electronic International Journal of
Time Use Research

contents

Exploring time diaries using semi-automated activity pattern extraction

Katerina Vrotsou, Kajsa Ellegård and Matthew Cooper

Katerina Vrotsou
Dept. of Science and Technology
Linköping University, Campus Norrköping
SE-601 74 Norrköping, Sweden
e-mail: katerina.vrotsou@liu.se

Kajsa Ellegård
Dept. of Technology and Social Change
Linköping University
SE-5 81 83 Linköping, Sweden
e-mail: kajsa.ellegard@liu.se

Matthew Cooper
Dept. of Science and Technology
Linköping University, Campus Norrköping
SE-601 74 Norrköping, Sweden
e-mail: matt.cooper@liu.se

Abstract

Identifying patterns of activities in time diaries in order to understand the variety of daily life in terms of combinations of activities performed by individuals in different groups is of interest in time use research. So far, activity patterns have mostly been identified by visually inspecting representations of activity data or by using sequence comparison methods, such as sequence alignment, in order to cluster similar data and then extract representative patterns from these clusters. Both these methods are sensitive to data size, pure visual methods become too cluttered and sequence comparison methods become too time consuming. Furthermore, the patterns identified by both methods represent mostly general trends of activity in a population, while detail and unexpected features hidden in the data are often never revealed. We have implemented an algorithm that searches the time diaries and automatically extracts all activity patterns meeting user-defined criteria of what constitutes a valid pattern of interest for the user's research question. Amongst the many criteria which can be applied are a time window containing the pattern, minimum and maximum occurrences of the pattern, and number of people that perform it. The extracted activity patterns can then be interactively filtered, visualized and analyzed to reveal interesting insights. Exploration of the results of each pattern search may result in new hypotheses which can be subsequently explored by altering the search criteria. To demonstrate the value of the presented approach we consider and discuss sequential activity patterns at a population level, from a single day perspective.

JEL-Codes: C69, D13, R29

Keywords: Time-geography, diaries, everyday life, activity patterns, visualization, data mining, sequential pattern mining

1   Introduction

Individualization is one dominant characteristic of modernity (Giddens, 1991; Castells, 2003) but, still, most people find themselves meshed into social and material contexts that restrict their opportunities to fulfil their own personal wants. The individuals feel restricted by circumstances out of their control and unable to reach goals they have set up for long and short term projects. In the popular debate lack of time is blamed for such shortcomings. Better knowledge about how people spend their time might provide ways to understand why there is not enough time. Time use studies have a great potential in this respect due to the richness of the collected diary data: a diary not only tells what people do, where they are located, who they are together with, but also when they do what they do, for how long they do it and, not least, in what context of other activities they do it.

The richness of the diary data collected in time use surveys, however, is usually not fully utilized in their analysis. The diaries are frequently used to produce statistics on how much time individuals spend on various kinds of everyday activities (Eurostat, 2004). Comparisons between sexes, ages and family types are made and, in countries where time use surveys are performed repeatedly, changes over time are scrutinized. The important results from time use studies provide knowledge about the overall time use of average individuals in a society and about similarities and differences between groups. There is, however, much more to be found in this collected data, not least how people mesh their activities together in households and workplaces.

What activities an individual performs, and consequently what activities appear in the diary, are a result of an allocation process, during which the individuals' ambitions to perform activities of importance for reaching a personal goal are moulded by social rules, conventions, law, other personal goals and not least the restricted accessibility of material circumstances and location (Hägerstrand, 1970a). The outcome of this allocation process, meaning what activities the individual actually performs in the course of the day, often does not correspond exactly to the individuals' ambitions. Power over how time is used by individuals is introduced as soon as activities that concern division of labour in the household or in the workplace are set on the agenda. Since power exerted by one individual in a household, for example the power of a small child in immediate need of care, influences the activities performed by other household members (parents or siblings). The child's needs alter the order, sequence and pattern of activities performed by others in the household. The meshing of activities is hard to examine by the most common methods in time use studies since the appearance of activities that are related to each other in sequential order is seldom considered in the analysis of time use data. The complexity of the task seems overwhelming. The challenge is to look at the diary data in time use surveys from different angles.

The main contribution of this paper is the development of an interactive semi-automated activity pattern extraction algorithm implemented within the application developed for visualiz-

ing time use data called VISUAL-TimePAcTS[1] (Ellegård and Vrotsou, 2006). The underlying idea is that activity sequences within the empirical activity data, may give clues to research questions and hypotheses that are not identified when the order of activities is not taken into consideration. The goal is to assist and simplify the study of more complex activity combinations of everyday life. The algorithm is applicable to individual, household, group and population levels and can be used for finding arguments for policy development, for example on gender policy, as well as for individuals' own reflections upon their everyday life and what could be done to improve the personal well-being. The properties of the pattern extraction algorithm make it possible to dig deeper into the constitution of identified activity patterns, for example by changing the criteria for the pattern extraction in order to test variations within the identified pattern. Doing so also gives rise to research questions and allows the further investigation of the validity of these questions, as we will demonstrate later in the paper.

The paper is arranged as follows: in Section 2 an overview of some related work is given, Section 3 is a short description of the visualization tool and the representation that this work is based on. Section 4 describes the algorithm in detail, Section 5 presents an analysis scenario, and finally, conclusions are presented in Section 6.
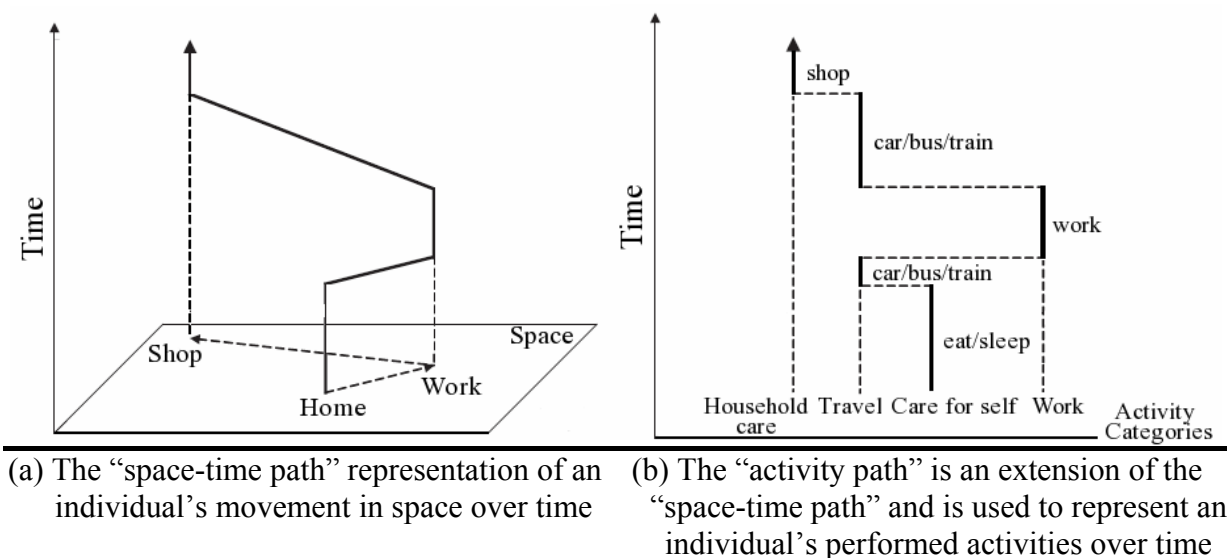
2   Related work

Identifying and studying patterns of activity and similarities/trends of these patterns within and between individuals' daily activity schedules is a subject of interest to the time use research community. There have been several approaches to perform studies of this kind, both visual and algorithmic. In this section we will consider research performed in different areas concerned with the identification of activity patterns.

The time geographical framework (Hägerstrand, 1970b) is an early example of using visual representation in the study of human behaviour and is considered an intuitive approach to represent and analyse similarities between individuals in space and time. This conceptual framework considers populations as groups of socially and geographically interrelated individuals and not as indistinct aggregate masses. Each individual is unique and their actions are defined and constrained by location in time and space, by socio-economic rules and conventions and by past experiences and knowledge. Time is a continuously changing variable that constrains the individuals' possibilities in the future, as an individual can be at only one place at a time and perform a limited number of activities at each time point (Lenntorp, 1976). An individual's movement in space and time can therefore be represented by a single continuous trajectory called a "space-time path" (Figure 1a). Several individuals' paths can be drawn within a single representation, the "space-time cube", revealing places in space and time where such paths meet, so called "bundles", and rendering the identification of patterns of

---

[1]   The abbreviation VISUAL-TimePAcTS stands for VISUALization, Time, Place, Activity, Technologies used and Social companionship.

actions within populations possible. There are many studies that have used time geographical representations for the analysis of activity patterns, some examples follow. Kraak (2003) implemented the space-time cube in an interactive visualization environment. Kwan (1999, 2000) and Kwan and Lee (2004) have made extensive use of time geographical representations within a GIS environment to reveal human activity patterns. Huisman and Forer (1998, 2005) created a model for representing and analysing potential activity paths and action volumes in a GIS environment. A GIS data model was presented by Yu (2006) for analysing spatio-temporal patterns and interactions of human activities.

Figure 1
The "space-time path" (a) and the "activity path" (b)

(a) The "space-time path" representation of an individual's movement in space over time	(b) The "activity path" is an extension of the "space-time path" and is used to represent an individual's performed activities over time

Source: 1(a) Image based on Hägerstrand (1970b); 1(b) Image based on Ellegård (1999).

The original time geographical concept of the space-time path is mainly concerned with the spatial movement of an individual over time while the activities performed by the individual – if considered at all – are implicitly derived from the places visited during this time-space movement (Lenntorp, 1976). The activities an individual performs over time, however, can be visually described in a way that resembles their spatial movement over time. Activities, like the movements, take time to perform, they have a start time and a duration and occur sequentially. The original time geographical concept was therefore extended to also consider everyday life activities (Ellegård, 1999) which are also represented by a single continuous vertical trajectory in this case called the "activity path" (Figure 1b). This representation of activity diaries was incorporated into a visualization environment in order to facilitate the interactive exploration of these diaries (Ellegård and Cooper, 2004) resulting in the visual analysis tool VISUAL-TimePAcTS (Ellegård and Vrotsou, 2006). Using this representation individuals' activity paths can be compared and patterns of activity retrieved through purely visual methods. Trends can be spotted in the total representation and also a sequence of activities can be defined and highlighted revealing the distribution of this predefined pattern across the represented population. The drawback of this approach, however, is that it limits the activity com-

bination options to those that the researcher using the tool has in mind. There are also examples of visual approaches to the identification and study of activity patterns that do not use time geographical representations. Kwan (2000), for example, has used line representations and activity duration patterns over a geographical map to display activity patterns, and Zhao et al. (2008) have used representations such as 3D rods over a geographical map, and 3D activity ringmaps to display trends of daily activity.

A popular algorithmic method for the identification of activity patterns in social science, in general, and in time use research in particular, is sequence alignment (also known as optimal matching). Sequence alignment was first introduced to the social sciences by Abbott and Forrest (1986) and to activity pattern analysis by Wilson (1998). According to the sequence alignment method, which was originally developed for protein and DNA sequences (Kruskal, 1983), the similarity of two sequences can be determined by the number of operations needed to transform one sequence into the other. The operations used are insertion, deletion and substitution and each operation carries a cost. The smallest sum of these costs defines the degree of similarity between the sequences. Aligning all sequences in a set pair-wise and calculating their similarity score results in a similarity score matrix for the whole set which can then be used as input into clustering algorithms in order to classify the sequences into groups. Each of these groups can then be analysed and characteristic activity patterns identified within each. There has been a lot of research concerning the use of sequence alignment in the social sciences, Abbott and Tsay (2000) present a thorough review. Concentrating on travel and activity pattern analysis: Wilson (1998, 2001, 2006, 2008) has shown many applications and refinements to the identification of similar patterns within populations, as has Joh et al. (2001a, 2001b) and Lesnard (2006) among others. Schlich (2001) has, instead, applied sequence alignment to study variation in travel patterns within individuals' daily sequences in a population. Joh et al. (2002) introduced the incorporation of other attributes (such as location, duration, and start time among others), apart from the activity itself, in the similarity computation of sequences. They suggest a multidimensional alignment approach, and a heuristic method for its calculation, in order to reduce the search space. Wilson (2008) proposed the inclusion of geographical coordinates in the alignment process and hence the weighting of the costs calculation with a geographical distance.

There are a number of issues concerning the application of sequence alignment in activity time diaries. The greatest, which is an issue generally, is how to assign costs for the different operations since it may result in very different similarity matrices and hence classifications. Substituting activity "walking" with "running" may deserve a lower cost than substituting it with "eating", for example. Furthermore, since each alignment gives a single similarity score depending on the number of operations, two day sequences that include the exact same subsequence but at different times of day, which intuitively signifies a similarity between them, may receive the same score as two completely dissimilar sequences. Finally, choosing to include or discard duration in the alignment process can also alter the resulting classification. If duration of events is discarded then all events or sequences of events are considered equal

regardless of duration. A person, for example, performing a "care for others" activity for 5 minutes (perhaps helping a child dress) and then working the rest of the day will be ranked as identical with a person taking care of others the whole day and then working for an hour, even though their activity behaviour is actually very different. At the same time and for the same reasons, including duration can also have a negative effect on the results. Duration can be included by breaking the day up into intervals of a certain fixed time, and events are in turn broken up into several repetitions of themselves. If for example the day is broken up into 30 minute intervals, an event lasting 2 hours is represented by repeating the fixed time event 4 times in the daily sequence. Repetition of the same event several times can conceal otherwise apparent similarities between sequences and also depending on the time interval size short activities can be lost and small variations in the sequences disappear.

Less researched is the use of pattern mining methods in the social science field. The extraction of new knowledge, in the form of interesting relationships and patterns, from large databases is the central objective in the area of data mining. When the data analysed has a sequential nature, meaning that the data consist of ordered items, then the process is referred to as sequential mining (Han and Kamber, 2000). Defining interestingness in the context of pattern extraction is a complex and subjective matter. Most often frequency of occurrence is used as a representative measure, the process is then called frequent pattern mining. Frequent pattern mining was introduced by Agrawal et al. (1993) for the discovery of patterns in transaction databases, so called 'market basket analysis', and the apriori algorithm was introduced. The technique was later extended to consider also sequential data (Agrawal and Srikant, 1995) and refined in 1996 (Srikant and Agrawal, 1996). There has been extensive research on frequent pattern mining since its introduction, using different approaches. A thorough review of the current status of the discipline can be found in Han et al. (2007). In this paper we concentrate on the apriori approach, since it's the one we have based our work on, and refer the interested reader to Han et al. (2007) for further details on other methods. According to the apriori principle *a sequence of events is frequent only if all of its subsequences are frequent.* In order to identify frequent event sequences in the data, candidate sequences are then created stepwise by increasing them one element per iteration and these candidates are then identified in the database and filtered based on pre-specified constraints.

The nature of the time use diary data that we deal with here is similar to that of the sequential transaction data. A performed activity is a performed event in time. An individual performs several activities during a day in a certain order, these make up different activity sequences. The ordering of each of these sequences, their frequency of occurrence and the manner of their repetition within a population are of interest to the time use researcher as they may reveal interesting categorizations or characteristics within this population. The researcher should be able to define the attributes that these sequences must have in order to make them reveal interesting patterns to study. Hence, the apriori principle for mining frequent sequences can be used for the extraction of the patterns but the possibility should exist to include other criteria than just the frequency of their occurrence.

In this paper we have combined sequential mining, visualization and interaction techniques to allow the extraction of activity sequences from diary data. To do this we have adapted the apriori algorithm (Agrawal and Srikant, 1995) to our data and introduced interaction to its computation in order to allow the user to define interestingness through constraints that define the characteristics of the activity sequences and are not limited to frequency of occurrence. The fact that the user can control and restrict the sequence extraction is what makes the process semi-automatic.

3 Representation and data in VISUAL-TimePAcTS

The research work presented in this paper is developed as a feature in the visual activity-analysis tool VISUAL-TimePAcTS (Ellegård and Vrotsou, 2006), a visualization application for interactively studying activity diaries of individuals, groups and whole populations.

The central representation used within VISUAL-TimePAcTS is the activity path inspired by the time geographical conceptual approach (Hägerstrand, 1970b) as described in section 2. The activities in the collected diaries are classified into a hierarchical scheme of about 600 numerical codes with 5 levels of detail, with respect to the description of the activities, and grouped into 7 main activity categories (care for oneself, care for others, household care, reflection/recreation, transportation, procure and prepare food, and gainful employment or education). Each level of detail, n, is broken down into more detailed descriptions at level $n-1$ so level 5 is the most general level while level 1 is the most detailed. The seven generalized main activity categories (Ellegård, 1999, 2006) are each represented by a unique colour in VISUAL-TimePAcTS and consequently activities in all subcategories of the same main category have the same colour in the representation.

An individual's activity path in VISUAL-TimePAcTS can be rotated and studied from various angles. Seen from the front only the general division of activities into the seven main categories can be detected (Figure 3a) since sequences of activities within the same main activity category are not revealed (they all have the same colour). But if the same activity path is rotated the observer can see the breakdown of the seven main activity categories into more detailed subcategories of activities (Figure 3b, 3c). At a quick glance, the activity path seen from the front view (Figure 3a) may resemble a bar chart holding information about the time spent by the individual on each activity category (see, for example, Eurostat (2004)). There are, however, great differences since traditional time budgets represent an average individual. Important information is, therefore, hidden, such as the time of day when activities are performed, their duration and the number of times activities occur in the course of the day. This kind of sequence related information is constantly available to the viewer of the activity path in VISUAL-TimePAcTS and is important for detecting activity patterns.

The use of activity paths in the study of everyday life is useful as it also allows the study of two or more individuals simultaneously while, at the same time, preserving the uniqueness of

each individual. Drawing the activity paths of a group of individuals side by side in a box-like configuration (Figure 4), using the front view (Figure 3a), gives the researcher the opportunity to access information about the character and actual timing of the activities of whole populations in a single representation.

Figure 3
Visualization examples of the activity path of an individual in VISUAL-TimePAcTS

| (a) front | (b) side view | (c) rotated view |
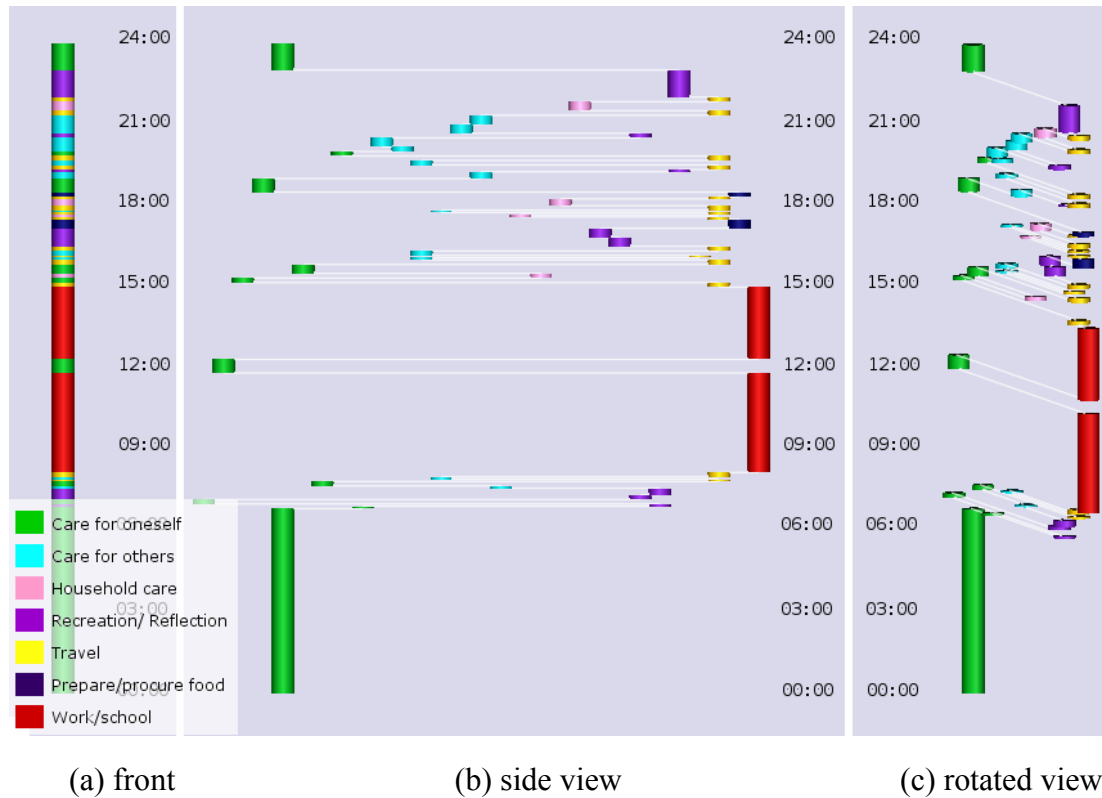
Time is shown on the y-axis and colours represent the 7 activity categories. (a) shows the front view, where the general division of the activities can be detected at main category level. (b) shows the path in side view, revealing the breakdown into more detailed activity descriptions. (c) shows a slightly rotated view of the activity path in 3D.
Source: Produced using VISUAL-TimePAcTS.

The diary data used in this work is a subset of time diaries collected in a pilot study by Statistics Sweden (*SCB*, www.scb.se) in 1996. A survey consisting of 179 households, in which 463 household members (aged 10 years and older) have filled in time diaries for one weekday and one weekend day. The subset we have chosen in this study includes individuals aged 20 to 65 years, 283 individuals in total (147 women and 136 men). Further, we have chosen to analyse weekdays and leave the analysis of weekend days for now. The sample might be regarded as relatively small, but since our aim is to demonstrate the algorithm and discuss research questions generated by using it, this is of minor importance.

In order to use the pattern extraction algorithm of VISUAL-TimePAcTS the diary data should be in the form of activities having a start time and a duration and occurring sequentially over a 24 hour period. Even though the coding scheme currently used in the pattern extraction dif-

fers from the schemes traditionally used in time diary surveys[2], adjustments can easily be made to incorporate these into the application.

