **<br>(6.3)                      | -19.6 ***<br>(6.3)                     | -5.7<br>(6.5)                             | -25.2 ***<br>(8.0)                    | 11.4<br>(11.1)                             | -10.8<br>(16.9)                            | 5.3<br>(12.6)                              | -23.6<br>(19.8)                            | -22.0<br>(21.2)                            | 12.0<br>(39.5)                             | -61.1 ***<br>(21.4)                        | 48.7<br>(49.2)                             |
| Other Adults                   | -4.9<br>(8.8)                          | -18.5 *<br>(12.0)                      | -11.8<br>(12.7)                           | -2.1<br>(13.2)                        | -32.4<br>(19.7)                            | -89.5 ***<br>(25.3)                        | -12.7<br>(24.6)                            | -64.0 **<br>(32.3)                         | -39.8<br>(31.2)                            | -53.2<br>(59.1)                            | -0.1<br>(33.7)                             | -20.8<br>(62.4)                            |
| First or Post-Grad Degree      | 3.2<br>(12.0)                          | 26.4 **<br>(13.0)                      | 1.8<br>(13.7)                             | 21.7<br>(15.8)                        | -35.5<br>(24.6)                            | 24.2<br>(35.5)                             | -28.5<br>(26.2)                            | 52.7<br>(39.4)                             | 161.6 ***<br>(47.7)                        | 55.7<br>(85.7)                             | 19.4<br>(46.5)                             | -153.7<br>(101.8)                          |
| Other Higher Educ. Degree      | -5.0<br>(28.2)                         | 14.8<br>(28.1)                         | -24.2<br>(21.3)                           | -3.4<br>(22.2)                        | -42.6<br>(56.1)                            | -32.3<br>(99.0)                            | -61.2<br>(39.1)                            | -16.2<br>(48.4)                            | 175.4 *<br>(101.2)                         | -240.5<br>(280.9)                          | 67.3<br>(43.2)                             | -231.5 *<br>(136.8)                        |
| Higher Educ. Below Degree      | -0.8<br>(11.4)                         | 0.1<br>(12.5)                          | 2.0<br>(14.7)                             | 23.0<br>(15.8)                        | -18.8<br>(21.9)                            | -4.0<br>(33.1)                             | 5.2<br>(28.0)                              | 73.0 *<br>(40.8)                           | 125.3 ***<br>(38.9)                        | 55.9<br>(74.2)                             | 43.2<br>(52.5)                             | -269.2 **<br>(105.0)                       |
| "A" level or voc. level        | -12.8<br>(12.4)                        | 10.2<br>(12.8)                         | 9.5<br>(12.6)                             | 3.7<br>(13.6)                         | -53.6 **<br>(23.5)                         | 12.9<br>(38.5)                             | -0.1<br>(24.0)                             | 19.8<br>(38.2)                             | 152.4 ***<br>(46.6)                        | -4.9<br>(87.1)                             | 31.8<br>(39.9)                             | 22.0<br>(82.0)                             |
| "O" level, geese grade         | -10.5<br>(9.7)                         | -14.1<br>(10.3)                        | 11.7<br>(12.7)                            | -7.2<br>(14.6)                        | 0.8<br>(19.2)                              | 42.2<br>(27.6)                             | 22.5<br>(22.6)                             | 60.7 *<br>(36.8)                           | 101.6 ***<br>(35.1)                        | -43.5<br>(64.9)                            | 9.6<br>(40.9)                              | -98.5<br>(85.4)                            |