Figure 4
Front view visualization of a weekday of a group of
individuals aged 22-30 in VISUAL-TimePAcTS
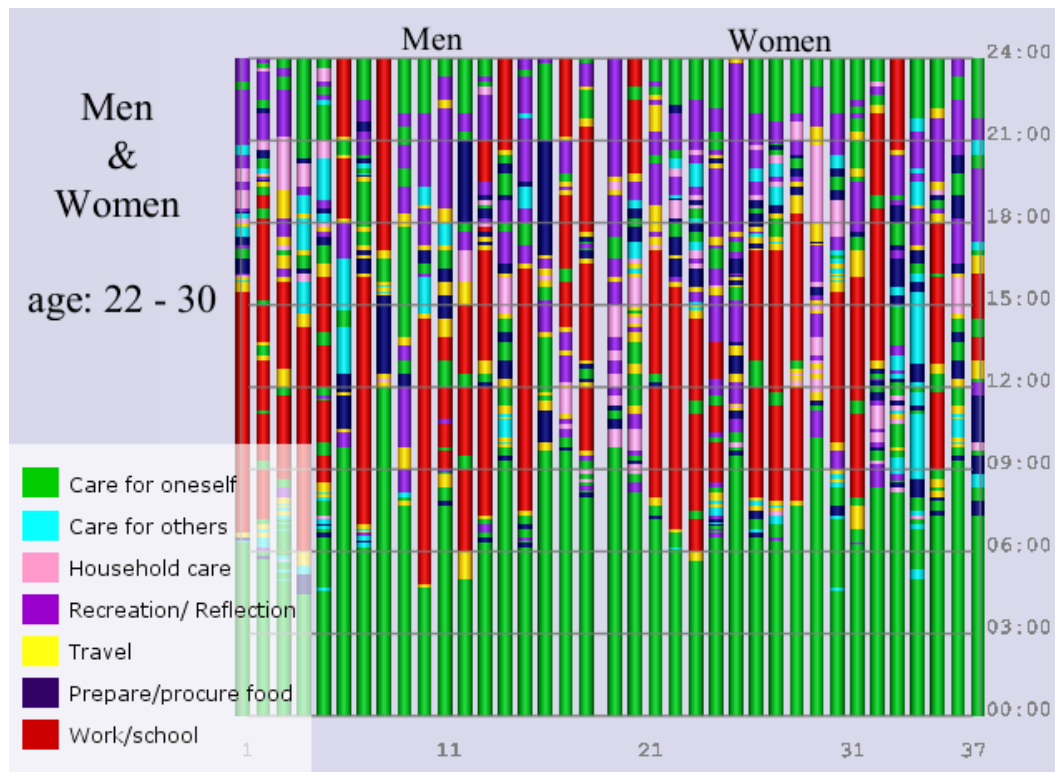
Time is shown on the y-axis, individuals are ordered by sex and age from left to right
on the x-axis. Colours represent the 7 activity categories.
Source: Produced using VISUAL-TimePAcTS.

4   Activity pattern extraction

An automatic pattern extraction algorithm can assist the time use researcher in two ways. First, it can allow the researcher more time to analyse the resulting activity patterns of a population, and second, such an algorithm could open up the possibility of new discoveries. The researcher may come across activity patterns that were unexpected and gain new insight about

---

[2]   This categorization scheme differs in some ways from other schemes and the main difference is that what commonly is called "domestic work" (for example in the time use surveys used in the harmonized European scheme, Eurostat (2004)) in our scheme is divided into three main categories, namely "care for others", "household care" (comprising activities for care for buildings, maintenance, cleaning, and care for other things and belongings) and "procure and prepare food". When looking for activity sequences by extracting activity patterns in VISUAL-TimePAcTS, it is important that the main activity categories are not so general and broad that they hide variations (Ellegård, 2006).

the time use of populations. This has been our motivation for attempting to use sequential pattern mining in time use research.

4.1   Definition of activity patterns

As mentioned previously, the order in which individuals perform their daily activities is significant. Therefore, studying how identical sequences of activities are spread across the diaries of a population gives insight and reveals similarities in the way that people live their lives. Activity patterns are defined as the constellations that emerge from the way activity sequences are distributed in the diary data. We separate between activity patterns at the individual and the population level.

The same activity sequence distributed across the diary day or days of a single individual is defined as an *individual activity pattern*. These are most useful when studying repetitive behaviour of a single individual over a longer period of time. The same activity sequence distributed over single day diaries of a whole population reveals a *collective activity pattern*. Collective activity patterns are more appropriate when studying similarities and differences either between the individuals within a single group or between different groups. The choice of type of activity pattern to study depends, of course, on the research question.

4.2   Algorithm description

Activity diaries are considered as events occurring over time in a certain order: sequences of events. A sequence of two (*double*), three (*triple*), four (*quadruple*) or any number of *n* activities will also be referred to as an *n-tuple,* a *tuple* of *n*, or simply a *tuple*. The goal with the algorithm is to extract interesting *n-tuples* from the diaries, meaning *n-tuples* whose distribution constitutes interesting activity patterns. What is classified as interesting is defined by the researcher using the algorithm by allowing them to set constraints on the algorithm that determine the attributes of the identified activity patterns.

An *n-tuple* can be integrated in an individual's diary in two ways. Activities can succeed each other directly, leaving no gap in between (*gap* = 0) or other activities, that are not part of the *n-tuple*, can interrupt the *tuple* activities creating a gap between them (*gap* > 0). This can be seen in Figure 5 where the *3-tuple* "cook dinner → eat dinner → wash dishes" has been located in two different individuals' activity paths. In Figure 5a the individual washes the dishes immediately after having finished dinner, while the individual in Figure 5b takes a pause to smoke (a one activity gap) before washing the dishes.

We have used an apriori algorithm (Agrawal and Srikant, 1995) as our starting point for the activity pattern extraction and adjusted its computation and constraints to match our diary data. We use the lower order event sequences to create higher order ones depending on the constraints that define the interesting attributes in an activity pattern. We have introduced a lot of user control over the computation of the algorithm as the main goal is not simply to find

frequently occurring activity sequences, so the user should also be able to decide on the characteristics of the extracted patterns.

Figure 5
Examples of the activity sequence (*tuple*) "cook dinner→ eat dinner→ wash dishes"
integrated in different ways in two individuals' diaries

<table>
<tr><td>a) a zero gap match</td><td>b) a gap = 1 match</td></tr>
</table>
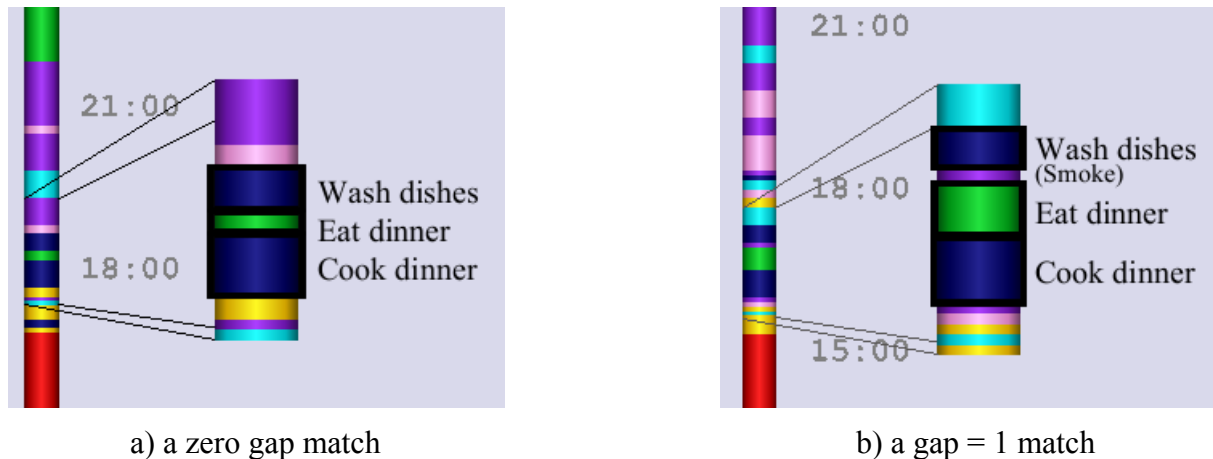
Source: Produced using VISUAL-TimePAcTS.

The activity pattern extraction algorithm principally iterates over three steps (Figure 6):

(1) generation of candidate tuples
(2) location of the candidate tuples in the dataset
(3) filtering of the located candidates according to user constraints

The user constraints that can be set, which will be explained in detail later, are:

(1) a minimum and maximum tuple duration
(2) a minimum and maximum gap between adjacent activities of the tuple
(3) a minimum and maximum number of occurrences of the tuple in a pattern
(4) a time window within which the emerging activity pattern must occur
(5) a minimum and maximum number of individuals that should perform the tuple

These criteria are those that we have found useful so far but the list is being extended as required. After the algorithm has run to completion the resulting extracted *n-tuples* become available to the user for visualization and interactive visual analysis of the resulting patterns. Next we will go through each step of the algorithm in more detail.

4.3   Candidate tuple generation

The first step of the activity pattern extraction algorithm is the candidate *tuple* generation. The candidate *tuples* are generated stepwise by increasing them by one activity per iteration. In the first iteration the single activities performed by the population are identified and counted and the ones that don't fit the constraints are ignored while the rest are considered the valid ones and go on to the next step of the iteration. In the second iteration the valid single activities (*1-*

tuples) are joined together to create pairs of activities (*2-tuples*). All pairs that satisfy the constraints are then the valid *2-tuples* and sent to the next step of the algorithm while the others are discarded. The iterations continue similarly, *2-tuples* are joined to create *3-tuples*, *3-tuples* are joined to create *4-tuples* etc. until no more candidate *n-tuples* can be generated that satisfy the set constraints.

Figure 6
Overview of the activity pattern extraction algorithm
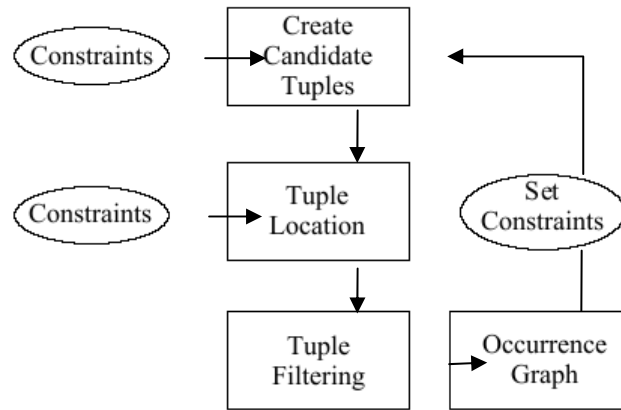
In order to join two *n-tuples* they have to have *n-1* elements exactly identical and result in at most two *(n+1)-tuples*. Due to the sequential nature of the data a join operation between two *n-tuples* can be performed in exactly four ways regardless of the value of *n*: (1) the first *n-1* elements (1, ... , n-1) of both *n-tuples* are identical, (2) the last *n-1* elements (2, ... , n) of both *n-tuples* are identical, (3) elements 2,..., n of the first *n-tuple* are identical with elements 1, ... , n-1 of the second *n-tuple*, (4) elements 1, ... , n-1 of the first *n-tuple* are identical with elements 2, ... , n of the second n-tuple. Let us illustrate this by an example. If *a, b, c, d* are the activities included in two 3-tuples to be joined then the different join operations that can be applied to create the 4-tuples are (the join operation is denoted by the symbol   ):

$$(1) \quad (\boldsymbol{a,b},c) \quad (\boldsymbol{a,b},d) \rightarrow (\boldsymbol{a,b},c,d)$$
$$\rightarrow (\boldsymbol{a,b},d,c)$$
$$(2) \quad (a,\boldsymbol{b,c}) \quad (d,\boldsymbol{b,c}) \rightarrow (a,d,\boldsymbol{b,c})$$
$$\rightarrow (d,a,\boldsymbol{b,c})$$
$$(3) \quad (a,\boldsymbol{b,c}) \quad (\boldsymbol{b,c},d) \rightarrow (a,\boldsymbol{b,c},d)$$
$$(4) \quad (\boldsymbol{a,b},c) \quad (d,\boldsymbol{a,b}) \rightarrow (d,\boldsymbol{a,b},c)$$

A candidate *(n+1)-tuple* is valid if and only if it is composed of valid sub-tuples, meaning sub-tuples that have survived the previous iterations' filtering. Because of this many generated candidates can be immediately eliminated from the process thus reducing the search space and hence the calculation time of the algorithm.

When the candidate patterns have been generated they are sent to the next step of the algorithm; the *tuple* location step.

4.4 Tuple location

The algorithm steps through the generated candidate *tuples* and matches each of them to the diary data, meaning it identifies them in the individuals' diaries. The constraints set by the user are considered during this search and the matches that don't satisfy these constraints are ignored, while the ones that do match them are considered to be the extracted *tuples*. A record is kept of the number of occurrences of each extracted *tuple*, the individuals performing them, and the *tuples'* location in the dataset. This information is saved for every iteration of the algorithm in a data structure and is then used in the study and visualization of the patterns. If no matches are found for the generated candidate *tuples* then the algorithm terminates otherwise the extracted *tuples* are filtered.

4.5 Filtering of extracted tuples

During the filtering step the extracted *tuple* matches are tested against the user specified constraints. Let us take a closer look at these constraints.

(1)   The user can specify a *minimum and maximum duration* that an *n-tuple* in the activity diaries should have in order for it to be classified as an interesting activity pattern member. A user can, for example, decide that only short activity *tuples* that complete within 2 hours are interesting to study.

(2)   A *minimum and maximum gap* allowed between the activities of an *n-tuple* can also be defined. This means that a user can choose the number of other activities that are allowed to interrupt two adjacent *tuple* activities. The user may want to study patterns consisting of *tuples* in which activities follow one another immediately in the individuals' days, as in figure 5a, or may regard the *tuple* in figure 5b as equally valid.

(3)   The *minimum and maximum number of occurrences* of each extracted *n-tuple* can also be set by the user. The user can select to study only frequently occurring *n-tuples* for example.

(4)   A *time window* deciding the time of day of occurrence for the emerging activity pattern can be specified. A user may, for example, be only interested in studying activity patterns that occur in the evening.

(5)   And finally the *minimum and maximum number of people* that should be performing the extracted *n-tuple* can be set. The user for example may be interested only in patterns consisting of *n-tuples* that are performed by the majority of the population.

Some of the constraints are also applied during the candidate generation and the *tuple* location in order to speed up the process. The time window constraint, for example, is applied when initiating the algorithm and counting the single activities. There is no need to take into account activities that are outside of the specified time window as these will be eliminated in the

filtering step either way. The time window, the *tuple* duration, and the minimum and maximum gap are considered in the location step and *tuple* matches that exceed these limits are not recorded. Finally, in the filtering step all limits are tested against all the extracted *n-tuples*.

When the filtering step of an iteration has finished, a frequency graph is drawn showing the number of occurrences of the extracted *n-tuples*. The user can, at this stage, choose to define new constraints that will apply to the next iteration or continue the pattern extraction process with the same settings. If no extracted *tuples* survive the filtering then the algorithm terminates and the results are ready to be visualized, otherwise it continues to the next iteration and the generation of new higher order candidate *tuples*. The user can also choose to terminate the algorithm at any stage.

4.6 Visualization and interaction

The extracted *n-tuples* are listed, by order *n*, in the graphical user interface of VISUAL-TimePAcTS and made available to the user. The user can select, by clicking on the list with the mouse, one or more extracted *n-tuples* to be displayed in the visualization window. The extracted *tuples* are highlighted in the visualized data by being drawn in colour while surrounding activities are shown in grey. The pattern activities are coloured depending on the activity category that they belong to. Representing the sequences in this manner allows the user to interactively explore the extracted patterns in context and reveals how the activity sequences are distributed throughout the day, how different individuals perform them, and which activities are likely to interfere with and interrupt the carrying out of the larger projects which these sequences represent. An activity pattern emerges by the representation of the distribution of the *n-tuples* across the diaries in the population.

The user can switch between the default visualization and the pattern visualization, at any time, and can also switch between the different levels of the extracted patterns.

4.7 Filtering script language

The pattern extraction algorithm finds all the *tuples* in the data that match the user's criteria. This can result in large numbers of activity patterns that aren't always easy to examine. For this reason further filtering of the identified patterns has also been added to the pattern extraction feature. A scripting language has been implemented that allows the user to write commands applying logical operations on the resulting *tuple* set of a specific order, *n*, in order to narrow the results. The operators available to the user are:

(1)   AND operator (&). The user can define one or more activities all of which must be present in the *tuples*. The command "work"&"lunch" (900&3), for example, will filter out all *tuples* that do not have both work and lunch activities present.

(2)   OR operator (;). The user can define one or more activities at least one of which must be present in the *tuples*. The command "work";"lunch" (900;3), for example, will filter out all *tuples* that do not include either work or lunch activities.

(3)   FOLLOWED BY operator (:). The user can narrow the search to patterns where certain *tuple* activities or ranges of *tuple* activities succeed one another. For example the user can search for *tuples* in which a travel activity is followed by a work activity. The command for this would be: "travel":"work" (550-649 : 900).

(4)   RANGE operator (-). The user can select an activity range that the pattern activities should lie within. A single range can be decided for all elements in the *tuples*, or for each element separately. For example the user can narrow the results to *tuples* having the first element within the code range 0-100 (care for oneself activities). The command for this would be: "care for oneself": *any activity* (0-100 : *).

These different operators can be combined and create longer filtering commands to be applied. For example, the command ("lunch";"coffee"):"work" ((3;4):900) keeps only *tuples* in which the activity work is preceded by either lunch or coffee activity.

4.8   Algorithm efficiency

The algorithm and the visualization framework are implemented in C++, OpenGL and using wxWidgets for the graphical user interface. The algorithm was run on a laptop PC with a dual core 2GHz Centrino CPU and 2GB RAM, for a dataset consisting of 289 individuals performing, in total, 10,514 activities, and applying different constraints to the pattern extraction. Table 1 shows performance times for these test runs. The results show that activity patterns are extracted in interactive times for large subsets of the population, as long as constraints are set on the pattern extraction.

Table 1
Results from running the pattern extraction algorithm on a laptop PC with a dual core 2GHz Centrino CPU and 2GB RAM and applying different constraints

Example	Max. order (n)	Level of detail	Min. people	Max. tuple duration	Max. gap	TOTAL TIME (sec)
1	4	2	15	4 hours	0	4.03
2	5	2	15	8 hours	0	4.45
3	5	2	15	4 hours	4	12.67
4	7	2	15	8 hours	4	15.71

Source: Calculations computed within VISUAL-TimePAcTS.

5   Activity analysis scenario

In order to demonstrate how the pattern extraction process works in VISUAL-TimePAcTS and show how to analyse and better understand the arrangement of activity patterns we will go through an example step by step.

Individuals aged 20 to 65 in the population database are chosen to be studied on a weekday with an activity classification level of detail of 2; a quite high level of detail. Figure 7 shows the front view visualization of the activity paths of this group within VISUAL-TimePAcTS and Table 2 shows some numerical information concerning the selected group.

Figure 7
Front view visualization in VISUAL-TimePAcTS of a group of individuals aged 20 – 65
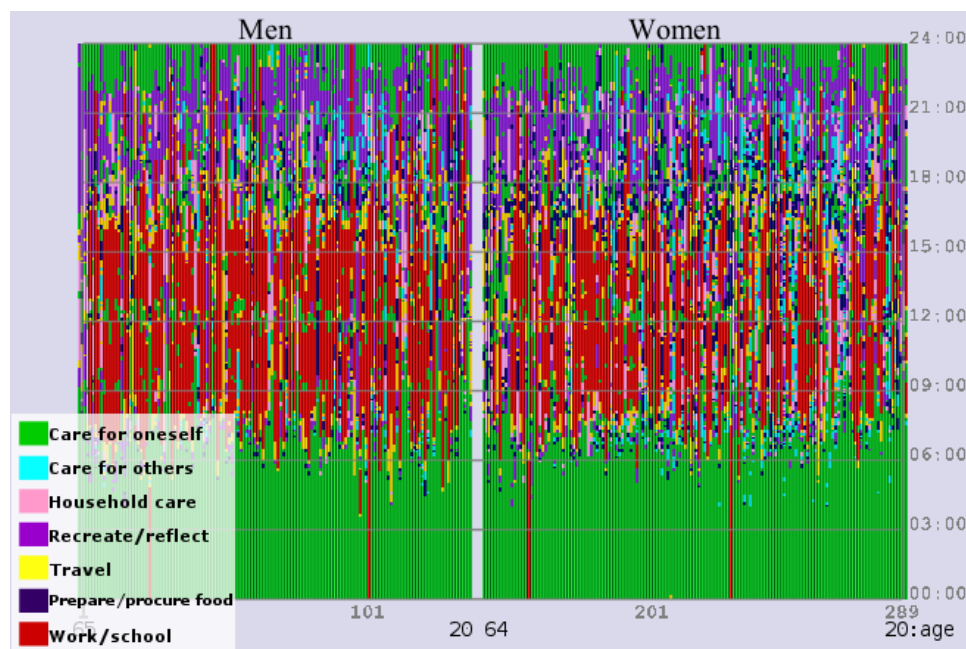
Time is shown on the y-axis and the individuals are ordered along the x-axis by
age and gender. Colours represent the 7 activity categories
Source: Produced using VISUAL-TimePAcTS.

Table 2
Numerical information about the selected group of individuals

	Selected group
Age	20 – 65
No individuals	289
Women	150
Men	139
Diary entries	10514
No of unique activities	262

Source: Calculations computed within VISUAL-TimePAcTS.

For the first run of the algorithm the specified constraints were: a maximum activity sequence (*n-tuple*) duration of 10 hours, no gap between the adjacent *tuple* activities and a minimum of 15 individuals performing the activity pattern (see Table 3).

After having defined the constraints that the extracted patterns should meet, the first iteration of the algorithm can start. The unique single activities (*1-tuples*) are generated, located, and filtered according to the algorithm description in section 4. The first iteration concludes with the display of a graph showing their occurrence frequency at which point we can choose to alter the constraints that will apply to the second iteration or continue with the same ones. We choose to keep the same constraints for all iterations and continue to go through the subsequent iterations in the same manner until the algorithm terminates. Using the previously described data and constraints we extract *tuples* up to order 5, *5-tuples*.

Table 3
User specified constraints applied to the first example run of the pattern extraction algorithm

	Minimum	Maximum
Pattern duration (hours)	0	10
Time window	00:00	24:00
Activity gap	0	0
Pattern occurrences	1	no limit
No of individuals performing the pattern	15	no limit

Figure 8a shows the list of the groups of all orders *n* of the extracted *tuples*, in this case *n* = *5*. By clicking, with the mouse, on an item in this list, a group of extracted *n-tuples* can be selected (in Figure 8a, for example, the *4-tuples* are selected). Upon selection, the list of all *n-tuples* that are included in this group is shown in the interface (Figure 8b shows a subset of the list of *4-tuples*). Selecting one or more distinct *n-tuples* from the list will result in their pattern being drawn in the visualization window.

We have chosen to start with the *4-tuples* (sequences of 4) in the list of extracted *tuples* (Figure 8a) and look for potentially interesting collective activity patterns containing the activity "work" (code 900). In order to do this the script language was used to filter out all *tuples* that do not include work (Figure 8b). The *4-tuples* containing "work" are 9 of the total of 10. Figure 8b shows how these are presented in the VISUAL-TimePAcTS user interface. Most of these work-related *4-tuples* are not very exciting: the majority of them are comprised of a combination of meals (here codes 3, 4, 11), travel (here code 556) and travel related activities (like dropping off or picking up somebody (codes 208, 212) on the way somewhere). However, in one of them there is one activity that stands out as it differs in nature from the rest, namely the activity "read the newspaper" (code 477). We find this deviation interesting and choose to analyse it further. The complete activity sequence that includes "work" and "read the newspaper" is: "have breakfast→ read the newspaper→ travel by car→ work" – or written in the codes: 3→477→556→900. Since breakfast is one of the activities in the chosen *4-tuple*, we can suspect that its distribution creates an activity pattern which is related to mornings. Furthermore, since the last activity in the sequence is "work" we will call this *4-tuple*

"getting ready for work". "Getting ready for work" ought to be relatively evenly spread between working men and women, at least among those who do not have to drop off children at the day care centre or school. Gender similarities and differences concerning how the morning activities are organized and performed are of interest in many respects. In households, for example, for discussing who does what kind of tasks in the morning rush and what is the division of labour, but also among policy makers for finding arguments for policy measures to provide equal opportunities for men and women to participate in the labour market.

Figure 8
Pattern extraction algorithm results as seen in VISUAL-TimePAcTS

(a)   (b)
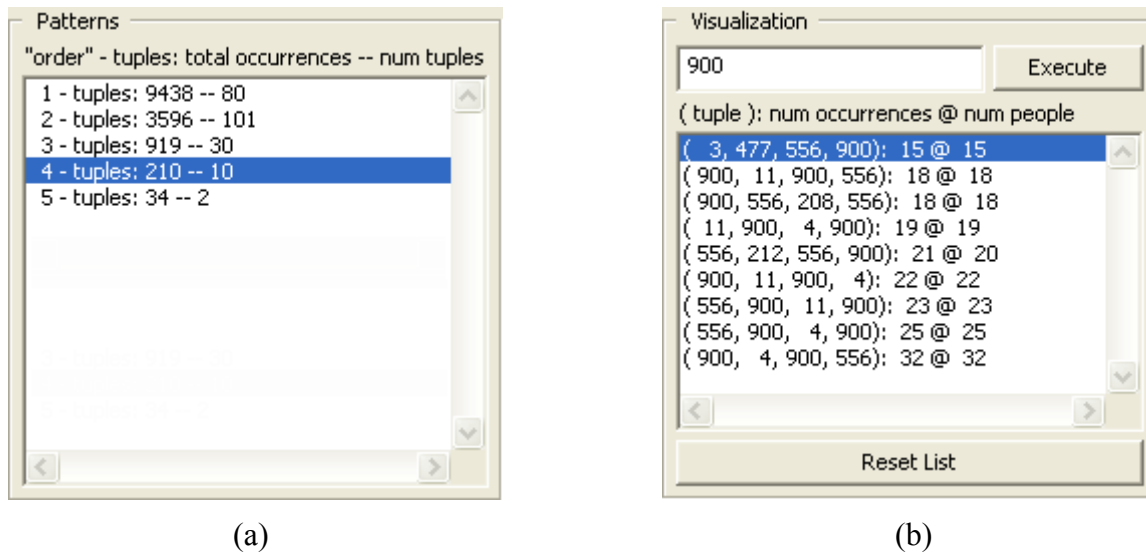
(a) List of all extracted *n-tuple* groups (*4-tuples* are selected),
(b) List of extracted *4-tuples* which include the activity "paid work" (900).
Source: Screen shot image of the VISUAL-TimePAcTS user interface.

After identifying this collective activity pattern as "getting ready for work", it may then be informative to see how often the distinct activities involved in the pattern appear among the individuals in the population, as well as examine whether there are differences between men and women. This can be done by looking at the single activities composing it. The distinct single activities making up the *4-tuple* "getting ready for work" appear frequently during the week day in the population. "Have breakfast", for example, appears in the data 258 times, "read newspaper" 287 times, "travel by car" 496 times, and "work" 947 times. These activities are quite evenly distributed among men and women, as can be seen in Figure 9, even though "travel by car" is a bit more frequent among men. From this information we can conclude that there are not very big gender differences when the activities are looked upon as single events. The next step is then to see if the result is the same when we look at the more complex (higher order) activity sequences.

The generated research question is, hence: How is the activity sequence "getting ready for work" distributed among individuals in the population and, more precisely, between men and women? The even distribution of the distinct single activities indicates that this should be the

case for the complete sequence also. To answer this question we study the visualization of the collective activity pattern created by the selected *4-tuple* (Figure 10). This collective activity pattern appears only 15 times in the population[3] and is performed by 15 individuals. It shows a great difference between men and women, with only two women performing the activity sequence as opposed to 13 men. Furthermore, we can see that it is performed primarily by men aged 35 and older. However, since each of the distinct activities of the sequence were evenly distributed between men and women in the selected population, we have to dig deeper into the data to understand why this inequality appears.

Figure 9
Visualization of the distinct single activities making up the collective activity pattern "getting ready for work": "have breakfast→ read newspaper→ travel by car→ work" (3→477→556→900) in VISUAL-TimePAcTS

(a) "Have breakfast" (3)

(b) "Read newspaper" (477)

(c) "Travel by car" (556)

(d) "Work" (900)
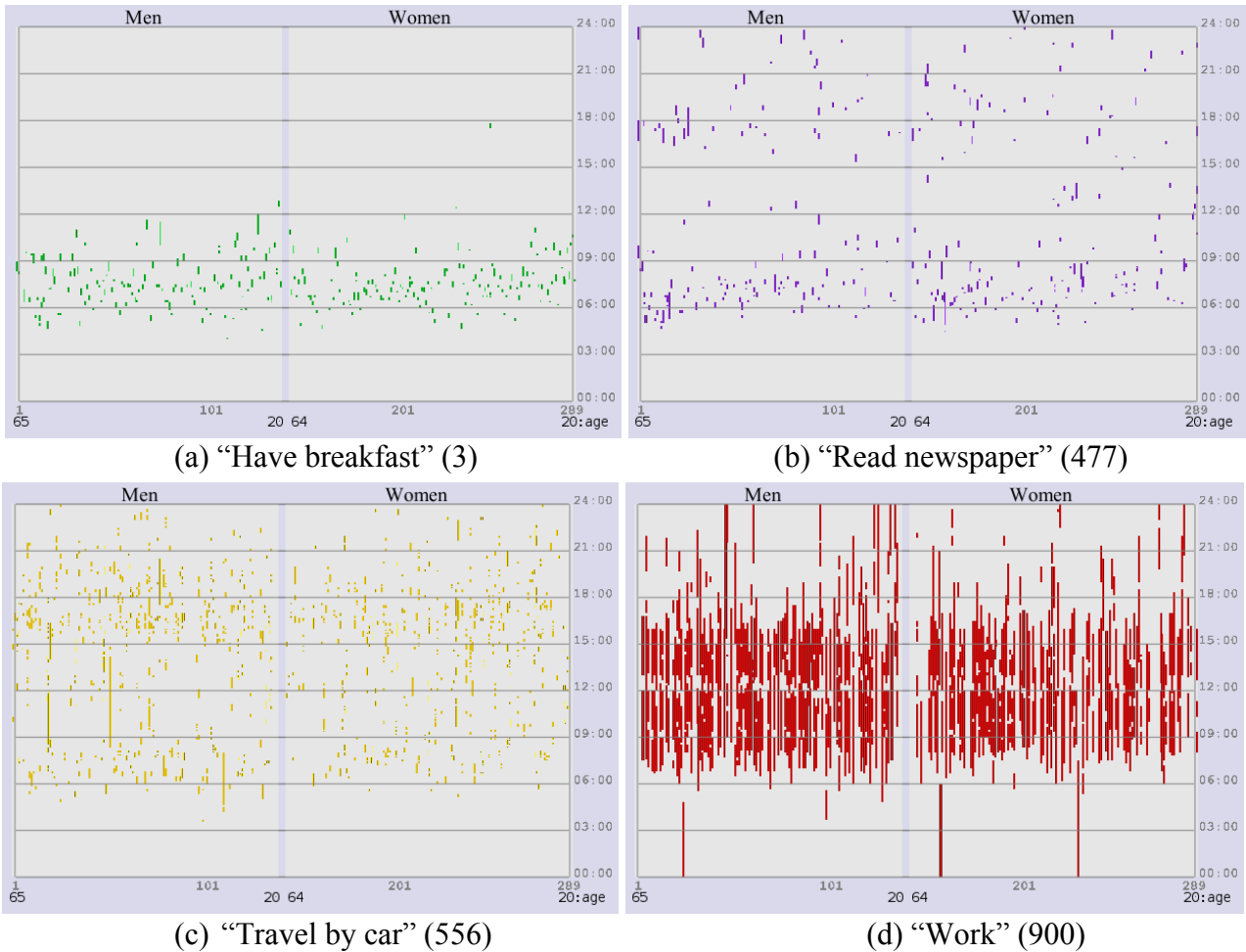
Source: Produced using VISUAL-TimePAcTS.

To do this we go back to the list of *n-tuples* and choose to look at the *3-tuples*, focusing on those consisting of activities present in the "getting ready for work" *4-tuple*. Figure 11 shows the distributions of the two activity sequences that "getting ready for work" can be broken

---

[3] This is also seen after the code sequence as the number 15 in Figure 9b.

into; namely the *3-tuples* "have breakfast→ read newspaper→ drive car" (3→477→556) and "read newspaper→ drive car→ work" (477→556→900). The resulting activity pattern representations (Figure 11) are somewhat surprising as they show only a slight change in the number of individuals performing the *3-tuples* and no change in the overall distribution. We already know, however, from looking at the single activities (seen in Figure 9), that women and younger men do engage, to greater extent, in all of the distinct single activities. So, we make a hypothesis that the *4-tuple* in question ("getting ready for work") is most likely performed by more individuals in the population than those extracted by the algorithm and shown in the representation. We can further assume that the *4-tuple* is probably interrupted by other activities in the majority of the individuals' diaries and therefore the strict constraints of the algorithm eliminated these individuals. In order to explore the assumed hypothesis we run the pattern extraction algorithm again with altered constraints. We permit a gap of 4, meaning that maximum 4 other activities may interrupt the adjacent activities of the *4-tuple*, as opposed to the previously set zero gap, while the rest of the constraints remain unchanged (Table 4).

Figure 10
Visualization of the *4–tuple* "have breakfast→read newspaper→travel by car→work"
(3→477→556→900) in VISUAL-TimePAcTS
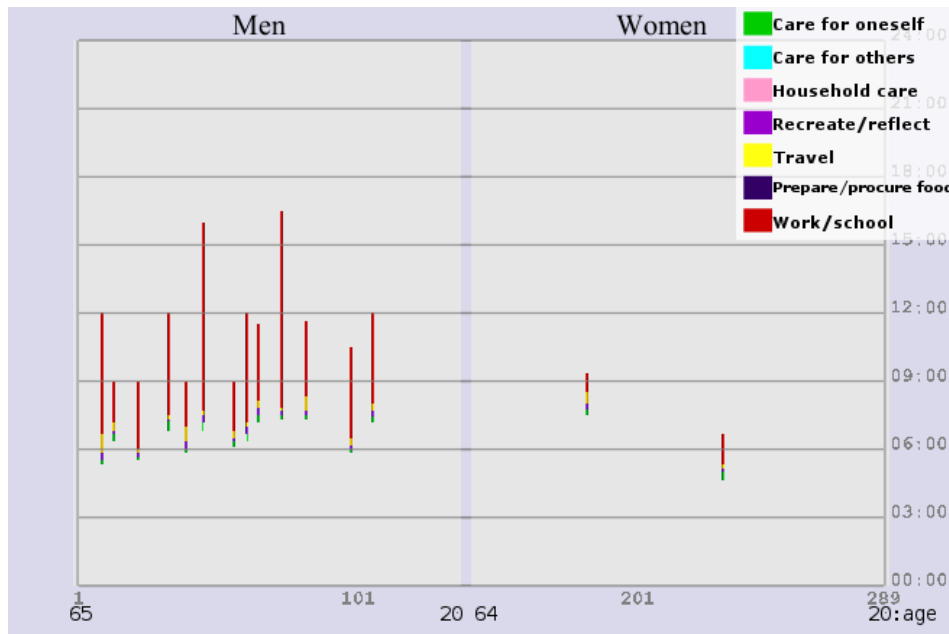
The constraints applied to the algorithm are: minimum of 15 people performing the *tuple*, maximum gap of zero between adjacent *tuple* activities and maximum duration 10 hours.
Source: Produced using VISUAL-TimePAcTS.

Re-analysing the data with this reduced constraint confirms our hypothesis. We find that more young men (13 additional) and women (9 additional) perform the *4-tuple* "getting ready for work", revealing a new collective activity pattern (Figure 12). 37 individuals carry out the *4-tuple*, compared to 15 when no interruptions are allowed. Further analyses can then be per-

formed to determine which are the activities that interrupt the *4-tuple* and study these in depth.

Table 4
User specified constraints applied to the second
example run of the pattern extraction algorithm

	Minimum	Maximum
Pattern duration (hours)	0	10
Time window	00:00	24:00
Activity gap	0	4
Pattern occurrences	1	no limit
No of individuals performing the pattern	15	no limit

6   Conclusions

In this paper, we have presented a data mining algorithm which, combined with interaction and visualization techniques, facilitates the extraction and analysis of activity patterns from time use activity diaries. Further, we have demonstrated an example of how this analysis can proceed by going through a user scenario including identification of an interesting *tuple*, the raising of a research question, formation of a hypothesis and its verification. The goal of the pattern extraction algorithm has been to facilitate the automated identification of collective activity patterns in a population of individuals while preserving the group members' individuality when studying the identified patterns. The results from using the algorithm and analysing the extracted activity patterns appear promising with respect to this goal.

The pattern extraction algorithm should also be useful for finding answers to other methodologically and theoretically grounded research questions, for example questions relating to various activity patterns to empirically found indicators on well-being, like how health and sick leave are experienced. Activity patterns are also important in the making of a sustainable society, not least when it comes to energy used by appliances needed when activities are performed. Another interesting question is whether one specific collective activity pattern in a population or group predicts the appearance of a specific other activity pattern. Flexibility and ability to meet varying conditions and restrictions are hence important properties of methods for time use studies. This is met in the presented work by the interactive nature of the suggested pattern extraction process.

The analyst using the pattern extraction feature of VISUAL-TimePAcTS has freedom both in the extraction process of the patterns and in their analysis. The filtering script language implemented allows the analyst to narrow the results list and look at fewer at a time. The visualization of the results facilitates the understanding of the activity patterns and gives a concrete picture to use as a common ground for discussion and analysis. Using the VISUAL-

TimePAcTS pattern extraction algorithm helps researchers into time use to sort through the mass of activity data collected in diary surveys and helps to better understand combinations of activities in terms of collective and individual activity patterns. The combination of these features will help the user to extract new types of results from time use studies.

Figure 11
Visualization of the two extracted 3–*tuples* that make up the *4–tuple*
"getting ready for work" (3→477→556→900) in VISUAL-TimePAcTS
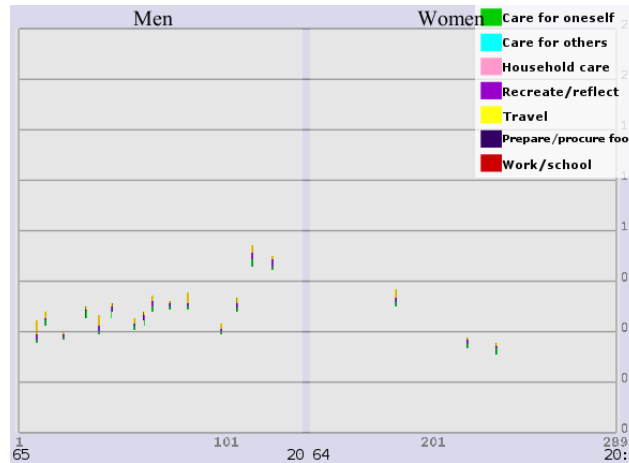
(a) "have breakfast→ read newspaper→ drive car" (3→477→556)
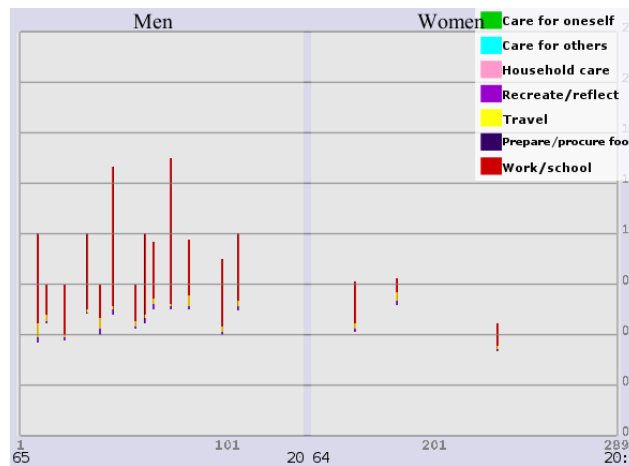
(b) "read newspaper→ drive car→ work" (477→556→900)

The constraints applied to the pattern extraction algorithm are: minimum of 15 people performing the *tuple*, maximum gap of zero between adjacent *tuple* activities and maximum *tuple* duration of 10 hours.
Source: Produced using VISUAL-TimePAcTS.

Future work includes the extension of the search and filtering criteria to support new users and new types of activity patterns in the data. Each new kind of task and new type of data being considered requires modifications to the search criteria and the list is becoming extensive to support the many types of user who may be interested in this type of searching.

Note

VISUAL-TimePAcTS is an application developed as part an ongoing research project and is continuously extended. A stable, distributable version of the application, including the functionality described in this paper, is currently being developed and will be available in December 2009. For further information please contact the authors.

Figure 12
Visualization of the *4–tuple* "breakfast→ read newspaper→ drive car→ work"
(3→477→556→900)
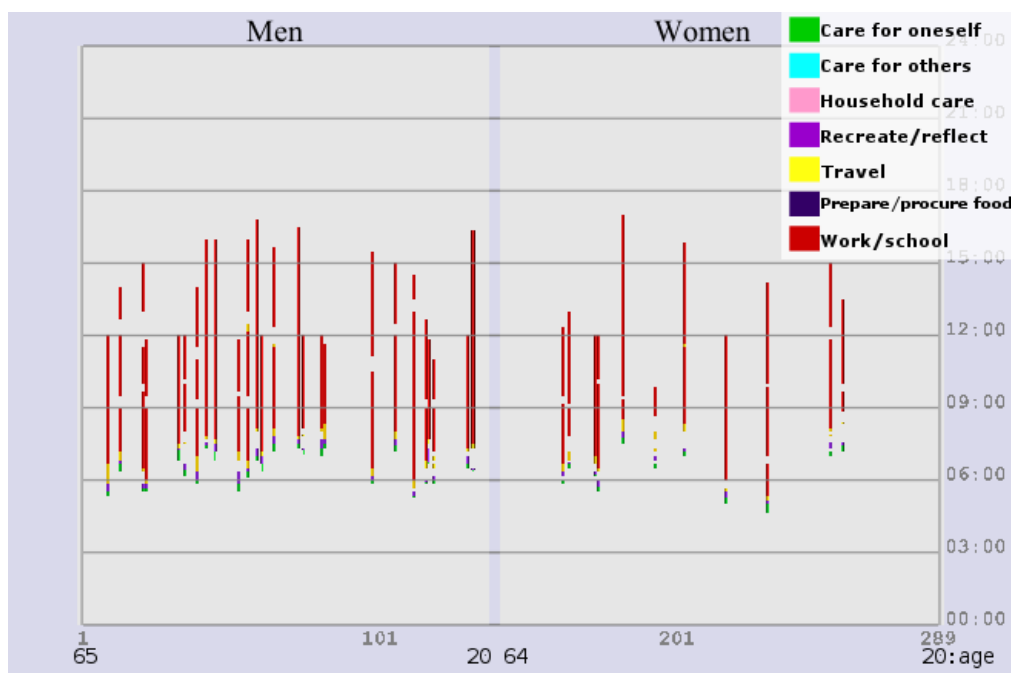
The constraints applied on the pattern extraction algorithm are: minimum of 15 people performing the *tuple*, maximum gap of 4 between adjacent *tuple* activities and maximum *tuple* duration of 10 hours. 39 individuals (12 women and 27 men) display this activity pattern at the population level.
Source: Produced using VISUAL-TimePAcTS.

References

Abbott, A. and J. Forrest (1986), Optimal matching methods for historical data, in: *Journal of Interdisciplinary History*, Vol. 16, 473-496.

Abbott, A. and A. Tsay (2000), Sequence analysis and optimal matching methods in sociology – Review and prospect, in: *Sociological Methods and Research*, Vol. 29, No. 1, 3-33.

Agrawal, R., Imielinski, T. and A. Swami (1993), Mining association rules between sets of items in large databases, in: *Proceedings of the 1993 ACM SIGMOD International Conference on Management of Data*, Washington, DC, 207–216.

Agrawal, R. and R. Srikant (1995), Mining sequential patterns, in: *Proceedings of the Eleventh International Conference on Data Engineering*, Taipei, Taiwan, 3-14.

Castells, M. (2003), *The power of identity – The information age – Economy, society, and culture*, Vol. 2, Blackwell Publishers.

Ellegård, K. (1999), A time-geographical approach to the study of everyday life of individuals – A challenge of complexity, in: *GeoJournal*, Vol. 48, No. 3, 167-175.

Ellegård, K. and M. Cooper (2004), Complexity in daily life – 3D-visualization showing activity patterns in their contexts, in: *electronic International Journal of Time Use Research (eIJTUR)*, Vol. 1, No. 1, 37-59.

Ellegård, K. (2006), The power of categorisation in the study of everyday life, in: *Journal of Occupational Science,* Vol. 13, No. 1, 37-48.

Ellegård, K. and K. Vrotsou (2006), Capturing patterns of everyday life – Presentation of the visualization method VISUAL-TimePAcTS, in: *28th International Association for Time Use Research (IATUR) Annual Conference*, Copenhagen, Denmark.

Eurostat. (2004), *How Europeans spend their time – Everyday life of women and men, Data 1998-2002*, European Commission Theme 3 – Population and social conditions, Pocketbooks, Brussels.

Fails, J.A., Karlson, A., Shahamat, L. and B. Shneiderman (2006), A visual interface for multivariate temporal data – Finding patterns of events across multiple histories, in: *Proceedings of IEEE Symposium on Visual Analytics Science and Technology (VAST)*, 167-174.