| geese below grade c            | -21.0<br>(18.1)                        | -22.1<br>(18.1)                        | 7.6<br>(23.7)                             | -5.7<br>(22.8)                        | -4.5<br>(31.8)                             | 8.6<br>(47.2)                              | 27.3<br>(43.8)                             | 41.7<br>(65.6)                             | 102.8 *<br>(58.9)                          | -151.6<br>(122.5)                          | 16.9<br>(67.8)                             | 192.5<br>(133.4)                           |
| Other Known Qualifications     | -10.4<br>(21.6)                        | -14.9<br>(21.5)                        | -9.1<br>(17.7)                            | -3.0<br>(17.7)                        | 54.0<br>(37.7)                             | -25.4<br>(48.9)                            | -54.7 *<br>(32.4)                          | -74.4<br>(49.3)                            | -92.8<br>(73.2)                            | -119.7<br>(138.4)                          | 106.1 **<br>(54.1)                         | -13.0<br>(104.6)                           |
| Winter                         | 11.8<br>(9.5)                          | 12.5<br>(10.4)                         | -17.0<br>(11.9)                           | 1.1<br>(13.2)                         | 7.2<br>(19.9)                              | 16.4<br>(29.1)                             | 0.7<br>(24.6)                              | -28.1<br>(36.7)                            | -18.2<br>(35.4)                            | 66.7<br>(70.8)                             | 49.2<br>(41.6)                             | 45.8<br>(82.4)                             |
| Spring                         | -5.3<br>(10.7)                         | 2.8<br>(10.7)                          | -14.4<br>(10.9)                           | -5.8<br>(12.0)                        | 20.8<br>(19.8)                             | 17.9<br>(28.2)                             | -4.2<br>(22.0)                             | -7.0<br>(31.9)                             | -11.4<br>(33.0)                            | 12.0<br>(62.9)                             | -18.7<br>(36.0)                            | -6.2<br>(75.4)                             |
| Summer                         | -28.3 ***<br>(9.9)                     | 1.5<br>(10.6)                          | -15.3<br>(10.8)                           | -10.7<br>(12.8)                       | 73.9 ***<br>(18.5)                         | 25.3<br>(28.1)                             | 22.6<br>(21.4)                             | -32.0<br>(33.8)                            | -80.0 **<br>(35.0)                         | -38.9<br>(66.7)                            | -54.0<br>(36.0)                            | 32.3<br>(76.0)                             |
| Variance and covariance terms: |  |  |   |                                       |  |  |  |  |  |  |  |  |
| Transitory Error Variance      | 94.8 ***<br>(2.2)                      | 98.7 ***<br>(2.5)                      | 89.5 ***<br>(2.8)                         | 95.0 ***<br>(3.5)                     | 181.9 ***<br>(6.2)                         | 225.4 ***<br>(10.7)                        | 182.5 ***<br>(5.8)                         | 261.6 ***<br>(12.3)                        | 353.8 ***<br>(17.9)                        | 523.1 ***<br>(54.6)                        | 338.9 ***<br>(12.4)                        | 598.1 ***<br>(46.7)                        |
| Transitory Error Correlations  | $\rho_{PS, J, 1}$<br>-0.010<br>(0.043) | $\rho_{PS, J, 2}$<br>-0.051<br>(0.053) | $\rho_{PS, M, 1}$<br>0.279 ***<br>(0.045) | $\rho_{PS, M, 2}$<br>0.093<br>(0.057) | $\rho_{PM, J, 1}$<br>-0.350 ***<br>(0.039) | $\rho_{PM, J, 2}$<br>-0.201 ***<br>(0.062) | $\rho_{PM, M, 1}$<br>-0.385 ***<br>(0.039) | $\rho_{PM, M, 2}$<br>-0.241 ***<br>(0.060) | $\rho_{SM, J, 1}$<br>-0.536 ***<br>(0.035) | $\rho_{SM, J, 2}$<br>-0.644 ***<br>(0.051) | $\rho_{SM, M, 1}$<br>-0.515 ***<br>(0.032) | $\rho_{SM, M, 2}$<br>-0.621 ***<br>(0.047) |
| Log Likelihood                 | -35713.67                              |  |   |                                       |  |  |  |  |  |  |  |  |