Giddens, A. (1991), *Modernity and self-identity – Self and society in the late modern age*, Polity Press, Cambridge, UK.

Han, J. and M. Kamber (2000), *Data mining – Concepts and techniques (The Morgan Kaufmann Series in Data Management Systems)*, Morgan Kaufmann Publishers, San Francisco, CA.

Han, J., Cheng, H., Xin, D. and X. Yan (2007), Frequent pattern mining – Current status and future directions, in: *Data Mining and Knowledge Discovery*, Vol. 15, No. 1, 55-86.

Huisman, O. and P. Forer (1998), Computational agents and urban life spaces – A preliminary realisation of the time-geography of student lifestyles, in: *Proceedings of the Third International Conference on GeoComputation*, Bristol, U.K.

Huisman, O. and P. Forer (2005), The complexities of everyday life – Balancing practical and realistic approaches to modelling probable presence in space- time, in: *Proceedings of the 17th Annual Colloquium of the Spatial Information Research Centre (SIRC)*, University of Otago, Dunedin, New Zealand, 155-168.

Hägerstrand, T. (1970a), *Tidsanvändning och omgivningsstruktur (Time use in a structuring environment)*, Statens Offentliga Utredningar (SOU), Vol. 14, Annex 4, Allmänna Förlaget, Stockholm.

Hägerstrand, T. (1970b), What about people in regional science?, in: *Papers in Regional Science*, Vol. 24, No. 1, 6-21.

Joh, C.H., Arentze, T.A. and H.J.P. Timmermans (2001a), Multidimensional sequence alignment methods for activity-travel pattern analysis – A comparison of dynamic programming and genetic algorithms, in: *Geographical Analysis*, Vol. 33, 247-270.

Joh, C.H., Arentze, T.A. and H.J.P. Timmermans (2001b), A position-sensitive sequence alignment method illustrated for space-time activity-diary data, in: *Environment and Planning A*, Vol. 33, No. 2, 313-338.

Joh, C.H., Arentze, T.A., Hofman, F. and H.J.P. Timmermans (2002), Activity pattern similarity – A multidimensional sequence alignment method, in: *Transportation Research Part B – Methodological*, Vol. 36, No. 5, 385-403.

Kraak, M.-J. (2003), The space-time cube revisited from a geovisualization perspective, in: *Proceedings of the 21st International Cartographic Conference*, Durban, South Africa, 1988–1995.

Kruskal, J.B. (1983), An overview of sequence comparison – Time warps, string edits and macromolecules, in: *SIAM Review*, Vol. 25, No. 2, 201-237.

Kwan, M.P. (1999), Gender, the home-work link, and space-time patterns of nonemployment activities, in: *Economic Geography*, Vol. 75, No. 4, 370-394.

Kwan, M.P. (2000), Interactive geovisualization of activity-travel patterns using three-dimensional geographical information systems – A methodological exploration with a large data set, in: *Transportation Research Part C – Emerging Technologies*, Vol. 8, 185-203.

Kwan, M.P. and J. Lee (2004), Geovisualization of human activity patterns using 3D GIS – A time-geographic approach, in: Goodchild, M.F. and D.G. Janelle (eds.), *Spatially integrated social science*, Oxford University Press, 48-66.

Lenntorp, B. (1976), Paths in space-time environments - A time-geographic study of movement possibilities of individuals, in: *Lund Studies in Geography – Series B*, No. 44, Human Geography, Royal University of Lund, Department of Geography, Lund, Sweden.

Lesnard, L. (2006), Optimal matching and the social sciences, in: *28th International Association for Time Use Research (IATUR) Annual Conference*, Copenhagen, Denmark.

Schlich, R. (2001), Analysing intrapersonal variability of travel behaviour using the sequence alignment method, in: *European Transport Research Conference*, Cambridge, Great Britain.

Srikant, R. and R. Agrawal (1996), Mining sequential patterns – Generalizations and performance improvements, in: *Proceedings of the Fifth International Conference on Extending Database Technology (EDBT)*, Avignon, France.

Wilson, C. (1998), Activity pattern analysis by means of sequence-alignment methods, in: *Environment and Planning A*, Vol. 30, No. 6, 1017-1038.

Wilson, C. (2001), Activity patterns of Canadian women – Application of ClustalG alignment software, in: *Transportation Research Record*, No. 1777, 55- 67.

Wilson, C. (2006), Reliability of sequence-alignment analysis of social processes – Monte Carlo tests of ClustalG software, in: *Environment and Planning A*, Vol. 38, No. 1, 187-204.

Wilson, C. (2008), Activity patterns in space and time – Calculating representative Hägerstrand trajectories, in: *Transportation*, Vol. 35, No. 4, 485-499.

Yu, H. (2006), Spatio-temporal GIS design for exploring interactions of human activities, in: *Cartography and Geographic Information Science*, Vol. 33, No. 1, 3-19.

Zhao, J., Forer, P. and A.S. Harvey (2008), Activities, ringmaps and geovisualization of large human movement fields, in: *Information Visualization*, Vol. 7, No. 3-4, 198–209.

Changes in American children's time – 1997 to 2003

Sandra L. Hofferth

Department of Family Science
1210E Marie Mount Hall
School of Public Health
University of Maryland, College Park 207423
e-mail: hofferth@umd.edu

Abstract

Over the six-year period between 1997 and 2003 broad social changes occurred in the United States: welfare rules changed, the nation's school policies were overhauled, America was attacked by terrorists, and American values shifted in a conservative direction. Changes in children's time were consistent with these trends. Discretionary time declined. Studying and reading increased over the period, whereas participation in sports declined, suggesting that the increased emphasis on academics at the school level has altered children's behavior at home as well. Increased participation in religious and youth activities and declines in outdoor activities may reflect changes in parental values and security concerns. The results suggest continuation of the upward trend in reading and studying from the 1980s and early 1990s, but increased religious attendance and youth group participation rather than increased participation in sports characterized this recent period.

1 Changes in children's time – 1997 to 2003

1.1 Introduction

The public is fascinated by trends in children's activities, such as homework, sports, reading, and watching television (Mathews, 2003; Ratnesar, 1999). Although to repeatedly measure and then report these activities may appear insignificant, to the contrary, a comparison of how children spend their time today compared to the past opens a window on changes in values and beliefs over the period that would otherwise be invisible.

Research on changes in values and beliefs has been hampered by its dependence upon individual self-report. What individuals report cannot usually be taken at face value, but must be deconstructed (Daly, 2001). Researchers attempt to look beneath the surface to interpret the meaning of what respondents say, recognizing that actors may be unaware of their motivations. For example, some parents who enroll children in extracurricular activities may want their child to win a college scholarship (Dunn, Kinney and Hofferth, 2003), while others may desire to improve social skills or even to create positive childhood memories (Daly, 2001). Self-reports are particularly insensitive to social change. If the same questions or categories are used, major changes or shifts cannot surface (Alwin, 2001).

However, an alternative to self-report for assessing values and beliefs is the examination of behavior. The experiences, the actions that individuals and families take, are important. Each of us has exactly 24 hours each day, and only those 24 hours; what varies is how we use that time. Although some actions are reinforced externally, value-based actions are self-reinforcing. Satisfaction or nostalgia occurs after the fact, strengthening the behavior. To the extent that parents make activity decisions based upon anticipation of consequences, symbolic as well as physical, they are expressing their values (Bandura, 1976). Thus, how people spend their time becomes a reliable indicator of their values. And, even more important, how parents and children make decisions regarding their children's time is a reliable indicator of their values regarding childrearing. As parental values or underlying circumstances change, children's activities should change.

This paper, therefore, examines changes in children's time as indicators of changes in family and societal circumstances and values over time. It examines changes in the activities of children 6 to 12 between 1997 and 2003, the latest year in which detailed data on American children's time are available. It explores whether changes occurred in participation or in time spent. Finally, it examines whether changes reflect changes in family structure, family income, family size, maternal education, and maternal employment or whether they reflect broader social changes that occurred between 1997 and 2003.

1.2   Background

Previous research has examined social change between 1981 and 1997, focusing on the consequences for children's activities of three major demographic shifts: increased labor force participation of mothers, decline in two-parent families, and increased educational levels of the population (Hofferth and Sandberg, 2001b; Sandberg and Hofferth, 2001; Sayer, Bianchi and Robinson, 2004). Documented were three associated changes in children's time. First, nondiscretionary time, the sum of day care/school, personal care, eating, and sleeping, increased and, therefore, discretionary time declined (Hofferth and Sandberg, 2001b). Second, time in structured activities such as art activities and sports increased and unstructured play, housework, and television viewing declined. Third, time spent in religious attendance declined, but children's study and reading time rose.

The increase in nondiscretionary time resulted from children spending more time in day care because of increased maternal employment. Mothers were attracted into the work force by higher female wages and encouraged to take increasing responsibility in the financial support of their families by family dissolution and stagnating male wages up through the mid 1990s (Levy, 1998). In contrast, declining play, television viewing, and household work, and increased arts, sports participation, reading, and studying occurred among children of nonworking as well as working mothers; therefore, these were not due to changes in maternal employment, but could represent broad value change (Hofferth and Sandberg, 2001b). Many ongoing changes reflect the increased educational levels of the population. Mothers with higher education place more value on reading, studying, and constructively using time (Hofferth, 2006). Previous research has pointed to the value parents place, not just on academic success, but also success in developing their children's physical, social, and creative skills (Dunn, Kinney and Hofferth, 2003). In 1997 children of mothers with some college spent more time reading, participating in youth groups, and studying, and spent less time watching television, compared with children of less educated mothers (Hofferth and Sandberg, 2001b). Between 1981 and 1997 a decline in religious attendance occurred among those children whose mothers had not completed any college.

What changes took place between 1997 and 2003, a six-year period at the end of the 20th century, that justify examining changes in children's time over this relative short period of time? There was little of the change in family structure and family size that characterized previous periods (Federal Interagency Forum on Child and Family Statistics, 2003; U.S. Bureau of the Census, 2005); however, four critical changes occurred. The first was a revival of conservative values during the 1990s linked with both Democratic and Republican administrations. Second, and associated with this first change, was the passage of welfare reform legislation in 1997 that changed the welfare system to a program of temporary assistance by removing entitlements, setting limits on eligibility, and establishing assisted pathways to independence for low-income mothers. Third, was the passage of legislation in 2001 establishing clear academic benchmarks for primary and secondary students in the U.S. and enforcing testing to evaluate progress on these goals. The fourth was the attack by terrorists on the World Trade Center in New York City on September 11, 2001.

A revival of traditional conservative values occurred in the last decades of the 20th century (Ansell, 2001). According to international commentators, the debates in the 2000 and 2004 elections focused more upon moral issues than foreign policy or internal economic policy (The Scotsman, 2004). Republican control over both houses of Congress and the election of a Republican President in both 2000 and 2004 solidified the conservative ascendancy. Abortion rights and gay marriage continue to be hot-button issues in Supreme Court appointments and state legislative initiatives. Increased conservatism may be reflected in activities such as increased attendance at religious services and children's participation in youth groups, which includes youth activities sponsored by religious institutions.

Increased conservatism was especially evident at the end of the 20th century, with Democratic President Bill Clinton supporting a socially conservative welfare bill in 1997. From the early to the mid 1990s, state legislation tightening welfare eligibility, followed by the passage in 1997 of federal legislation, the Temporary Assistance to Needy Families Act (TANF), increased emphasis on work in welfare programs (Hofferth, Stanhope and Harris, 2002). Subsequently, the employment levels of single mothers increased to those of married mothers (Federal Interagency Forum on Child and Family Statistics, 2003). The proportion of children living in a family with at least one full-time full-year employed parent was at a record high (Federal Interagency Forum on Child and Family Statistics, 2003). In addition, the proportion of children living with two parents employed full-time year round doubled from the early 1990s. This should lead to children spending even more time in school and in day care, with a concomitant decline in discretionary time.

"No Child Left Behind" legislation introduced by Republican President George Bush in 2001 focused upon making schools accountable for continued improvements in the academic progress of their students. This legislation increased emphasis on academic success in school, and raised concern about homework and studying time (Loveless, 2003) at a time when more women were completing four or more years of college (U.S. Bureau of the Census, 2008). National tests show gains in mathematics, particularly for younger students, but since 1992 children's reading test scores have remained about the same (Loveless, 2003). Reading for pleasure is the single most important activity associated with higher children's test scores in previous studies (Hofferth and Sandberg, 2001a), yet little is known about whether the small increases shown in the 1980s and 1990s (Hofferth and Sandberg, 2001b) have continued. Studying has also been found to be associated with higher achievement, particularly for adolescents (Cooper et al., 1998). Increased emphasis on academic success may have led to children spending increased time both studying and reading for pleasure. A related activity that may have been affected is participation in youth groups, which includes academic clubs, social clubs such as scouts, and service clubs such as safety guards. Extracurricular activities have been associated with greater academic success (Mahoney, Harris and Eccles, 2006).

Finally, the attacks by terrorists on the World Trade Center in September of 2001 increased anxiety about safety and security. The heightened concern about children's safety in their own communities (Pebley and Sastry, 2004) perhaps further reinforced the choice of supervised

activities over free play. In addition, it sent many families back to a search for community, including religious and community institutions.

1.3 Limits on choice of activities

Of course, not all families have access to the resources to pay for children's extracurricular activities or to live in safe neighborhoods. Access to resources is generally linked with family income, though race/ethnicity may be associated with differential access because residential segregation leads to differential neighborhood and school quality (Phillips and Chin, 2004). Previous research has not shown income to be an important predictor of children's activities (Hofferth and Sandberg, 2001a); children may have access to free or low-cost extracurricular activities through their schools. However, the part played by income compared with other factors needs to be explored using more recent data. The extent to which activities are associated with family income tests whether activities are limited by access and the extent to which they are associated with maternal education tests whether activities are primarily value-based. Race/ethnicity contributes to activity choice through access and through values, as do family structure and maternal employment, and their association with activities helps shed light on the role of resources versus values.

1.4 Research questions and hypotheses

This paper describes changes in children's time between 1997 and 2003, whether they are consistent with demographic and policy changes that occurred over the period, and whether they continue or alter trends seen since 1981.

We expect to see a continued decline in discretionary time as a result of continued increases in maternal employment, and continued increases in studying and reading time of children as a result of increased pressure to achieve in school. However, increased academic pressures may have reduced attention paid to sports. Additionally, increased conservatism may have increased attendance at religious services. Declines in children's time spent in outdoor activities such as walking would be consistent with increased security concerns. To test these hypotheses, we regress activities in 1997 and 2003 on maternal education, maternal work status, family size, age and gender of child, number of parents, race/ethnicity, and family income in the appropriate year, controlling for an indicator of whether the year was 2003. A significant sign on the coefficient for the activity in 2003 indicates that there was a change, controlling for all the other factors. Finally, our theoretical hypotheses regarding the importance of values versus access to resources would be supported if maternal education has a stronger association with children's activities than does family income.

2 Methods

2.1 The 1997 Child Development Supplement to the Panel Study of Income Dynamics

The study sample was drawn from the 1997 Child Development Supplement (CDS) to the Panel Study of Income Dynamics (PSID), a 30-year longitudinal survey of a representative sample of U.S. men, women, children, and the families in which they reside. In 1997, the PSID added a refresher sample of immigrants to the United States so that the sample represents the U.S. population in 1997. When weights are used, the PSID has been found to be representative of U.S. individuals and their families (Fitzgerald, Gottschalk and Moffitt, 1998). With funding from the National Institute of Child Health and Human Development, data were collected in 1997 on up to two randomly selected 0 to 12-year-old children of PSID respondents both from the primary caregivers and from the children themselves. The CDS survey period began in March 1997 and ended in early December 1997 with a break from mid-June through August; thus the study took place only during the spring and fall. Interviews were completed with 2,380 child households containing 3,563 children. The response rate was 88%. Post-stratification weights based upon the 1997 Current Population Survey were used to make the data nationally representative. Sample characteristics reflect the characteristics of the population of children under age 13 in the United States in 1997. The sample used in this study consisted of boys and girls between 6 and 12 years of age in 1997, from first grade through about grade 6 or 7, and who had a mother in the household. These children were born between 1985 and 1991.

2.2 The 2003 Child Development Supplement to the Panel Study of Income Dynamics

In fall 2002 through spring 2003, the participants of the 1997 Child Development Supplement were contacted again and another supplement was administered. Because 5-6 years had passed since they were previously interviewed, few children in the 2003 wave were under age 6. Consequently, to make comparisons of the two cohorts of children, we restricted the sample taken from the 2003 study to those children who were aged 6 to 12 years of age in 2003 and whose families participated in the 2003 Supplement. These children were born between 1990 and 1996. Some of the children from the original 1997 data collection were 13-18 in 2003; however, we did not include them because the 1997 wave did not have a comparable adolescent sample. The total potential number of children eligible to participate was 3,271, of whom 88.9% participated in the 2003 supplement. Weights were calculated to adjust for the original probability of selection and for attribution between 1997 and 2003. Thus the weighted total is representative of children aged 6 to 12 in 1997 or in 2003.[1]

---

[1] The 1997 sample used in this study differs slightly from the sample used in the analysis of change between 1981 and 1997 (Hofferth and Sandberg, 2001b). The previous analysis was conducted with an early version of the time diary file; slight changes in the file occurred between that time and the current release. Both stu-

2.3 Time diaries

The Child Development Supplements collected complete time diaries for one weekday and one weekend day for 79 percent (2,818) of the 3,563 sample children aged 0 to 12 in 1997 and 82% of the 2,911 children participating in 2003. Comparisons between children who provided a diary and those who did not showed no significant differences on demographic characteristics. The time diary, which was interviewer-administered either to the parent or to the parent and child, asked questions about the child's flow of activities over a 24-hour period beginning at midnight of the randomly designated day. These questions asked the primary activity that was going on at that time, when it began and ended, and whether any other activity was taking place. Children's activities were first assigned to one of 10 general activity categories (e.g., sports and active leisure) and then coded into 3-digit subcategories (e.g., playing soccer). Coding was conducted by professional coders employed by the data collection organization; the level of reliability exceeded 90 percent. Time spent traveling for the purpose of engaging in a specific activity was included in that category.

In the coding process, children's activities were classified into ten general activity categories (paid work, household activities, child care, obtaining goods and services, personal needs and care, education, organizational activities, entertainment/social activities, sports, hobbies, active leisure, passive leisure), and further subdivided into 3-digit subcategories (such as parent reading to a child) that could be recombined in a variety of ways to characterize children's activities. For comparison purposes, the primary activities of children aged 3 to 12 were classified into the 18 major categories used by Timmer and colleagues in the early 1980s (Timmer, Eccles and O'Brien, 1985) and by Hofferth and Sandberg in 2001 (Hofferth and Sandberg, 2001a; Hofferth and Sandberg, 2001b). These categories were expanded to separate shopping from household work and to separate day care from school. Youth groups were also distinguished from the broader "visiting" category. Religious attendance does not include meeting time of youth groups in a religious building but reflects attendance at services. Time spent traveling for the purposes of engaging in a specific activity was included in that category. Secondary activities are not measured. For example, time spent doing housework with the television on where housework was the primary activity is not counted as time "watching television".[2] Thus, some activities that are often secondary may be underestimated. Given that many activities are occasional, we would not expect all children to engage in most of these on a daily basis. However, we want to abstract from this to describe the activities of American children in general. Because not all children do every activity each day, the total time children spend in an activity is a function of the proportion who engage in the activity and the time

---

dies deleted children without two diaries and children who spent the entire week in one activity, and both studies weighted the data using PSID-provided sampling weights. The present 1997 data set includes four fewer children aged 6 to 8 and one fewer child aged 9 to 12 than did the one used for the previous report. We were unable to replicate the file exactly. Because of this sample difference, there are several small and nonsignificant differences between children's weekly time in some activity categories in the two reports. These differences in point estimates of only a few minutes do not influence the conclusions regarding changes over time between 1997 and 2003.

2   The specific activities that make up each of the 21 categories are available from the authors.

those participating spend in it. An estimate of weekly time is computed by multiplying weekday time (including those who do not participate and have zero time) by 5 and weekend day time by 2, after removing a few children who did not have both a weekend and weekday diary.[3] Selecting children aged 6 to 12 with two diaries and who were not interviewed over the Christmas break (see below), sample sizes were reduced to 1,448 cases in 1997 and 1,343 cases in 2003, a total of 2,791; missing data on some of the demographic variables further reduced the sample to 2,564 for the multivariate analyses.

Robinson and Godbey (1997) distinguished among contracted time (work, school), committed time (household and child care obligations), personal time (eating, sleeping, personal care), and free time (everything else). We generally use this model with some small changes because we are concerned with children, not adults. Because they have to be in school but don't have to work, we treat school and day care rather than work as children's "contracted" or nondiscretionary time. Personal care time is time spent eating, sleeping, and caring for their personal needs. Few children have "committed" time; we include household work as part of their free time because children negotiate their participation in household work from family to family. It is not fixed by society, like school, or by physical needs, like sleep and personal care. In comparison to discretionary time, nondiscretionary time varied little between 1981 and 1997 (Hofferth and Sandberg, 2001a). For the purpose of this paper, therefore, free or discretionary time consists of household work, shopping, studying, religious attendance, youth groups, visiting, sports, outdoors activities, hobbies, art activities, play, television viewing, reading, household conversations, and passive leisure (which includes going to movies and sports events as a spectator).

Limits of comparability across the two years of data

Because the two data collections were similarly conducted, the results should be comparable. There is one limitation, however, the seasonal difference between the 1997 and 2003 samples. The 1997 study was conducted primarily between March and June, and then again in September through November. In contrast, the 2003 study was conducted in October 2002 through June 2003, with the majority of interviews conducted between November 2002 and March 2003. Therefore, the data collection seasons were almost completely opposite, with the 1997 survey conducted in the late spring and early fall and the majority of the 2003 survey interviews conducted during the winter months. Although one would not expect that seasonality would play a major part in children's activities, it, in fact, does. The potentially most serious problem was that the 2003 survey was conducted over the Christmas holidays, when children were not attending school and their activities differed dramatically from those during the school year. Consequently, after examining the calendar for 2002 and 2003, all children's diaries collected from December 20, when schools begin closing for the holidays, through January 5, when most children should have been back in school, were deleted. This removed 157 cases for 2003.

---

[3]   Two children who, in 1997, had only one activity (traveling or visiting) were also excluded.