NOTE: Asymptotic standard errors in parentheses;  
Significance: \* = 10%; \*\* = 5%; \*\*\* = 1%.

Also included in the specification are controls for residence in a rural area, in London, the unemployment rate, and a quadratic in respondent's age.

**Table 4**  
**Marginal Effects of Living Arrangements**

**Panel A: ATUS**

|                  | Primary Care |         |         |         | Passive Care |         |         |         | Market Work |         |         |         |
|------------------|--------------|---------|---------|---------|--------------|---------|---------|---------|-------------|---------|---------|---------|
|                  | Women        |         | Men     |         | Women        |         | Men     |         | Women       |         | Men     |         |
|                  | Weekday      | Weekend | Weekday | Weekend | Weekday      | Weekend | Weekday | Weekend | Weekday     | Weekend | Weekday | Weekend |
| <i>Marginals</i> |              |         |         |         |              |         |         |         |             |         |         |         |
| Cohabiting       | -12.6        | 5.4     | -52.0   | -3.6    | -44.4        | -20.4   | -23.1   |         | -67.4       | -21.5   | -42.1   | 22.4    |
| Married          | -11.3        | -13.1   | -36.1   | -16.8   | -51.6        | -42.0   | -24.2   |         | -80.8       | -19.7   | 8.4     | 8.0     |
| + Child 0-3      | 73.3         | 58.5    | 18.8    | 36.3    | 0.6          | 5.0     | 15.6    |         | -82.3       | -14.2   | -24.6   | -14.9   |
| + Child 4-6      | 34.6         | 21.2    | 14.3    | 16.9    | -3.7         | 7.4     | 3.6     |         | -57.0       | -1.0    | -3.1    | 3.3     |
| + Child 7-11     | 17.8         | 1.4     | 4.7     | 5.6     | 16.9         | 10.1    | 31.1    |         | -47.4       | -4.9    | -24.5   | -6.8    |
| + Child 12-17    | 1.2          | -7.2    | -1.4    | -7.1    | -2.1         | -2.3    | 3.0     |         | -19.5       | 4.6     | 6.6     | -4.3    |
| + Other adult    | -14.2        | -0.2    | -2.0    | -11.3   | -23.9        | -7.7    | -24.3   |         | 17.7        | 6.2     | -0.9    | 3.4     |

**Panel B: UKTUS**

|                  | Primary Care |         |         |         | Passive Care |         |         |         | Market Work |         |         |         |
|------------------|--------------|---------|---------|---------|--------------|---------|---------|---------|-------------|---------|---------|---------|
|                  | Women        |         | Men     |         | Women        |         | Men     |         | Women       |         | Men     |         |
|                  | Weekday      | Weekend | Weekday | Weekend | Weekday      | Weekend | Weekday | Weekend | Weekday     | Weekend | Weekday | Weekend |
| <i>Marginals</i> |              |         |         |         |              |         |         |         |             |         |         |         |
| Cohabiting       | -12.6        | 0.4     | -26.2   | 5.8     | -24.7        | -90.4   | -61.6   |         | 59.4        | 7.0     | 146.0   | 13.2    |
| Married          | -10.9        | -7.3    | -20.2   | 6.4     | -41.3        | -91.5   | -57.3   |         | 47.0        | 19.8    | 176.1   | -0.5    |
| + Child 0-3      | 61.0         | 45.8    | 22.1    | 21.3    | -6.7         | 12.3    | -20.8   |         | -92.3       | -25.4   | -50.6   | -0.5    |
| + Child 4-6      | 24.2         | 9.0     | 12.0    | 4.9     | -1.3         | 7.2     | 2.4     |         | -45.3       | -8.4    | -29.9   | 17.8    |
| + Child 7-11     | 4.8          | -1.5    | 4.1     | -1.7    | 2.5          | 12.7    | 11.2    |         | -34.0       | -3.4    | -37.1   | -11.9   |
| + Child 12-17    | -8.8         | -8.8    | -2.3    | -8.2    | -6.0         | 2.7     | -12.2   |         | -11.9       | 2.2     | -51.1   | 14.7    |
| + Other adult    | -3.0         | -8.3    | -4.6    | -0.7    | -47.8        | -6.1    | -32.3   |         | -21.2       | -9.1    | 0.0     | -5.9    |