In order to address concerns about whether activity changes resulted from seasonal differences across the survey period with respect to outside temperature at interview, we created a dummy variable by coding the geographic location of the child into two types of states – warm-weather states and nonwarm-weather states. This was based upon the heating degree days calculated by the U.S. National Oceanic and Atmospheric Administration for the July 2004 to November 2005 season (U.S. Department of Commerce, 2006). Based upon data that showed a clear degree-day distinction between states in the southern rim of the U.S. and more northern states, states with fewer than 3,000 cumulative degree days were coded as warm states and the rest were nonwarm states.[4] Children in warm weather states should not be affected by seasonality that is weather-related. The results of our analysis indicated, as expected, that outdoors and sports activities were higher and participation in indoor activities lower in warm compared to nonwarm states in both 1997 and 2003 (not shown). However, in both warm and non-warm states, the data showed a decline in sports participation for both age groups between 1997 and 2003. The decline in sports, therefore, is not a result of differences in temperature at the interview dates in 1997 and 2003. It could still result from differences in seasonality that are not temperature-related because there is still substantial seasonality in the sports available to children in their schools and clubs; however, that type of seasonality should be limited to sports and should not in any way affect reading, studying, playing, sleeping, TV watching, or video game playing.

2.4 Variables

Besides the overall descriptive analyses by age of child (based upon age in months at the time of the CDS parent interview), we also conducted multivariate analyses using key demographic characteristics of the family as independent variables, including maternal employment (employed versus not employed), maternal education (some college and completed four years of college or more versus no college), family structure (1 versus 2 parents), family size (1 or 2 versus 3 or more children), and gender of the child. Income was measured by the ratio of family income to needs, the annual income of the family for the previous calendar year divided by the poverty line in dollars for that family size and year. We included a dummy variable for whether the state the child was residing in met the previously described definition of warm state or not. All the definitions were consistent across the two waves of data except that of maternal employment. In 1997, maternal employment was defined as ever-employed in the previous year, whereas, in 2003, maternal employment was defined as employed at the time of the survey. The core PSID data wave that collected employment information was conducted in 2001 and not in 2002; employment at the survey date was deemed to be a better indicator than employment more than a year prior to the survey.

---

[4]   The warm weather states are Alabama, Arizona, California, Florida, Georgia, Hawaii, Louisiana, Mississippi, New Mexico, South Carolina, and Texas. Hawaii was not represented in our study.

2.5   Analysis plan

The descriptive analyses show the proportion of children in an activity and then the total time, including those who did not participate. T-tests were used to compare across the years 1997 and 2003 and to compare boys and girls.

The purpose of the multivariate analyses is to examine the extent to which individual and family sociodemographic changes and study design account for changes in children's time between 1997 and 2003. These analyses of amount of time spent in the activity are based upon Tobit regression models that adjust for the fact that not all children engage in each activity, which would otherwise skew the distribution of times (Tobin, 1958), but permit keeping time at the interval level. If ordinary least squares (OLS) were used, the regression slope would be biased by the inclusion of zero values. The Tobit coefficients reflect both the effect of the independent variable on the probability of the activity and on the hours spent in the activity by participants (McDonald and Moffitt, 1980). The higher the proportion of children who participate in the activity, the more the results reflect the hours among participants and thus the more similar the results become to those from OLS regressions just on participants. Therefore, for activities in which all or almost all children participate (e.g., television viewing), OLS is used. All analyses are weighted using population weights provided by the PSID-CDS, which were then normalized so that numbers represent actual sample sizes. Robust standard errors were computed using STATA to adjust for clustering of both children within families and across the two years.

3   Results

3.1   Children's participation in activities by age

Between 1997 and 2003, declines in participation of children 6-12 occurred in several activities: visiting, sports, spending time out of doors, engaging in other passive leisure, and conversing with household members (Table 1). The proportion playing declined 4% and the proportion spending time in household work declined 9% for children aged 9 to 12, but not for children aged 6 to 8. Market work declined, but from a very low initial level.

The largest participation declines occurred in sports and outdoor activities, a decline that occurred in warm states as well as other states (not shown). Over all children aged 6 to 12, there was a decline of 21% in participation in sports, from 76% to 60%, a decline that occurred equally for children of both age groups. There was also a 37% decline in participation in outdoor activities, from 16% to 10%. We would expect increases in most of the other activities, because the total still must add to 24 hours. However, we do not see equal increases in other activities. Increases were selective.

Table 1
Percentage of children 6-12 participating in 21 weekly activities, 1997 and 2003, by age

Activities	Age 6-8			Age 9-12			All Ages		
	1997	2003		1997	2003		1997	2003	
N	598	573		850	770		1448	1343	
Market work	2%	0%	**	3%	0%	***	3%	0%	***
Household work	66%	69%		79%	72%	**	73%	71%	
Shopping	49%	47%		46%	46%		47%	46%	
Personal care	100%	100%		100%	100%		100%	100%	
Eating	100%	100%		100%	99%		100%	100%	
Sleeping	100%	100%		100%	100%		100%	100%	
School	90%	93%		91%	90%		91%	91%	
Studying	53%	64%	***	62%	68%	**	58%	66%	***
Religious attendance	26%	34%	**	26%	31%	*	26%	32%	***
Youth groups	26%	33%	**	27%	34%	**	27%	34%	***
Visiting	47%	46%		56%	49%	**	53%	48%	*
Sports	74%	57%	***	77%	62%	***	76%	60%	***
Outdoors	15%	13%		16%	8%	***	16%	10%	***
Hobbies	2%	2%		4%	4%		3%	3%	
Art activities	26%	35%	***	22%	21%		24%	27%	*
Playing	93%	94%		88%	84%	*	90%	88%	
Television	96%	97%		94%	97%	*	95%	97%	*
Reading	42%	54%	***	35%	43%	***	38%	47%	***
Household conversations	32%	27%	*	28%	25%		30%	26%	*
Other passive leisure	46%	38%	**	52%	44%	**	49%	42%	***
Daycare	12%	11%		5%	7%	*	8%	9%	

Note: *** statistically significant at the 0.001 level, ** at the 0.01 level, and * at the 0.05 level.
Source: Own calculations from the Panel Study of Income Dynamics.

The percentage of children reported as spending time studying increased between 1997 and 2003, a continuation of the upward trend from 1981 to 1997. Sixty-six percent of 6-12-year-old children reported studying at all in 2003, compared with 58% in 1997, an increase of 14%. As between 1981 and 1997, the proportion spending any time studying in a survey week increased more for younger children 6 to 8 (21%) than for older children 9 to 12 (10%). By 2003, almost the same proportion of younger (64%) as older children (68%) spent some time studying. This is a major change over just six years.

Similarly, 47% reported reading during the survey week in 2003 compared to 38% in 1997, an increase of 24% over the period. Again, the increase was larger for younger children (29%), than for older children (23%). In contrast to studying, where in 2003 the participation rates were similar, a larger proportion of younger than older children read for pleasure during the study week in both 1997 and 2003.

Several other categories of activities rose by considerable percentages. For all children, religious attendance rose 23%, from 26% to 32%, and participation in youth groups rose 26% (from 27% to 34%) between 1997 and 2003. Participation in art activities rose 13% for the entire group, with a 35% increase for children aged 6 to 8 (from 26% to 35%), and no increase for children aged 9 to 12.

Numerous categories showed no change. The proportion participating in personal care, eating, hobbies, sleeping, and school and day care did not change. Except for a 3% increase for children aged 9 to 12, the proportion watching television remained high and stable. Almost all watched television.

3.2   Time spent in activities by age

The total weekly time in each activity over all children, with nonparticipants (those spending zero time in an activity) included, is shown in Table 2. We first examined discretionary and nondiscretionary time. To obtain discretionary time we summed personal care, eating, sleeping, school and day care and subtracted the total from 168, the total number of hours available in a week. We found a decline in discretionary time between 1997 and 2003 that continued the decline previously found between 1981 and 1997. In 1981 children aged 6 to 12 enjoyed about 57 discretionary hours per week. In 1997, children aged 6 to 12 enjoyed about 50 discretionary hours per week. By 2003, discretionary time had declined two hours to about 48 hours. This is a decline of only 4%, small relative to the 12% decline from 1981 to 1997, but still significant because it occurred over only a 6-year period. The reason for the decline in discretionary time between 1997 and 2003 is the increased amount of time spent sleeping and in school, nondiscretionary activities. Personal care and day care remained constant and eating time declined slightly. In the following we focus only on discretionary time.

A comparison of Tables 1 and 2 tests whether changes in discretionary time result from changed participation or from changed time spent among those who participate. For example, the total time spent studying rose both because more children studied and because those who studied spent more time doing it. Including those who did not study at all, on average, children spent 2 hours and 55 minutes studying in 1997 and 3 hours 36 minutes per week studying in 2003, an increase of 23%. The percentage increase in time (23%) was greater than the percentage increase in participation (14%), indicating that time spent studying increased among those who studied (by 8%, not shown). The time spent studying showed a slightly larger rise for children aged 6 to 8 (32%, from 1:58 to 2:36) than for children aged 9-12 (20%, from 3:36 to 4:20).

Reading time for the entire age group of 6 to 12-year-olds increased 34% – from 1:11 to 1:35 – with the increase equal for older and young children. Similar to studying, the overall increase in reading time (34%) exceeded the percent increase in participation (24%), indicating increased time in reading among those who read (6%, not shown).[5] We checked to see

---

[5]   To calculate the weekly time for only those participating, divide the time in hours by the percent participating.

whether increased studying and reading was linked to season of interview. Study time increased in both warm and in nonwarm states, suggesting that it was a real change, whereas reading time increased only in nonwarm states, perhaps reflecting seasonality (not shown).

Table 2
Weekly time children 6-12 spent in 21 activities, 1997 and 2003, by age

	Age 6-8			Age 9-12			All Ages		
Activities	**1997**	**2003**		**1997**	**2003**		**1997**	**2003**	
N	598	573		850	770		1448	1343	
Market work	00:05	00:00	**	00:17	00:01	**	00:11	00:00	***
Household work	02:25	02:27		03:44	03:05	**	03:11	02:49	*
Shopping	02:31	02:09		02:15	02:22		02:22	02:17	
Personal care	07:59	08:02		07:51	07:42		07:55	07:50	
Eating	08:18	07:50	*	07:23	07:15		07:46	07:30	*
Sleeping	70:58	72:49	***	67:38	69:16	***	69:03	70:45	***
School	31:39	33:05	*	33:35	33:22		32:46	33:15	
Studying	01:58	02:36	***	03:36	04:20	**	02:55	03:36	***
Religious attendance	01:23	01:43		01:23	01:44	*	01:23	01:44	**
Youth groups	00:37	00:50		00:49	01:09	*	00:44	01:01	**
Visiting	02:47	02:15		02:40	02:21		02:43	02:19	*
Sports	05:03	02:46	***	06:31	04:31	***	05:54	03:47	***
Outdoors	00:31	00:34		00:39	00:18	*	00:36	00:25	*
Hobbies	00:04	00:02		00:09	00:05		00:07	00:03	
Art activities	00:51	01:05		00:56	00:56		00:54	01:00	
Playing	12:09	11:36		09:00	08:43		10:20	09:56	
Television	12:40	12:36		13:32	14:54	**	13:10	13:56	*
Reading	01:09	01:31	**	01:13	01:38	**	01:11	01:35	***
Household conversations	00:29	00:29		00:26	00:30		00:27	00:30	
Other passive leisure	01:35	01:18		02:18	01:57		02:00	01:40	*
Daycare	01:35	01:22		00:32	00:44		00:59	01:00	
Not ascertained	01:02	00:44		01:22	00:56	*	01:14	00:51	**
% of time accounted for	99%	100%		99%	99%		99%	100%	

Note: *** statistically significant at the 0.001 level, ** at the 0.01 level, and * at the 0.05 level.
Source: Own calculations from the Panel Study of Income Dynamics.

Declines occurred in several activities. Consistent with decreased participation, time in other passive leisure declined 17% and time spent in household work declined 12%. These declines were primarily due to a decline in participation rather than to a decline in time spent among participants. The 31% decline in time spent in outdoor activities also reflected a decline in participation rather than time spent among participants. In contrast, the 37% decline in time spent in sports reflected both a decline in participation and a decline in time spent among participants. These declines in physical activities occurred in both warm and nonwarm states (not

shown). Time spent visiting declined 13%, again due to decline in both participation and time spent.

Because of the declines in several major categories of activities, we expected increases in other activities. We found an increase of 6% in television viewing time, for example. Television viewing time remained constant for 6-8 year olds but increased for 9-12 year olds. Time spent in art activities remained at a low level. Although participation in art activities rose 35% for children aged 6 to 8, there was no overall increase in time spent in art activities for either age group or all children. Time in art activities among those participating remained constant. Sleep time rose by about 2% for all children 6 to 12 years of age.

There were several categories of activities that rose by large percentages. Between 1981 and 1997 the time in religious attendance had been declining (Hofferth and Sandberg, 2001b). Although the overall time spent in attendance at religious services was still low – 1 hour and 44 minutes in 2003 – the time spent rose 25% between 1997 and 2003, reflecting a 23% increase in participation and a 2% increase in time spent among participants. Youth groups also showed an increase. The total time spent in youth groups rose from 44 minutes to about an hour a week between 1997 and 2003. The increase of 36% over the period reflected a 26% increase in participation and a 7% increase in time spent among those participating (not shown). The increased time in religious activities was almost entirely a result of increased participation rather than increased time, whereas increased time in youth groups resulted from both increased participation and increased time spent in it.

3.3 Gender differences in activities

Table 3 shows gender differences in time spent in these activities, again including nonparticipants. In 2003, girls spent more time in household work, shopping, personal care, outdoor, and art activities than did boys. Boys spent more time in sports, hobbies, and play. Boys spent more time studying than girls in 1997, but that differential disappeared completely by 2003. Most of the 1997-2003 trends in activity time were similar for both boys and girls. The one exception was sports. The decline in sports was much larger for boys than for girls. Finally, only girls' play time declined from 1997 to 2003; boys' play time stayed the same.

3.4 Multivariate analyses of change, 1997 to 2003

This analysis focuses on reading, studying, sports, outdoor time, religious attendance, youth groups, household work, other passive leisure, visiting, outdoor activities, and television viewing. On these variables the descriptive analysis (Tables 1 and 2) suggested that changes in time occurred between 1997 and 2003.[6] The means for all the variables are shown in Table 4. Seventy-two percent of the sample was white, 16% Black, and 13% Hispanic. Forty-three percent of mothers completed at least some college, and 57% completed high school or less. Three-quarters of children lived with two parents and two-thirds had an employed mother. Forty-three percent of children lived in families with 3 or more children. Average family in-

---

[6]   A reduction in time in market work was significant; however, few children 6-12 engaged in market work.

come was 3.4 times the poverty line, about $47,600 for a family of three in 2003. One-third lived in a so-called "warm" state. The time data are comparable to Table 2, but the hours are in hours and fractions of an hour rather than hours and minutes. The sample size is reduced because of missing data on the independent variables.

Table 3
Weekly time children 6-12 spent in 21 weekly activities, 1997 and 2003, by gender

	Time spent in 1997			Time spent in 2003			Trend in time spent, change 1997-2003	
	Boys	**Girls**	**Gender diff.**	**Boys**	**Girls**	**Gender diff.**	**Boys**	**Girls**
N	731	717		688	655			
Market work	00:11	00:12		00:00	00:01		*	**
Household work	02:44	03:38	***	02:28	03:09	***		*
Shopping	01:57	02:47	***	02:04	02:28	*		
Personal care	07:17	08:32	***	06:59	08:39	***		
Eating	08:00	07:33	**	07:37	07:23		*	
Sleeping	68:54	69:12		70:37	70:53		***	***
School	33:05	32:27		33:15	33:15			
Studying	03:08	02:41	*	03:35	03:38		*	***
Religious attendance	01:24	01:22		01:43	01:44			*
Youth groups	00:47	00:41		00:54	01:07			**
Visiting	02:22	02:19	*	03:04	02:19			**
Sports	07:21	04:25	***	04:29	03:07	***	***	***
Outdoors	00:30	00:41		00:15	00:34	***	**	
Hobbies	00:04	00:09		00:05	00:02	*		*
Art activities	00:29	01:20	***	00:45	01:14	***	**	
Playing	11:12	09:27	***	11:33	08:23	***		*
Television	13:06	13:14		14:13	13:41		*	
Reading	01:04	01:18		01:27	01:43		**	**
Household conversations	00:27	00:27		00:26	00:33			
Other passive leisure	01:53	02:07		01:36	01:44		**	*
Daycare	00:54	01:04		00:54	01:06			
Not Ascertained (NA)	01:01	00:35	*	01:27	01:07	*	**	
% of time accounted for	99%	99%		100%	99%			

Note: *** statistically significant at the 0.001 level, ** at the 0.01 level, and * at the 0.05 level.
Source: Own calculations from the Panel Study of Income Dynamics.

3.4.1 Did real changes in time occur?

The first question is whether, after controlling for socioeconomic characteristics, state, and season of interview, real changes in children's time between 1997 and 2003 occurred. Examining the variable "year is 2003" in Table 5, we see that time attending religious services and

time spent participating in youth organizations were significantly higher in 2003 than in 1997; thus, time in these activities increased over the period. Participation in sports and outdoor activities was significantly lower in 2003 than 1997; participation in these activities declined. Differences between 1997 and 2003 in background variables such as maternal education, family income, type of state and season produced some of the apparent changes we saw previously in the time spent reading, studying, watching television, household work, passive leisure, and visiting. After controlling for background variables, there was no longer a significant difference in time spent in these activities between 1997 and 2003. For example, in this analysis the time spent reading was larger in 2003 than in 1997 by about .65 hours (39 minutes) per week, but the coefficient was not statistically significant.

3.4.2 Linking children's activities to resources

Access to resources is measured here by the ratio of family income to poverty and by race/ethnicity. In spite of the common belief that access to resources affects children's activities, the results show that greater family income to needs levels were directly associated only with the amount of reading time, household work, passive leisure, and television viewing. Children in higher income families were more likely to read for pleasure and spent more time reading than children from lower income families. In addition, children from higher income families spent fewer hours watching television. Finally, children in higher income families did marginally less household work and engaged in marginally more passive leisure. Presumably, financially advantaged children have access to many more valued types of activities that are alternatives to television and the family may pay for help with household work. No link between the ratio of income to needs and sports participation was found. Because reading and television viewing do not require the monetary resources that sports require, the associations between income and reading or television viewing may also reflect attitudes and values linked to economic success. That family income is not strongly predictive of many of children's activities net of education does not mean that income does not influence children's academic success; reading is a key developmental activity.

Race/ethnic differences are linked to resources and to values. Being Black or Hispanic was associated with fewer hours spent playing sports and engaging in outdoor activities. Black children spent significantly more time – about 2 hours per week – watching television than White children. Differences in sports and television viewing could be partially due to differences in resources, and lower time spent in outdoor activities may result from living in more dangerous neighborhoods. Finally, compared to White children, Black children spent about 2 more hours attending religious services, and Black and Hispanic children spent more time studying but less time reading for pleasure. These latter differences are likely to be linked to values rather than to resources.

3.4.3 Linking activity choices to values

The amount of education the mother has completed is the factor consistently associated with children's activities net of a variety of controls, corroborating previous work and our theory

that time reflects attitudes and values more than access to resources. Greater maternal education, in particular, completing four or more years of college, was associated with children spending more time attending religious services, participating in youth organizations, reading and studying, and engaging in sports and outdoor activities (Table 5). It was also associated with children spending more time in passive leisure activities, being more likely to visit, and helping more around the house. This is possible because they spend less time watching television.

Table 4
Means and standard deviations of variables

Variable	Pooled sample Total 1997 & 2003	
	Mean	SD
Background		
White and other	0.72	0.45
Black	0.15	0.36
Hispanic	0.13	0.33
Male	0.49	0.50
Age is 6-8 or actual age	0.41	0.49
Mother completed high school or less	0.56	0.50
Mother completed some college	0.22	0.42
Mother completed college or more	0.22	0.41
Mother is employed	0.67	0.47
Two parents (vs. one parent)	0.77	0.42
Three or more children	0.42	0.49
Family income to poverty ratio	3.40	3.82
Lives in warm state	0.31	0.46
Interview conducted in fall	0.27	0.44
Interview conducted in winter	0.32	0.47
Interview conducted in spring	0.41	0.49
Year is 2003	0.47	0.50
Weekly time (fractions of an hour)		
Reading	1.36	2.46
Studying	3.31	4.27
Sports	4.93	6.53
Religious attendance	1.55	3.19
Youth organizations	0.89	2.64
TV hours	13.50	9.98
Household work	3.06	4.11
Passive leisure	1.88	3.47
Eating	7.67	3.32
Visiting	2.57	5.01
Outdoor hours	0.54	2.55
Day care	1.06	4.30
N	2,564	

Note: All data are weighted.

Source: Own calculations from the Panel Study of Income Dynamics.

Table 5
Regression coefficients for effects of background on whether participated and weekly hours in selected activities

Variable	Reading		Studying		Sports		Religious attendance		Youth Organization	
	Logit	Tobit	Logit	Tobit	Logit	Tobit	Logit	Tobit	Logit	Tobit
	Whether	Hours	Whether	Hours	Whether	Hours	Whether	Hours	Whether	Hours
Background:										
Black	-0,73 ***	-1,58 **	0,44 *	1,17 *	-0,70 ***	-2,54 **	0,35 +	1,91 *	0,17	0,30
Hispanic	-0,63 *	-1,51 *	0,54 **	1,78 **	-0,60 *	-2,28 *	-0,07	-1,26	-0,03	-0,09
Male	-0,21 +	-0,56 *	0,15	0,42	0,31 *	2,58 ***	0,00	0,20	-0,02	-0,02
Age is 6 to 8	0,42 ***	0,29	-0,36 ***	-2,40 ***	-0,18	-1,90 ***	0,07	0,20	-0,06	-0,62 +
Mother completed some college	0,13	0,29	0,24	0,62	0,13	0,61	0,44 *	1,73 *	0,47 **	1,76 **
Mother completed college or more	0,62 ***	1,46 ***	0,37 *	1,16 *	0,29	1,77 **	0,48 **	1,81 *	0,57 ***	2,21 ***
Mother is employed	-0,37 **	-0,79 **	0,18	0,60	0,18	0,54	-0,20	-0,79	-0,20	-0,51
Two parents (vs. one parent)	0,34 *	0,58	-0,16	-0,41	-0,35 +	-1,23 +	0,74 ***	3,05 ***	0,63 **	1,46 *
Three or more children	0,11	0,15	-0,06	-0,32	-0,01	-0,07	0,11	0,59	0,14	0,00
Family income to poverty ratio	0,03 *	0,07 *	0,01	0,06	0,04	0,07	-0,01	-0,05	0,00	-0,02
Lives in warm state	-0,11	-0,23	0,01	0,36	0,35 *	1,52 *	-0,14	0,18	-0,21	-0,37
Interview conducted in fall	0,09	0,11	0,03	0,02	-0,11	0,24	0,26	1,46 +	0,27	1,04 +
Interview conducted in spring	0,00	-0,10	-0,53 *	-2,08 **	0,41 +	2,83 *	0,13	1,06	0,23	0,87
Year is 2003	0,28	0,65	0,05	0,01	-0,49 *	-1,09	0,40 +	2,05 *	0,53 **	1,81 **
Constant	-0,40 +	-0,66	0,53 *	2,16 ***	0,36	0,82	-1,50 ***	-7,15 ***	-1,31	-4,40 ***

Note: *** statistically significant at the 0.001 level, ** at the 0.01 level, * at the 0.05 level, and + at the 0.1 level.
Source: Own calculations from the Panel Study of Income Dynamics.

Table 5 cont.
Regression coefficients for effects of background on whether participated and weekly hours in selected activities

Variable	Household work		Passive Leisure		Visiting		Outdoors		Television
	Logit	Tobit	Logit	Tobit	Logit	Tobit	Logit	Tobit	OLS
	Whether	Hours	Whether	Hours	Whether	Hours	Whether	Hours	Hours
Background:									
Black	-0,38 *	-1,54 ***	-0,53 **	-1,51 **	-0,24	0,13	-0,70 ***	-2,54 **	1,89 *
Hispanic	-0,21	-0,31	-0,20	-0,73	-0,29	-0,34	-0,60 *	-2,28 *	1,40
Male	-0,35 **	-1,21 ***	-0,13	-0,35	-0,18 +	-0,89 +	0,31 *	2,58 ***	0,10
Age is 6 to 8	-0,46 ***	-1,39 ***	-0,25 *	-1,22 ***	-0,29 **	-0,54	-0,18	-1,90 ***	-1,45 **
Mother completed some college	0,30 +	0,73 +	0,21	0,61	0,18	0,84	0,13	0,61	-2,96 ***
Mother completed college or more	0,40 *	0,16	0,36 *	1,84 ***	0,41 *	1,13 +	0,29	1,77 **	-3,37 ***
Mother is employed	-0,04	-0,31	0,06	0,15	-0,17	-0,54	0,18	0,54	-1,15 +
Two parents (vs. one parent)	0,25	-0,12	0,02	0,23	0,08	0,24	-0,35 +	-1,23 +	-0,26
Three or more children	0,05	0,66 *	0,02	0,20	-0,24 *	-0,87	-0,01	-0,07	-0,67
Family income to poverty ratio	-0,02 +	-0,05 +	0,03	0,09 +		0,05	0,04	0,07	-0,16 **
Lives in warm state	-0,36 *	-0,97 **	-0,26 +	0,36	-0,21	-0,58	0,35 *	1,52 *	-0,39
Interview conducted in fall	0,15	0,37	0,32 +	0,71	0,29 +	1,30 +	-0,11	0,24	-1,74 *
Interview conducted in spring	0,12	0,61	0,40 *	0,93	0,19	1,42 +	0,41 +	2,83 *	-0,14
Year is 2003	-0,08	-0,2	-0,05	-0,33	-0,1	-0,13	-0,49 *	-1,09	0,43
Constant	1,18 ***	3,39 ***	-0,37 +	-1,77 *	0,15	-1,02	0,36	0,82	17,66 ***

Note: *** statistically significant at the 0.001 level, ** at the 0.01 level, * at the 0.05 level, and + at the 0.1 level.
Source: Own calculations from the Panel Study of Income Dynamics.

3.4.4 Other factors related to activity choices

Living with two parents was related to children's activity time. Children living with two parents spent more time in religious attendance and in youth organizations, and were more likely to read, but they spent less time in sports and outdoor activities than those with one parent. Children of employed mothers spent less time reading and watching television than did children of nonemployed mothers. This makes sense. Such children are more likely to be in day care (not shown); reading and watching television are activities more commonly engaged in at home than out of the home. Younger children spent less time in youth organizations, watching television, studying, in sports, and in outdoor activities than older children. They were more likely to read for pleasure, however. Children in larger families spent more time in household work and were less likely to visit or be in day care.

4 Discussion

Over the six-year period between 1997 and 2003 broad social changes occurred in the United States: welfare rules changed, the nation's school policies were overhauled, America was attacked by terrorists, and American values shifted in a conservative direction. Changes in children's time were consistent with these trends.

Consistent with changed welfare rules that made it necessary for low-income mothers to seek employment, children spent more time in school and day care than they had in 1997. As a result, children experienced a small decline in their discretionary time over the period.

Consistent with the passage of "No Child Left Behind" legislation and the federal government's focus over the period on improving children's academic test scores was the increased time children spent studying. An increase in study time that was stronger for younger (6-8-year old) than older (9-12-year old) children is consistent with increased math test scores for 4th graders but not 8th graders that were documented in the NAEP. However, this trend was not significant after background factors were controlled, suggesting that increased maternal education and other factors such as season of interview explained the increase in studying.

Also consistent with the increased emphasis on reading skills, increases in time spent reading occurred for all children. These increases were, as for studying, larger for younger than for older children. Research shows that reading for pleasure is clearly the best preparation for standardized tests. Therefore, increased reading for pleasure at young ages is a good omen for children's later academic achievement. Again, increased reading was explained by changes in family characteristics; after maternal education, employment, income, and other factors were controlled, reading levels were similar in 1997 and 2003.

Increased conservatism in the United States and a terrorist attack on September 11, 2001 were major changes in the latter part of the 20th and beginning of the 21st century, respectively. A major shift in children's activities over this 6 year period is represented by increased religious

attendance and time spent in religious activities. Reversing a previous decline between 1981 and 1997, this change likely reflected the increased threat to American national security, a return to basic values, and a search for meaning. Substantial increases in participation in and time spent in youth groups may reflect parents' desires that their children contribute to the community through volunteer and helping activities (Dunn, Kinney and Hofferth, 2003).

As some activities increased, others declined. Probably the most unexpected was the decline in participation in sports and outdoor activities in 2003 compared with 1997, even after controls for seasonality of interview and climate of state of residence were introduced. The decline in sports may be linked to the increased focus on academics, parental concern about overscheduling as a major topic for concern in the first part of the 21th century (Mahoney, Harris and Eccles, 2006). The decline in outdoor activities may be linked to safety and security concerns. A decline in time spent walking to school has been well-documented (Ham, Martin and Kohl, 2007). Both are relevant to concerns about reduced childhood physical activity and increased overweight over the past decade.

What is the relative importance of family values versus family resources in influencing children's time? Family income per se was less important to children's time than was maternal education. Greater family income to needs was linked to more time spent reading and less time spent watching television, with a marginal increase in passive leisure and a reduction in household work. Maternal education was much more important to children's time, influencing all the activities considered. This does not imply a lack of importance of income to children's outcomes, but does suggest that many of children's activities are not directly dependent upon financial resources. They are dependent upon family values and objectives for their children.

These changes reflect important value shifts at the beginning of the 21st century consistent with events and circumstances in the preceding decade. Changes in study and reading habits, in sports and outdoor activities, and in participation in religious observance and youth group activities reflect important behavioral and value shifts that will affect lives for years to come.

References

Alwin, D.F. (2001), Parental values, beliefs, and behavior – A review and promulga for research into the new century, in: Owens, T. and S. Hofferth (eds.), *Children at the millennium – Where did we come from, where are we going?*, Elsevier Science, New York, 97-139.

Ansell, A. (2001), *Unraveling the right – The new conservatism in American thought and politics*, Westview Press, Boulder, CO.

Bandura, A. (1976), Social learning theory, in: Spence, J., Carson, R. and J. Thibaut (eds.), *Behavioral approaches to therapy*, General Learning Press, Morriston, NJ, 1-46.

Cooper, H., Lindsay, J., Nye, B. and S. Greathouse (1998), Relationships among attitudes about homework, amount of homework assigned and completed, and student achievement, in: *Journal of Educational Psychology*, Vol. 90, No. 1, 70-93.

Daly, K.J. (2001), *Minding the time in family experience – Emerging perspectives and issues*, Elsevier Science, Oxford, England.

Dunn, J.S., Kinney, D.A. and S.L. Hofferth (2003), Parental ideologies and children's after-school activities, in: *American Behavioral Scientist*, Vol. 46, No. 10, 1359-1386.

Federal Interagency Forum on Child and Family Statistics (2003), *Trends in the well-being of America's children and youth, 1999*, U.S. Department of Health and Human Services, Washington, DC.

Fitzgerald, J., Gottschalk, P. and R. Moffitt (1998), The impact of attrition in the panel study of income dynamics on intergenerational analysis, in: *Journal of Human Resources*, Vol. 33, No. 2, 300-344.

Ham, S.A., Martin, S.L. and H.W. Kohl (2007), *Changes in the percentage of students who walk or bike to school – United States, 1969 and 2001*, Center for Disease Control and Prevention, USA.

Hofferth, S.L. (2006), Residential father family type and child well-being – Investment versus selection, in: *Demography*, Vol. 43, No. 1, 53-77.

Hofferth, S.L. and J.F. Sandberg (2001a), How American children spend their time, in: *Journal of Marriage and the Family*, Vol. 63, No. 3, 295-308.

Hofferth, S.L. and J.F. Sandberg (2001b), Changes in American children's time, 1981-1997, in: Hofferth, S. and T. Owens (eds.), *Children at the millennium – Where did we come from, where are we going?*, Elsevier Science, New York, 193-229.

Hofferth, S.L., Stanhope, S. and K.M. Harris (2002), Exiting welfare in the 1990s – Did public policy influence recipients' behavior?, in: *Population Research and Policy Review*, Vol. 21, No. 5, 433-472.

Levy, F. (1998), *The new dollars and dreams – American incomes and economic change*, Russell Sage Foundation, New York.

Loveless, T. (2003), *How well are American students learning?*, The 2003 Brown Center Report on American Education, Brookings Institution, Washington, DC.

Mahoney, J.L., Harris, A.L. and J.S. Eccles (2006), Organized activity participation, positive youth development, and the over-scheduling hypothesis, in: *Social Policy Report*, Vol. 20, No. 4, 3-31.

Mathews, J. (2003), Not quite piling on the homework, date of publication: 2003, October 1st, in: *Washington Post (Washington, DC)*, sec. A, 1 and 4.

McDonald, J. and R. Moffitt (1980), The uses of Tobit analysis, in: *Review of Economics and Statistics*, Vol. 62, No. 2, 318-321.

Pebley, A.R. and N. Sastry (2004), Neighborhoods, poverty, and children's well-being, in: Neckerman, K.M. (ed.), *Social inequality*, Russell Sage Foundation, New York, 119-145.

Phillips, M. and T. Chin (2004), School inequality – What do we know?, in: Neckerman, K.M. (ed.), *Social inequality*, Russell Sage Foundation, New York, 467-519.

Ratnesar, R. (1999), The homework ate my family, date of publication: 1999, January 25th, in: *Time*, 55-63.

Robinson, J.P. and G. Godbey (1997), *Time for life – The surprising ways Americans use their time*, Pennsylvania State University Press, University Park, PA.

Sandberg, J.F. and S.L. Hofferth (2001), Changes in parental time with children, in: *Demography*, Vol. 38, No. 3, 423-436.

Sayer, L.C., Bianchi, S.M. and J.P. Robinson (2004), Are parents investing less in children? Trends in mothers' and fathers' time with children, in: *American Journal of Sociology*, Vol. 110, No. 1, 1-43.

The Scotsman (2004), America's new conservatism, date of publication: 2006, January 26th, from: http://news.scotsman.com/opinion.cfm?id=1271072004.

Timmer, S.G., Eccles, J. and K. O'Brien (1985), How children use time, in: Juster, F.T. and F.P. Stafford (eds.), *Time, Goods, and Well-Being*, Institute for Social Research, Ann Arbor, Michigan, 353-382.

Tobin, J. (1958), Estimation of relationships for limited dependent variables, in: *Econometrica*, Vol. 26, No. 1, 24-36.

U.S. Bureau of the Census (2005), Statistical abstract of the United States 2005, U.S. Government Printing Office, Washington, DC.

U.S. Bureau of the Census (2008), Statistical abstract of the United States 2008, U.S. Government Printing Office, Washington, DC.

U.S. Department of Commerce (2006), Historical Climatology Series 5-1, National Oceanic and Atmospheric Administration, Washington, DC.

Harmonising extended measures of parental childcare in the time-diary surveys of four countries – Proximity versus responsibility

Killian Mullan and Lyn Craig

Killian Mullan
Social Policy Research Centre
University of New South Wales, Sydney, Australia
e-mail: k.mullan@unsw.edu.au

Lyn Craig
Social Policy Research Centre,
University of New South Wales, Sydney, Australia
e-mail: lcraig@unsw.edu.au

Abstract

Measures of childcare drawn from time-diary data are commonly based on the specific childcare activities a parent engages in throughout the day. This emphasis on activities has been criticised as it ignores the large quantity of time parents spend supervising their children. In order to provide more accurate estimates of childcare that incorporate supervisory childcare, researchers have turned to extended measures of care based on being i) in proximity to children or ii) responsible for children. There has been debate about the extent to which these approaches each measure the same aspect of childcare. In addition, it is thought they may be sensitive to the way surveys have been designed, which can affect the extent to which they can be compared cross-nationally. We argue that measures of proximity and responsibility are conceptually interchangeable, and demonstrate that they can be harmonised and compared cross-nationally. Finally, we suggest ways in which these extended measures of childcare can be made increasingly comparable cross-nationally.

JEL-Codes: D1, J13, J19

Keywords: Time-diary data, measurement of parental childcare, cross-national harmonisation of measures
of childcare, time geography

1   Introduction

Time-diary data provides the source of information for much of the research on time parents spend caring for their children, and is regarded as providing valid and reliable measures of the time people spend performing a variety of day to day activities (Robinson, 1985), which have been used in the disciplines of economics (Juster and Stafford, 1991) and sociology (Gershuny and Sullivan, 1998). In particular, these data have been used to explore a wide range of questions about childcare, including the gender distribution of care (Craig, 2007), the types of care children receive (Bittman et al., 2004; Craig, 2006), differences in care patterns over time and cross-nationally (Bianchi et al, 2006; Gauthier et al., 2004; Gershuny, 2000) the impact of maternal employment on time with children (Hofferth, 2001), and estimates of the imputed market value of the household production of childcare (Ironmonger, 1996; Varjonen and Aalto, 2006).

Researching time devoted to children, however, is challenging because how to conceptualise it and (partly as a consequence) how to accurately measure it are both contested. Difficulties of measurement and conceptualisation have led some to argue that time-diary data are inadequate to the purpose because they are predicated upon the idea that our days consist of a sequence of main or "primary" activities that can be summed to 24 hours, and therefore miss a great deal of the complexities of care (Bryson, 2007; Budig and Folbre, 2004). Inter alia, it is argued that focusing on the sequence of primary activities is overly restrictive because a great deal of childcare time is devoted to minding or supervising children, often while doing something else at the same time.

This has led, in some quarters, to the use of measures based on being in proximity to children, or being responsible for children, as extended measures of childcare intended to capture more of the large body of time parents spend supervising their children (Budig and Folbre, 2004; Folbre and Yoon, 2007). That is, in addition to requiring respondents to record their main activities, some time-diary surveys ask them directly about time when they are responsible for a child, and others ask them to note who they are with (in proximity to). These approaches both yield extended measures of childcare.

There is little understanding, however, of how measures based on proximity and responsibility relate to each other. Is one superior to the other? Are they in fact measuring the same thing? That is, are these extended measures of childcare broadly commensurate, or are they fundamentally different? Answering this question is pre-requisite to meaningful cross-national comparison of extended measures of childcare from time-diaries.

In this paper, we compare proximity-based measures of childcare from time-diary surveys in Australia (1997), the UK (2000-01), Italy (2002-03) and the USA (2003), with a responsibility-based measure also from the USA (2003). We set out a conceptual discussion relating to

aspects of childcare that extended measures should capture and evaluate, in light of this discussion, whether the two approaches are commensurate or not. We conclude that they are conceptually interchangeable. We then investigate the extent to which features of survey design may impact upon the comparability of measures of proximity and responsibility across these countries. We conclude that if carefully harmonised, the proximity- and responsibility-based measures are comparable. We suggest ways in which this comparability could be further improved.

The remainder of this paper is organised as follows. In Section 2 we address issues related to the conceptualisation and measurement of parental childcare. We then describe the data, the harmonisation of measures of childcare, the sample and the plan of analysis in Section 3. Our results are discussed in Section 4 and Section 5 concludes.

2 Background

2.1 Measuring childcare with time-diary data

There are a number of ways to measure childcare using time-diary data. To begin with, the backbone of time-diary data is the sequence of primary (main) activities in which a respondent engages throughout a day. Applied to childcare, the record of primary activities captures care such as bathing, feeding, transporting, talking to, reading to, getting from school and putting to bed. Some time-diary surveys not only ask about primary activities, but also ask respondents what else they were doing at the same time, yielding information about secondary activities. Childcare as a secondary activity is commonly held to be synonymous with supervisory childcare because it is something that is often carried out whilst doing some other primary activity (Ironmonger, 2004; Pollack, 1999).

In addition to asking respondents about their primary and secondary activities, time-diary surveys ask respondents about the people they are with throughout the day. This is known as co-presence data and yields a third potential measure of childcare which is the total time that parents are co-present with children. This measure has been used in a number of studies of parental childcare (Bryant and Zick, 1996; Craig, 2006; Fernandez and Sevilla Sanz, 2006).

A fourth measure is derived from direct close-ended (yes/no) questions relating specifically to the care of children. The American Time Use Survey (ATUS) asked respondents to note if a child was 'in their care', whilst the Canadian General Social Survey (CGSS) 1998 asked respondents to indicate if they were 'looking after' a child. In each case, the respondent was 'walked through' the sequence of activities on the previous day in a telephone interview. The third and fourth measures have been described as measures of 'proximity' and 'responsibility' respectively (Budig and Folbre, 2004; Jones, 2008), and this is how they will be referred to throughout this paper.

Given such a variety of options, the question of how to best measure the time parents spend caring for their children, including supervisory childcare, with time-diary data has received much attention in the literature (see for example Allard et al., 2007; Budig and Folbre, 2004; Fedick et al., 2005; Folbre and Yoon, 2007; Folbre et al., 2005). The key findings of this research are that measures of primary activity childcare are the most suitable to compare cross nationally and over time, but that they are also significant underestimates of total care. Secondary activity measures capture more supervisory childcare, but variability in estimates across surveys has led to concerns about their reliability. Furthermore, using secondary activities to measure supervisory childcare is argued to also produce underestimates because of their activity-based nature. In contrast to these activity-based measures, measures of proximity and responsibility both yield estimates of childcare that are much more comprehensive. However, it is not known whether these measures are commensurate with each other.

2.2 Proximity versus responsibility

2.2.1 Proximity versus responsibility – Some preliminary conceptual issues

In this section we discuss some of the key conceptual aspects of parental childcare that are relevant when thinking about measuring it comprehensively. Our purpose is to explore the extent to which being near one's child and being responsible for one's child are conceptually commensurate.

Childcare does not only consist of activities. Creating an environment for children, keeping them safe, sensitively monitoring their needs and intervening as and when appropriate is a continual requirement within which specific actions, such as reading to a child or giving them a bath, are nested. To count only relatively brief specific childcare actions results in an underestimate of time allocated to children. It is also a misrepresentation of the care process as a whole. For example, from a mother's point of view, caring for a young child is not a series of discrete activities that intermittently claim her time, but when (for example) the nappy is changed or the meal provided, she can turn her attention from. It is a continual and pervasive requirement to provide a protective environment that is arguably her first order priority, the fact from which all else follows, the basis upon which she structures her time. This view of childcare requires us to think not just about what a parent is physically doing, but to think also about who they are near and the specific manner in which they maintain a protective environment for their children.

To illustrate this, we draw on aspects of the work of Hagerstrand (1970) and Giddens (1984). Hagerstrand argued that individuals' daily lives are constrained not only by time but also by space, and that the spatial constraints operate on a number of levels simultaneously. He developed 'time-space maps' to illustrate his ideas.

Figure 1 shows a representation of a time-space map. It contains two arrows that represent the movements of a parent (thick arrow) and a child (thin arrow) through space and time. The

vertical sections of the arrows indicate movement through time at a fixed point in space, and the horizontal sections of the arrows indicate movement through space and time.[1] Figure 1 helps us to 'visualise' a comprehensive view of childcare. Suppose, for example, that a mother and child are at home and that up to t1 the mother is in the kitchen while the child is in another room. At t1 the mother moves to where the child is. The mother and child are then together in the same position from t1 to t2, which is represented by the small cylinder enclosing both mother and child. Hagerstrand refers to these periods as 'bundles'. Applied to childcare, these are the discrete activities carried out by mothers as part of the overall care they provide their children. We can imagine that the mother went to attend to the child in some way, to feed or dress them for example. After t2 the mother returns to the kitchen. In this particular example, the child's position remains unchanged throughout.

Figure 1
Parental childcare – A time-geography map
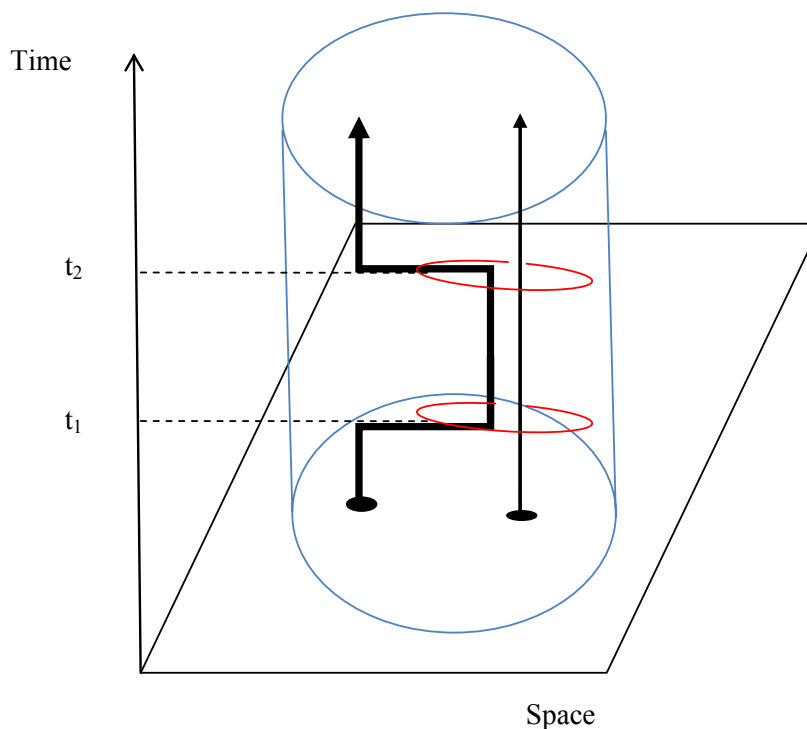
Source: Adapted from Hagerstrand (1970).