## Appendix A: Sample Statistics

**Table A1**  
**ATUS Sample Means**  
**By Gender and Sample**

|                                   | Women                        |  | Men                          |  |
|-----------------------------------|------------------------------|--|------------------------------|--|
|                                   | <u>Full</u><br><u>Sample</u> | <u>Time</u><br><u>Use</u><br><u>Sample</u> | <u>Full</u><br><u>Sample</u> | <u>Time</u><br><u>Use</u><br><u>Sample</u> |
| Cohabiting                        | 0.036                        | 0.031                                      | 0.033                        | 0.028                                      |
| Married                           | 0.592                        | 0.709                                      | 0.651                        | 0.895                                      |
| Children 0-3                      | 0.219                        | 0.393                                      | 0.201                        | 0.416                                      |
| Children 4-6                      | 0.181                        | 0.326                                      | 0.169                        | 0.350                                      |
| Children 7-11                     | 0.329                        | 0.592                                      | 0.281                        | 0.583                                      |
| Children 12-17                    | 0.312                        | 0.560                                      | 0.266                        | 0.553                                      |
| Other adults                      | 0.269                        | 0.173                                      | 0.312                        | 0.160                                      |
| Age                               | 40.743                       | 37.401                                     | 41.557                       | 39.845                                     |
| Less than high school (Base Case) | 0.088                        | 0.087                                      | 0.101                        | 0.086                                      |
| High school graduate              | 0.569                        | 0.573                                      | 0.553                        | 0.529                                      |
| Bachelor's degree or more         | 0.343                        | 0.339                                      | 0.346                        | 0.385                                      |
| Unemployment rate                 | 5.793                        | 5.795                                      | 5.778                        | 5.789                                      |
| Non-metro area                    | 0.191                        | 0.193                                      | 0.195                        | 0.200                                      |
| African American                  | 0.124                        | 0.108                                      | 0.097                        | 0.072                                      |
| Hispanic                          | 0.098                        | 0.113                                      | 0.098                        | 0.106                                      |
| Northeast (Base Case)             | 0.192                        | 0.194                                      | 0.193                        | 0.200                                      |
| Midwest                           | 0.259                        | 0.263                                      | 0.255                        | 0.258                                      |
| South                             | 0.345                        | 0.340                                      | 0.341                        | 0.326                                      |
| West                              | 0.204                        | 0.203                                      | 0.211                        | 0.216                                      |
| Fall (Base Case)                  | 0.244                        | 0.245                                      | 0.252                        | 0.249                                      |
| Winter                            | 0.264                        | 0.269                                      | 0.269                        | 0.275                                      |
| Spring                            | 0.239                        | 0.234                                      | 0.233                        | 0.235                                      |
| Summer                            | 0.253                        | 0.252                                      | 0.246                        | 0.242                                      |
| 2004 Sample                       | 0.398                        | 0.392                                      | 0.400                        | 0.403                                      |
| Number of Observations            | 11427                        | 6359                                       | 9596                         | 4620                                       |

**Table A2**  
**UKTUS Sample Means**  
**By Gender and Sample**

|                               | Women                        |  | Men                          |  |
|-------------------------------|------------------------------|--|------------------------------|--|
|                               | <u>Full</u><br><u>Sample</u> | <u>Time</u><br><u>Use</u><br><u>Sample</u> | <u>Full</u><br><u>Sample</u> | <u>Time</u><br><u>Use</u><br><u>Sample</u> |
| Cohabiting                    | 0.110                        | 0.106                                      | 0.115                        | 0.132                                      |
| Married                       | 0.586                        | 0.684                                      | 0.609                        | 0.841                                      |
| Children 0-3                  | 0.185                        | 0.361                                      | 0.153                        | 0.368                                      |
| Children 4-6                  | 0.137                        | 0.274                                      | 0.108                        | 0.262                                      |
| Children 7-11                 | 0.282                        | 0.590                                      | 0.226                        | 0.566                                      |
| Children 12-17                | 0.303                        | 0.628                                      | 0.261                        | 0.640                                      |
| Other adults                  | 0.450                        | 0.177                                      | 0.498                        | 0.168                                      |
| Age                           | 38.654                       | 36.911                                     | 40.647                       | 39.843                                     |
| No qualifications (Base Case) | 0.332                        | 0.310                                      | 0.324                        | 0.307                                      |
| Other known qualification     | 0.053                        | 0.042                                      | 0.091                        | 0.072                                      |
| gcse below grade c            | 0.040                        | 0.056                                      | 0.035                        | 0.042                                      |
| "O" level, gcse grade a-c     | 0.199                        | 0.230                                      | 0.143                        | 0.160                                      |
| "A" level or voc. level 3     | 0.103                        | 0.097                                      | 0.141                        | 0.154                                      |
| Other higher educ. degree     | 0.158                        | 0.156                                      | 0.142                        | 0.150                                      |
| First or post-grad. degree    | 0.116                        | 0.110                                      | 0.125                        | 0.116                                      |
| Unemployment rate             | 6.883                        | 6.821                                      | 6.756                        | 6.587                                      |
| Rural                         | 0.429                        | 0.424                                      | 0.447                        | 0.453                                      |
| London                        | 0.085                        | 0.081                                      | 0.081                        | 0.072                                      |
| Fall (Base Case)              |                              | 0.294                                      |                              | 0.276                                      |
| Winter                        |                              | 0.218                                      |                              | 0.207                                      |
| Spring                        |                              | 0.257                                      |                              | 0.269                                      |
| Summer                        |                              | 0.232                                      |                              | 0.248                                      |
| Number of Observations        | 3574                         | 1511                                       | 3274                         | 1131                                       |