Also depicted in Figure 1 is a larger cylinder within which the discrete childcare activity described above took place, and which Hagerstrand refers to as a 'domain'. Hagerstrand describes this as a space where authority is exercised so as to control and/or protect individuals or things within it. In a purely physical sense, in the context of childcare, a 'domain' could,

---

[1]   Strictly speaking, an upward-sloping diagonal line should be used to represent movement in both space and time.

for example, encompass the entire family home as is the case in the above example. More generally, it represents a protective environment that parents provide for their children. A view of childcare that focuses only on discrete childcare activities would consider only the specific episode of childcare activity that began at t1 and ended at t2. This view fails to consider, however, the wider role of parents in providing a caring and protective environment for their children.

Hagerstrand's theoretical insights illustrate the importance of considering spatial constraints as well as temporal constraints. His work helps to show how specific care activities can be nested within a broader 'domain', which can be understood here as a protective environment for children and which can extend beyond the immediate confines of a single room. There are more than simply physical aspects to this. A parent could not, for example, leave a child home alone. Rather, a childcare 'domain' is established as a direct result of the parents' co-presence with the child. Even out-of-doors, a parent creates a protective space through being in proximity to the child. This means that the physical dimensions of the space are not the most important factor, but the proximity of the parent and child.

A major problem with Hagerstrand, however, is that he does not elaborate upon the role of the human agent (in this case the parent). As a result, we understand little of how parents create and maintain this protective space.

Giddens (1984) addresses this weakness in Hagerstrand's work. He argues that people create and maintain situations of co-presence with others as part of a continual stream of reflexive monitoring of the 'contextuality' of daily life, and do so on a plane of awareness that he terms 'practical' consciousness. That is, much of daily life is routine, practical, and not explicitly examined. However, people could articulate what they are doing, and why, if they were asked to. That is, they could easily bring elements of their life from practical consciousness to what Giddens refers to as 'discursive' consciousness. People do not need to constantly explain the nature or purpose of their actions, their positioning in space or their proximity to others, but have the ever-ready potential to do so. This points to the reflexive nature of routine daily life operating continually on a level of practical consciousness.

Being in proximity to someone is not, therefore, only a physical matter, but rather an ongoing conscious process that an individual maintains in a reflexive manner. This provides for proximity to open up beyond the confines of a single room. Indeed, it is a conscious 'opening up' of the physical space which characterises much of the supervisory care that parents provide. One can think, for example, of a parents' warning to children that they are being 'watched' even when they are not within eye contact.

The link between practical consciousness and maintaining proximity theorised by Giddens highlights an important connection between the two ideas of childcare as either responsibility or as proximity. The word 'responsible' can be used to denote a sense of purpose or agency on the part of the parent who is conscious or mindful of the child's presence. Giddens helps us to understand that maintaining proximity with children is also purposeful and conscious, or

mindful, on the part of the parent. In both cases we are extending our conception of childcare beyond specific childcare activities focusing on the conscious or mindful element of care. In addition and closely related to this, in both cases, our conception of childcare extends beyond the confines of a single room.

Measures of responsibility and proximity from time-diary surveys can be viewed as alternative approaches to capturing childcare that extends spatially beyond the confines of a single room, and also extends beyond specific childcare activities towards the more conscious or mindful element of childcare. Both aspects of an extended view of childcare are explicitly considered in the design of measures of proximity and responsibility included in time-diary surveys. We turn now to look at aspects of the design of measures of proximity and responsibility in time-diary surveys, and to other features of survey design with a potential bearing upon the extent to which these measures are commensurate.

2.2.2 Proximity versus responsibility: Issues concerning the design of measures in time-diary surveys

Time-diary surveys require respondents to provide information relating to their time use on a specific day. The two main time-diary methods are a self-completed instrument and a telephone interview in which respondents are 'walked through' the previous day. Both these methods provide accurate and valid data on time use (Juster, 1985). Time-diary methodology is regarded as superior to asking respondents a stylised question about how much time they spend caring for children, known as the recall method (Gershuny, 2000; Robinson, 1985).

As well as information on activities, time-diary surveys ask respondents who they were with, which yields information about proximity. The surveys in all the countries included in this study (Australia, USA, Italy and the UK) ask respondents to indicate who they are with throughout the day. Therefore they all have 'proximity' measures. The only one of the four surveys that has a 'responsibility' measure is the American Time Use Survey (ATUS). The ATUS is a telephone survey and as respondents were walked through their previous day they were asked to state times during which a child was 'in your care'. This is the only survey included in this study that has such a measure. Appendix 1 summarises the measures available in the time-diary surveys included in this study.

Asking a parent if a child is 'in your care' is clearly different from asking them to record who they are co-present with. This raises a question as to whether they are substantively different measures. The discussion above suggests that to be commensurate such measures must i) extend spatially beyond the confines of a single room, and ii) extend beyond specific childcare activities to the more mindful element of childcare.

With respect to the first point, a criticism of proximity measures is that they may be inappropriate because they may restrict estimates of childcare to time when parents are in the same room as children (Budig and Folbre, 2004; Folbre and Yoon, 2007). The ATUS, for example, explicitly restricts proximity measures to being in the same room. But such a restriction is the

exception and not the rule. The ATUS is very unusual in imposing this constraint. The Australian Bureau of Statistics (ABS, 2003) defines proximity as "(a) those who were with the person when they were at home. This referred to all present in the house and grounds, whether belonging to the household or not, and (b) those for whom the person was responsible as well as those involved in the same activity when away from home (e.g. at a picnic, the person helping the respondent prepare the food, and others conversing with them and the associated children nearby)." Many of the European time-diary surveys define proximity in accordance with guidelines set down by Eurostat (Eurostat, 2004). These state that a person does not have to be engaged in an activity with another to be considered in proximity to them, but rather that they are "on hand". Most surveys, therefore, do not stipulate that people must be in the same room to be regarded as in proximity to others. The responsibility measure in the USA was specifically designed cover situations where parents are not in the same room, but are 'near enough to provide immediate assistance' (Schwartz, 2001). In this very important regard, therefore, measures of responsibility and proximity are commensurate.

The second point, the conscious or mindful element of looking after children, is recognised by those seeking to develop extended measures of childcare. For example, the responsibility measure in ATUS refers to childcare as a 'state of being *mindful* of and responsible for, a child' (Schwartz, 2002). There is also, as discussed above, a spatial dimension as parents must be in proximity to their children, and this may extend beyond the confines of a single room. Further, the creation of this space is a conscious act on the part of parents who are mindful of being in proximity to their children. As noted previously, the Australian Bureau of Statistics (ABS, 2003) incorporates in their definition of proximity 'those for whom the person was responsible'. This is a clear statement of the conceptual link between responsibility and proximity, which designers of the ABS time-diary survey obviously recognise. Finally, the Eurostat guidelines state that co-presence does not entail that the respondent be engaged in the same activity with another person (Eurostat, 2004). This is important as it clearly divorces the measure of proximity in recent European time-diary surveys from any relation to specific activities.

To summarise, when measures of proximity and responsibility are designed to extend beyond the confines of a single room then they ought to be commensurate. In addition, both capture the conscious or mindful dimensions of the care parents provide regardless of whether we think of this explicitly in terms of responsibility or proximity. The difference in the questions may not, therefore, be important especially as each question is designed to do the same thing. That is, to draw information from the practical consciousness of individuals on aspects of their daily routines.

One added point in relation to the design of the responsibility measure in the USA is that it is restricted to time when at least one child is awake, whereas respondents to the other surveys could record being in proximity to a child when all children in the household are asleep. The discussion above did not stipulate that children need to be awake to be receiving care. Indeed,

the focal point of our measures is the parent who while awake is mindful of their children and consciously providing a caring protective environment. Restricting extended measures of care to time when at least one child is awake may affect the extent to which the responsibility measure in the USA is incommensurate with the measures of proximity in other countries.

There are a limited number of empirical studies comparing measures of proximity and responsibility, and researchers disagree on the implications of the findings. Fedick et al. (2005) compare estimates of proximity to estimates of responsibility from the Canadian General Social Survey (CGSS) 1998 mentioned above. They conclude that the differences in the estimates of proximity and responsibility are not substantial. Proximity in the CGSS 1998 is not restricted to being in the same room, and so the relative similarity between these two measures does suggest that they are quite commensurate. Folbre & Yoon (2007) argue, in contrast, that the differences between estimates of proximity and the estimates of responsibility are large enough to conclude that they "are related but distinctly different measures of child care." It is difficult to draw a definitive conclusion on this issue from such a narrow base of empirical research.

A final issue that relates to survey design concerns the use of prompts in the secondary activity column of some time-diary surveys suggesting childcare as an example of a possible secondary activity. Recall from above that wide variation in estimates of secondary activities has led to some concern about their validity. Some have argued these specific prompts for childcare may be a factor leading to this wide variation in estimates of secondary activity childcare (Budig and Folbre, 2004; Folbre and Yoon, 2007). The suggestion is that prompts encourage respondents to say they were doing childcare as a secondary activity, and that the lack of a prompt does not mean that less secondary activity care is done, simply that less is recorded.

The use of prompts is of interest in this study because of the presence of temporal overlaps between different measures that we discussed above. Such prompts are a feature of survey design directly related to secondary activity measures, but they may be indirectly related to measures of proximity or responsibility as a result of temporal overlaps between different measures. In other words, a parent may record childcare as a secondary activity, as well as record being co-present with a child. The use of prompts in the secondary activity column may be a problem if overall estimates of proximity or responsibility are systematically larger in surveys where such prompts are used. The potential indirect impact of the existence of prompts in the secondary activity column of some surveys has not been examined in previous research.

2.3   Summary and research questions

In broad summary, the discussion above highlighted that the care parents provide their children has a spatial dimension that extends beyond specific activities, and beyond specific places. Parents actively provide a safe environment for children to be in. This is done reflex-

ively in a routine and 'practically' conscious manner. If parents are asked to comment on this feature of their daily lives they do can so. This can be by simply indicating the proximity of children, or can be elicited from responses to direct questions relating to parents' responsibility for their children's care. We have argued that these measures are conceptually interchangeable, and each is a theoretically valid way of capturing the large quantity of supervisory childcare parents provide.

Estimates of these measures, however, may be quite different as a result of survey design. The effects of survey design on estimates could be direct, as when in some surveys the measures extend beyond the confines of a single room and in others they do not. The effects of survey design could also be indirect, as when prompts for childcare are included in the secondary activity column of some surveys. Furthermore, restricting measures to certain periods in the day may also impair their comparability across surveys.

To test these possibilities, we harmonise and compare measures of proximity and responsibility from time-diary surveys in Australia (1997), the USA (2003), the UK (2000-01), and Italy (2002-03). Measures of proximity are available in all surveys used in the paper, whilst a responsibility measure is available in the USA survey only. (Appendix 1)

We address three questions relating to methodologies in the measurement of childcare with these data. These are:

1) Are measures of proximity designed to extend beyond the confines of a single room commensurate with a measure of responsibility that has also been designed to extend beyond the confines of a single room?

2) Do prompts in the secondary activity column of time-diaries bias estimates of extended measures of childcare upwards?

3) Does restricting the ATUS measure of responsibility to time when at least one child is awake affect the extent to which this measure is commensurate with measures of proximity in other countries?

3 Methodology

3.1 Data

We use time-diary data from Australia 1997 (AUSTUS), the USA 2003 (ATUS), Italy 2002-03 (ITUS) and the UK 2000-01 (UKTUS). All the surveys ask respondents about their main activity yielding data on primary activities. All the countries except the USA ask respondents what else they were doing, which yields data on secondary activities.[2] The time-diary instruments in Australia and the UK each offer childcare as a suggestion in the secondary activity

---

[2]   Although not asked in the ATUS, when volunteered by respondents secondary activity data is collected.

column. These are the prompts in the secondary activity column that we referred to above. All the countries ask respondents who they were with, which is a measure of proximity. The USA also asks respondents about time when a child was in their care, which is a measure of responsibility. (See the summary Appendix 1)

3.2 Measures

When harmonising measures of proximity and responsibility, one of the most important factors to consider is the age of the children to which the measures refer. The time-diary instrument in the UK allows respondents to indicate if they are in proximity to children 0 – 9 years and 10 – 14 years. In Italy, respondents can indicate if they are with children 0 – 9 years. In Australia, proximity with children aged 0 – 11 years is specified, whilst in the ATUS measures of proximity can be constructed for children of any age. The ATUS responsibility measure, however, is restricted to children aged 0 – 12 years. To harmonise these measures, we adopt a 'lowest common denominator' approach restricting the analysis to households where the oldest child is aged 9 years. This means that the measures in Australia and the USA effectively cover children aged 0 – 9 years, and are thus comparable with the measures of time with a child aged 0 – 9 years in the UK and Italy. (This has obvious implications for sample selection which are detailed below.)

Surveys in the UK and Italy do not collect proximity information if the respondent is sleeping, in paid employment or engaged in education-related activities. To make the measures more comparable we apply this restriction to the proximity measure in Australia and the USA[3], and the responsibility measure in the USA.

We create measures of total proximity in Australia, Italy, the UK and the USA. The measure in the USA is restricted to being in the same room. In addition, we create a measure of total responsibility in the USA. All these measure apply to children 0 – 9 years. In addition, they are all restricted to time when the parents are awake, not in paid work or engaged in education related activities.

Recall that our second research question addresses the potential impact of prompts in the secondary activity column in some surveys. For this, we divide the measure of responsibility in the USA, and the measures of proximity in the other three countries into three distinct components. These are: i) total primary activity childcare when in proximity to a child or responsible for a child ii) total secondary activity childcare when in proximity to a child or responsible for a child and iii) the remainder of time when in proximity to a child or responsible for a child

Note that the ATUS does not collect information on secondary activity childcare and so it is

---

[3]   Co-presence data is also not collected in ATUS if the respondent is sleeping or engaged in certain personal care activities. The personal care activities constitute a marginal quantity of time, and imposing this restriction in the other surveys is not straightforward because of differences in the detail of the coding of specific activities. Given that the quantity of time is minimal this does not have a strong bearing on substantive results.

impossible to create this measure for the USA. The implications of this will be discussed when presenting the results below. In instances where a parent records both a primary and secondary childcare activity we only count the primary activity.

3.3 Sample

All four surveys provide nationally representative samples. We restrict the sample to households where the oldest child is aged 0 – 9 years. As described above, this restriction enhances the comparability of measures of proximity and responsibility across countries. We further restrict the samples to households where the only adult residents are the mother and the father. This avoids complications arising from extra potential carers in households, and abstracts from the obvious differences that would arise in lone parent households. Table 1 shows the sample of mothers and fathers from each country. The country samples are reasonably well balanced by gender. The ATUS, UKTUS and ITUS each over-sampled weekend days, particularly in Italy where two thirds of the observations are weekend days.

Table 1
Numbers of observations

	Mothers	Fathers
Italy	2,208	2,206
Australia	887	913
United States of America	1,365	1,236
United Kingdom	949	874

Source: Own calculations based on data from ATUS, UKTUS, AUSTUS and ITUS.

3.4 Analysis plan

Our questions are methodological and our analysis is designed to illustrate the extent to which measures of proximity and responsibility may or may not be comparable.

To address the first question, we compare estimates of proximity in Australia, Italy and the UK, not restricted to being in the same room, with the estimate of proximity in the USA which is restricted to being in the same room. We then carry out a second comparison with measures of proximity in Australia, Italy and the UK and the measure of responsibility in the USA all of which are not restricted to being in the same room. This should, in a very simple manner, allow us to assess the extent to which measures of proximity in Australia, Italy and the UK which are not restricted to being in the same room are more comparable with the responsibility measure in the USA than with the proximity measure in the USA.

To address the second question, we examine the three parts of the measures of proximity in Australia, Italy and the UK and the measure of responsibility in the USA which are: 1) primary activity childcare, 2) secondary activity childcare, and 3) not performing a specific childcare activity. There are two components to our approach to this question. Firstly, we

wish to know if prompts are systematically related to estimates of secondary activity childcare. To examine this, we compare estimates of secondary activity childcare in Australia and the UK, which each prompt for childcare in the secondary activity column, with Italy which has no prompt. This will allow us to assess the impact of such prompts on estimates of secondary activity childcare when with children. Secondly, we investigate if prompts are systematically related to estimates of proximity/responsibility more generally. By this we mean do they impact on other aspects of the measures such as, for example, time when no specific childcare activity is occurring. If prompts are systematically related to these measures in general, it should be apparent too for the component when parents are not engaged in any childcare activity, and would thus imply that prompts do have a detrimental impact on cross-national comparisons of measures of proximity/responsibility. To look at this, we compare the measures of proximity/responsibility net of any specific childcare activities.

To address the third question, we plot the average time per hour parents are in proximity to their children in Australia, Italy and the UK, and responsible for children in the USA. We look at average levels of this measure throughout the day for signs that the restriction of the measure of responsibility to times in the day when at least one child is awake, impacts on the extent to which it is comparable with the measures of proximity in the other countries.

For the first two questions, we estimate OLS regressions on the total measures of proximity and responsibility, and the three sub-components of these totals depending on whether the parent is also performing primary activity childcare, secondary activity childcare, or no childcare activity. We use these models to compute predicted means for the various measures, adjusted for several factors known to have a strong influence on the time parents spend caring for their children. We choose this option rather than reporting sample means as we do not have suitable weights available in all surveys. In addition, this approach allows us to test differences across countries.

The key variable of interest is the country the parent is in. We enter three dummy variables indicating if the respondent is living in Australia, Italy or the UK. Respondents from the USA are the reference group. The regressions control for age of youngest child (0-4 years omitted), number of children (one child omitted), whether the parent has a degree (yes=1), and the employment status of the parent. Employment status is grouped into three: 1) employed full-time (omitted); 2) employed part-time; and 3) not in employment. We estimate models for mothers and fathers separately as we are not primarily interested in gender differences. Standard errors are computed taking into consideration potential intra-group correlation arising from multiple observations for individuals in Australia and the UK. Regression output is reported in Appendix 1 below for mothers (Appendix 2) and fathers (Appendix 3).

4   Results

We begin by looking at estimates of the total measures of proximity in all countries, and the total measure of responsibility in the USA. Results contained in Table 2 show that the proximity measure in the USA, which is constrained to being in the same room, is considerably lower than the proximity measures in Australia, the UK and Italy where the proximity measure is not constrained to being in the same room.

In a clear answer to our first research question, the results here show that when measures of proximity are not restricted to being in the same room, then they do provide estimates of care that are commensurate with a more explicit responsibility measure.

Table 2
Mothers' and fathers' predicted average hours per day of proximity in USA, Australia, UK and Italy, and responsibility in USA

	Proximity				Responsibility
	USA	Australia	UK	Italy	USA
Mothers	8.4	12.4	9.9	9.4	10.3
	(1.5)	(1.4)	(1.4)	(1.5)	(1.6)
Fathers	5.5	7.6	6.4	6.1	6.6
	(0.6)	(0.7)	(0.6)	(0.5)	(0.6)

Notes: Standard deviations in parenthesis.
Source: Own calculations based on data from ATUS, UKTUS, AUSTUS and ITUS.

For both mothers and fathers, the estimate of the restricted proximity measure in the USA is lower than the estimates of the proximity measures in all other countries and, perhaps more importantly, lower than the estimate of the responsibility measure in the USA. There is a difference of about two hours between the estimates of proximity and responsibility in the USA, the latter of which is designed to extend beyond the confines of a single room. The responsibility estimate in the USA is closer to the estaimtes of proximity in the other countries. The gap between mothers in the USA and Australia, for exmaple, has halved from four hours to two hours. As we noted above, proximity measures in countries other than the USA are designed to extend beyond the confines of a single room and we conclude that respondents in these surveys are clearly indicating times when they are with children though not in the same room. Such proximity measures are therefore commensurate with the responsibility measure in the USA, with both capturing aspects of childcare that extend beyond the confines of a single room and beyond specific childcare activities.

The conceptual discussion above stressed that primary and secondary childcare activities are nested within extended measures of care. One implication of these temporal overlaps is that prompts relating to supervisory childcare in the secondary activity columns of time-diaries may lead to estimates of extended measures that are biased upwards. Recall that such prompts

are used in time-diary instruments in Australia and the UK. Our second research question asks if these prompts affect the comparability of extended measures. To answer this, we decomposed the entire time parents are in proximity to a child or responsible for a child depending on whether they are doing a primary childcare activity, a secondary childcare activity, or not doing any childcare activity. Table 3 reports the predicted means from regressions on time in each of these three distinct components of the overall measures of proximity in Australia, the UK and Italy, and the measure of responsibility in the USA.

Table 3
Mothers' and fathers' predicted average hours per day of primary childcare activities, secondary childcare activities, and no childcare activities when in proximity to a child in Australia, the UK and Italy, or responsible for a child in the USA

	Proximity			Responsibility
	Australia	**UK**	**Italy**	**USA**
Mothers				
No childcare activities	5.7	6.2	6.4	7.8
	(0.8)	(0.7)	(0.8)	(0.8)
Primary childcare activities	3.1	2.4	2.4	2.6
	(0.7)	(0.7)	(0.7)	(0.7)
Secondary childcare activities	3.6	1.3	0.6	-
	(0.2)	(0.2)	(0.2)	-
Fathers				
No childcare activities	5.0	4.7	4.7	5.3
	(0.5)	(0.4)	(0.3)	(0.4)
Primary childcare activities	1.2	1.1	1.0	1.3
	(0.3)	(0.3)	(0.3)	(0.3)
Secondary childcare activities	1.4	0.6	0.3	-
	(0.1)	(0.1)	(0.1)	-

Notes: Standard deviations in parenthesis.
Source: Own calculations based on data from ATUS, IKTUS, AUSTUS and ITUS.

It is clear from results in Table 3 that cross-national variation in estimates of total proximity for mothers is largely concentrated in time when they are also performing secondary activity childcare. It seems unlikely, however, that variation in estimates of secondary activity care are related to the use of prompts in the secondary activity column in the time-diaries in Australia and the UK. It is true that the estimates of secondary activity childcare are larger in Australia and the UK than in Italy where no prompt is used. For example, the estimate of secondary activity childcare for the UK is about twice as large as the Italian estimate. But it is also the case that the estimate in Australia is about three times larger than the UK estimate. Given that both these countries prompt respondents about supervisory childcare, we cannot attribute the difference between them to the use of such prompts.

We further inquire if the prompts are systematically related to measures of proximity in general. If this were the case, then it should be apparent in other components of the measures including when not engaging in any childcare activities. The results do not suggest this. Estimates of proximity net of specific childcare activities, and estimates of primary activity childcare when in proximity to a child or responsible for a child are broadly similar cross-nationally. In fact, the estimate of proximity net of care activities is largest in Italy (the USA is discussed below), which has the lowest estimate of secondary activity childcare and no prompt. These results suggest variation in estimates of secondary activity childcare mimic those for overall time caring for children, and are not an artefact of survey design.

Information on secondary activity childcare is not systematically collected in the ATUS. At the same time, the responsibility estimate net of childcare activities for mothers in the USA is larger than estimates of proximity in the other countries. We suggest that secondary activities, if systematically collected, were subtracted from this measure then it would be more similar to the estimates of proximity net of childcare activities in the other countries. For this to be the case, the assumed estimate of secondary childcare in the USA would have to be in a range of about 1.4 to 2.1 hours. Considering the estimates of secondary activity in the UK and Australia, this is reasonable.

The timing of measures of proximity and responsibility

Recall that the ATUS responsibility measure is not collected when children are sleeping, which may limit the extent to which this measure is commensurate with proximity measures in the other countries, which are not restricted in the same manner. There is no conceptual rationale for such a restriction, and our third research qustion asks if it limits the comparablility of measures. To explore this, we look at the timing of these measures throughout the day. We compute 24 distinct measures of proximity/responsibility time for each hour in the day and then plot the sample means at each time point to form a tempogram. Figure 2 is the tempogram for mothers and Figure 3 is the tempogram for fathers.

The times most likely to be affected by restricting the ATUS responsibility measure to only when children are awake are early in the morning and late in the evening. Looking first at the morning time (up to 10am), there is little evidence to suggest that the measure of responsibility in the USA is systematically different from proximity measures in the other countries. The average time per hour in the USA is almost identical to that in the UK up to about 9am for mothers, and 8am for fathers. The average time for Australia and Italy are higher and lower respectively, than the other coutries. Cross-national patterns in the early morning echo those prevalent when averaged over the entire day. It is perhaps to be expected that this restriction would not have much of an impact in the morning as parents and children tend to get up together, especially when the children are younger.

Figure 2
The timing of mothers' proximity measure in Australia,
Italy and the UK, and responsibility measure in the USA
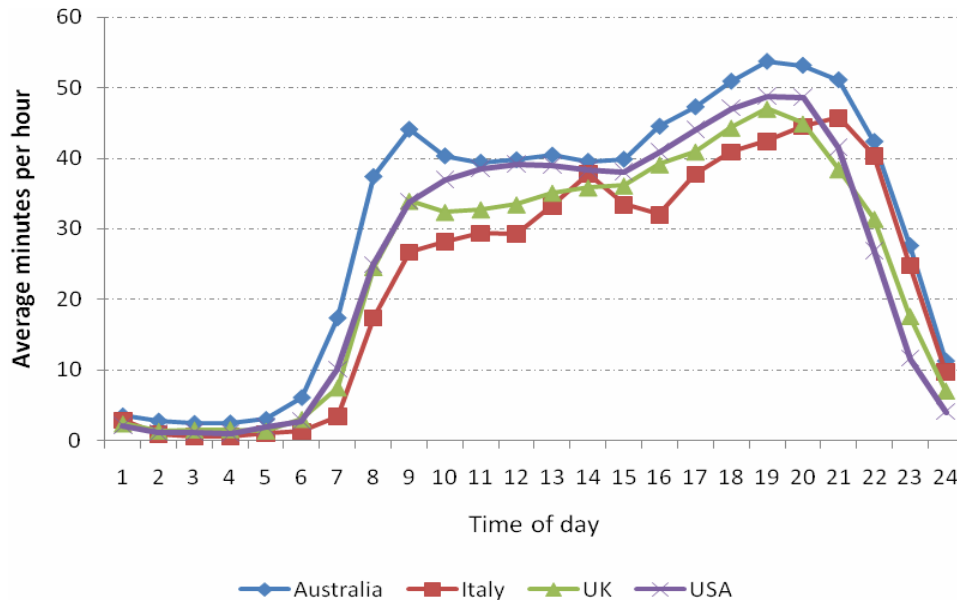
Source: Own calculations based on data from ATUS, UKTUS, AUSTUS and ITUS.

Figure 3
The timing of fathers' proximity measure in Australia,
Italy and the UK, and responsibility measure in the USA
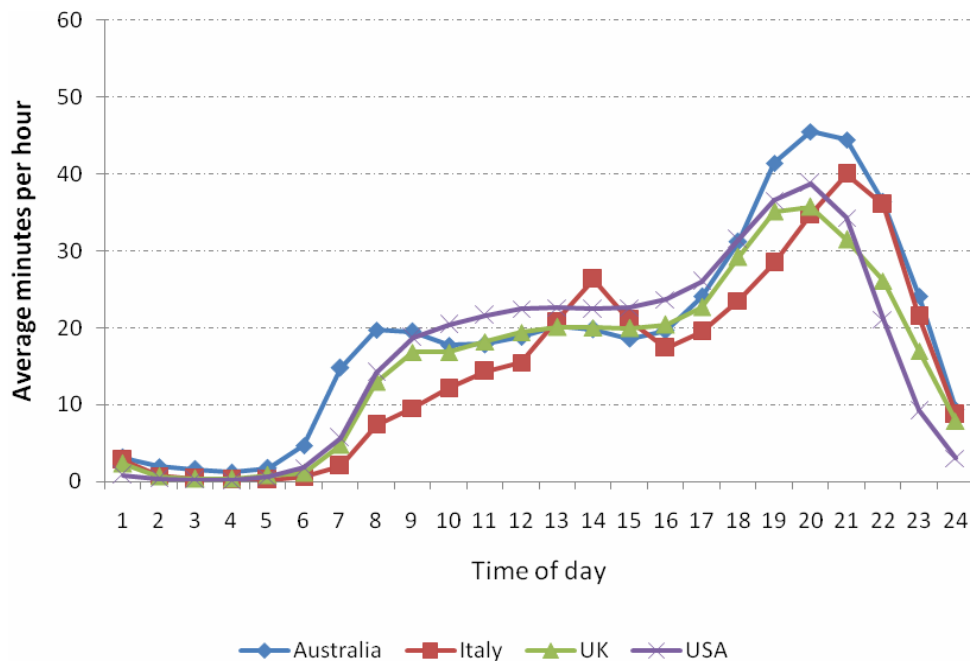
Source: Own calculations based on data from ATUS, UKTUS, AUSTUS and ITUS.

Figures 2 and 3 show that the estimates of proximity and responsibility peak in the evening for mothers at around 7pm and for fathers at around 8pm and decline thereafter (Italy is an exception, which we discuss below). After 9pm there is a sharper drop in the average time per hour that parents in the USA state being responsible for children, such that this is lower than the average estimates of proximity per hour in all other countries. This is the only time in the entire day where the estimate of responsibility for the USA falls below the estimates of proximity in all the other countries. This shows that the timing restriction does have a modest impact on the measure of responsibility in the evening that makes it slightly less comparable with measures of proximity in the other countries.

One option to make the responsibility measure more comparable with proximity measures would be to assume that the 'trajectory' of the estimate of responsibility in the USA follows that of the country it is most similar to over the day, which would be the UK. This would obviously increase the overall estimate in the USA, moving it closer to the estimate in Australia, but the substantive findings set out above would remain intact. An alternative proposition would be to ignore proximity later in the evening as children are more likely sleeping. One major reason for not following this approach concerns Italy. For both Italian mothers and fathers, time with children is concentrated more towards evening. It peaks at around 9pm. This very likely reflects cultural differences in the temporality of family time in Italy compared with the other countries analysed here. If we were to ignore proximity later in the evening, results would likely be biased against Italian households.

5 Conclusion

Childcare is difficult to measure because so much of it occurs in a routine fashion, continuously, as a 'matter of course' throughout the day. Supervisory childcare is often combined seamlessly, though not effortlessly, with other activities that appear, at least on the surface, to be of primary importance. Therefore time-diary measures which capture only specific activities miss a great deal of care, and research attention has turned to ways in which the large amount of supervisory childcare parents provide their children might be tapped. Most surveys gather information on whether parents are in proximity to children, and some include specific direct questions as to when parents are responsible for children. We argued that these two approaches are conceptually interchangeable. We then discussed particular features of survey design that may affect whether these measures are indeed comparable cross-nationally. We set out three specific methodological research questions.

Our first research question was whether the comparability of extended measures of childcare is affected by restrictions that confine them to a single room. Most surveys do not restrict measures of proximity to being in the same room, and this is a clear advantage in capturing supervisory childcare. Not surprisingly, we found that a measure of proximity restricted to being in the same room had lower estimates than measures of proximity when no such restric-

tion was applied. The differences are not huge, but enough to suggest that restricting the measure of proximity to being in the same room has an impact on the comparability of this measure cross-nationally. Moreover, measures of proximity that are not restricted to being in the same room were comparable in magnitude with the measure of responsibility. We conclude that measures of proximity that are not restricted to being in the same room as children capture parental childcare viewed broadly as looking after, that is providing a protective environment for, children and are commensurate with measures of responsibility which were explicitly designed to capture this dimension of childcare.

Our second research question concerned the use of prompts in the secondary activity column and whether they impacted on estimates of extended measures of childcare. Our approach to this question had two components. Firstly, we compared estimates of secondary activity childcare. We found that while there were large differences in secondary activity childcare these could not be linked to the use of prompts for childcare. Both Australia and the UK, which each prompted for childcare, had larger estimates of secondary activity childcare than Italy which did not prompt for childcare in the secondary activity column. But there was a large difference in the estimates between Australia and the UK. This leads us to the second component of this question: Are these prompts related to measures of proximity more generally? We compared estimates of proximity net of all childcare activities and found that they were remarkably similar across countries. This suggests that measures of proximity are not affected by the use of prompts in the secondary activity column in some surveys. We therefore conclude that cross-national differences in estimates of secondary activity childcare mimic cross-national differences in the overall time parents are with their children. In other words, these are substantive differences and not an artefact of survey design.

Our third research question was whether there were limits to the comparability of the responsibility measure because it was restricted to time when at least one child is awake. We found that this restriction does modestly affect the measure, most notably in the evening. We conclude that these measures are sensitive to such restrictions and future time-diary surveys should be mindful of this. One of the limitations of the paper arises from cross-national variation in the age brackets of children that extended measures of childcare cover. This meant that we had to restrict our analysis to families where the oldest child was nine years of age. Time-diary surveys have made considerable progress in harmonising activities. Future surveys should try to harmonise the age brackets for children in extended measures of care. There has been some movement towards this in the Harmonised European Time Use Survey (HETUS), but there remains variation. The Italian and UK data both had a bracket for children 0 − 9 years, but the UK alone had a further bracket for children 10 − 14 years. Harmonised age brackets are crucial to further develop extended measures of care from time-diary data that are comparable across countries.

Our comparisons did not include measures of childcare derived from survey questions asking respondents to recall how much time they spend caring for children. These have been the sub-

ject of research comparing these measures with measures from time-diary surveys (Fedick et al., 2005), and comparing estimates of these recall-based measures cross-nationally using the European Community Household Panel (Joesch and Spiess, 2006). Joesch and Spiess reported that mothers in the UK spent about 70 hours per week 'looking after' their children in 1996. This is quite similar to the estimate of proximity for mothers reported here of 9.9 hours per day, which is about 70 hours when summed over a week. There are some differences between the samples used in their study and ours, but this simple comparison does suggest that these measures provide similar estimates to the broader measures of proximity and responsibility from time-diary surveys discussed in this paper. However, as noted above, time diary data are widely acknowledged to be superior to stylised estimates. Time-diary data are less prone to social desirability bias. They have the added advantage that one can study the timing of care across the day and, perhaps more importantly, examine periods when more than one dimension of childcare is occurring simultaneously. They can be analysed in conjunction with other aspects of time allocation including leisure, market work and domestic labour. They also capture further social dimensions to providing childcare, such as whether parents are caring alone or with a spouse.

This paper has shown that extended measures of childcare, which incorporate supervisory childcare, can be derived from time-diary data and compared cross-nationally. The most common extended measure available in time-diary surveys is the time parents are in proximity to their children. Provided this measure is not restricted to being in the same room, it has been shown here to be commensurate with a responsibility measure in the USA that was explicitly designed to capture supervisory care. This is an important finding as it opens the way for future comparative studies on these comprehensive measures of childcare using time-diary data. Harmonised time-diary surveys such as the Multi-national Time Use Survey (MTUS) or the Harmonised European Time Use Survey (HETUS) are currently restricted to primary activities, and it is to be hoped that future versions of these surveys will incorporate measures of proximity that are common to time-diary surveys. This paper highlights how important this aspect of time-diary surveys is for the measurement of childcare, and shows how such measures can be harmonised creating the potential for future comparative research.

Appendix

Appendix 1

Summary of measures available in the time-diary surveys included in the paper

	Australia (1997)	USA (2003)	Italy (2002-03)	UK (2000-01)
Primary activity	√	√	√	√
Secondary activity	√	X	√	√
Prompts for secondary activity	√	-	X	√
Proximity	√	√	√	√
Proximity restricted to being in the same room	X	√	X	X
Responsibility	X	√	X	X
Responsibility restricted to being in the same room	-	X	-	-

Notes: √ = Yes; X = No.

Source: Own calculations based on data from ATUS, UKTUS, AUSTUS and ITUS.

Appendix 2
OLS results for mothers

	Model 1	**Model 2**	**Model 3** no childcare activity	**Model 4** primary child-care activity	**Model 5** secondary child-care activity
Australia	6.3***	1.8***	-2.3***	0.5***	3.6***
	(0.2)	(0.2)	(0.2)	(0.1)	(0.1)
UK	4.1***	-0.4	-1.8***	0.0	1.3***
	(0.2)	(0.2)	(0.2)	(0.1)	(0.1)
Italy	3.7***	-0.8***	-1.6***	0.0	0.7***
	(0.1)	(0.2)	(0.1)	(0.1)	(0.0)
Youngest child 5 - 9 years	-1.8***	-1.8***	-0.2	-1.3***	-0.3***
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Two children	1.0***	0.4***	0.1	0.3***	0.1
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
> 2 children	1.7***	1.0***	0.4	0.6***	0.0
	(0.2)	(0.2)	(0.2)	(0.1)	(0.1)
Has a degree	0.2	0.2	-0.5***	0.5***	0.2**
	(0.1)	(0.2)	(0.1)	(0.1)	(0.1)
Works part time	0.7***	0.9***	0.5***	0.2*	0.3***
	(0.2)	(0.2)	(0.1)	(0.1)	(0.1)
No paid employment	2.1***	2.6***	1.6***	0.6***	0.4***
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Intercept	4.6***	9.1***	7.2***	2.1***	-0.3***
	(0.2)	(0.2)	(0.2)	(0.1)	(0.1)
Number of observations	5,409	5,409	5,409	5,409	5,409
Adjusted R^2	0.29	0.16	0.08	0.14	0.30

Notes: Standard errors in parenthesis. *** P < .001; ** P < .01; * P < .05. Model 1 compares the restricted proximity measure in the USA with the measure of proximity in all other countries. Model 2 compares the responsibility measure in the USA with the measure of proximity in all other countries. Models 3 – 5 refer to the three components of the responsibility measure in the USA, and the proximity measure in Australia, Italy and the UK.

Source: Own calculations based on data from ATUS, UKTUS, AUSTUS and ITUS.

Appendix 3
OLS results for fathers

	Model 1	Model 2	Model 3 no childcare activity	Model 4 primary childcare activity	Model 5 secondary child-care activity
Australia	3.0 ***	1.0 ***	-0.3	-0.2 *	1.5 ***
	(0.2)	(0.2)	(0.2)	(0.1)	(0.1)
UK	1.9 ***	-0.1	-0.6 **	-0.2 *	0.7 ***
	(0.2)	(0.2)	(0.2)	(0.1)	(0.0)
Italy	1.8 ***	-0.2	-0.5 **	-0.1 *	0.4 ***
	(0.2)	(0.2)	(0.2)	(0.1)	(0.0)
Youngest child 5 - 9 years	-0.5 ***	-0.4 *	0.2	-0.5 ***	-0.1
	(0.1)	(0.2)	(0.1)	(0.0)	(0.0)
Two children	0.5 ***	0.4 **	0.2	0.2 ***	0.0
	(0.1)	(0.1)	(0.1)	(0.0)	(0.0)
> 2 children	0.4 *	0.3	0.1	0.1	0.1
	(0.2)	(0.2)	(0.2)	(0.1)	(0.1)
Has a degree	0.5 **	0.6 ***	0.0	0.4 ***	0.2 **
	(0.2)	(0.2)	(0.1)	(0.1)	(0.1)
Works part time	0.7 *	1.0 *	0.3	0.4 **	0.3 *
	(0.4)	(0.4)	(0.3)	(0.1)	(0.1)
No paid employment	1.9 ***	2.2 ***	1.6 ***	0.5 ***	0.0
	(0.3)	(0.3)	(0.3)	(0.1)	(0.1)
Intercept	4.1 ***	6.1 ***	5.0 ***	1.2 ***	-0.1 **
	(0.2)	(0.2)	(0.2)	(0.1)	(0.0)
Number of observations	5,229	5,229	5,229	5,229	5,229
Adjusted R^2	0.07	0.03	0.01	0.05	0.15

Notes: Standard errors in parenthesis. *** $P < .001$; ** $P < .01$; * $P < .05$. Model 1 compares the restricted proximity measure in the USA with the measure of proximity in all other countries. Model 2 compares the responsibility measure in the USA with the measure of proximity in all other countries. Models 3 – 5 refer to the three components of the responsibility measure in the USA, and the proximity measure in Australia, Italy and the UK.

Source: Own calculations based on data from ATUS, UKTUS, AUSTUS and ITUS.

References

ABS. (2003), Time Use Survey, Technical paper, Australia Bureau of Statistics, Canberra, Australia.

Allard, M.D., Bianchi, S., Stewart, J. and V. Wright (2007), Measuring time spent in childcare – Can the American Time Use Survey be compared to earlier U.S. time-diary studies, in: *Monthly Labor Review* 130(5), 23-36.

Bianchi, S.M., Robinson, J.P. and M.A. Milkie (2006), *Changing rhythms of american life*, Sage, New York.

Bittman, M., Craig, L. and N. Folbre (2004), Packaging care – What happens when parents utilize non-parental child care, in: Folbre, N. and M. Bittman (eds.), *Family time – The social organization of care*, Routledge, London, 133-151.

Bryant, K.W. and C.D. Zick (1996), An examination of parent-child shared time, in: *Journal of Marriage and the Family*, Vol. 58, 227-237.

Bryson, V. (2007), *Gender and the politics of time – Feminist theory and contemporary debates*, The Policy Press, Bristol, U.K.

Budig, M.J. and N. Folbre (2004), Activity, proximity or responsibility, in: Folbre, N. and M. Bittman (eds.), *Family time – The social organization of care*, Routledge, London, 51-68.

Craig, L. (2006), Does father care mean fathers share? – A comparison of how mothers and fathers in intact families spend time with children, in: *Gender and Society*, Vol. 20, 259-281.

Craig, L. (2007), *Contemporary motherhood – The impact of children on adult time*, Ashgate Publishing, London.

Eurostat (2004), *Guidelines on harmonised european time use surveys*, Office for Official Publications of the European Communities, Luxembourg.

Fedick, C.B., Pacholok, S. and A.H. Gauthier (2005), Methodological issues in the estimation of parental time – Analysis of measures in a Canadian time-use survey, in: *electronic International Journal of Time-Use Research*, Vol. 2, 67-87.

Fernandez, C. and A. Sevilla-Sanz (2006), *Social norms and household time allocation*, ISER Working Paper 2006-38, University of Essex, Colchester.

Folbre, N., Yoon, J., Finnoff, K. and A.S. Fuligni (2005), By what measure? – Family time devoted to children in the United States, in: *Demography*, Vol. 42(2), 373-390.

Folbre, N. and J. Yoon (2007), What is child care? – Lessons from time-use surveys of major english-speaking countries, in: *Review of Economic of the Household*, Vol. 5, 223-248.

Gauthier, A.H., Smeeding, T.H. and F.F. Furstenberg (2004), Are parents investing less time in children? – Trends in selected industrialised countries, in: *Population and Development Review*, Vol. 30, 647-671.

Gershuny, J. and O. Sullivan (1998), The sociological use of time-use diary analysis, in: *European Sociological Review*, Vol. 14, 69-85.

Gershuny, J. (2000), *Changing time – Work and leisure in post-industrial society*, Oxford University Press, Oxford.

Giddens, A. (1984), *The constitution of society – Outline of the theory of structuration*, University of California Press, Berkeley.

Hägerstrand, T. (1970), What about people in regional science, in: *Papers of the Regional Science Association*, Vol. 24, No. 1, 7-21.

Hofferth, S. (2001), Women's employment and care of children in the United States, in: Van der Lippe, T. and L. Van Dijk (eds.), *Women's employment in a comparative perspective*, Aldine de Gruyter, New York.

Ironmonger, D. (1996), Counting outputs, capital inputs and caring labour – Estimating gross household product, in: *Feminist Economics,* Vol. 2, 37-64.

Ironmonger, D. (2004), Bringing up Betty and Bob – The macro time dimensions of investment in the care and nurture of children, in: Folbre, N. and M. Bittman (eds.), *Family time – The social organization of care*, Routledge, London, 93-109.

Joesch, J.M. and K.C. Spiess (2006), European mothers' time spent looking after children – Differences and similarities across nine countries, in: *electronic International Journal of Time-Use Research*, Vol. 3, 1-27.

Jones, M. (2008), Measuring passive childcare in time use surveys – A comparison of international methodologies, in: *International Association for Time Use Research Conference*, Sydney.

Juster, F.T. and F.P. Stafford (1991), The allocation of time – Empirical findings, behavioural models and problems of measurement, in: *Journal of Economic Literature*, Vol. 29, 471-522.

Juster, F.T. (1985), The validity and quality of time use estimates obtained from recall diaries, in: Juster, F.T. and F.P. Stafford (eds.), *Time goods and well-being*, Institute for Social Research, Ann Arbour, 63-91.

Pollack, R.A. (1999), Notes on time use, in: *Monthly Labor Review*, Vol. 122, 7-11.

Robinson, J.P. (1985), The validity and reliability of diaries versus alternative time use measures, in: Juster, F.T. and F.P. Stafford (eds.), *Time goods and well-being*, Institute for Social Research, Ann Arbour, 33-62.

Schwartz, L. (2001), *Minding the children – Understanding how recall and conceptual interpretations influence responses to a time-use summary question*, The American Time Use Survey Division of Labor Force Statistics.

Schwartz, L. (2002), The American Time Use Survey – Cognitive pre-testing, in: *Monthly Labor Review*, Vol. 125(2), 34-44.

Varjonen, J. and K. Aalto (2006), *Household production and consumption in Finland 2001 – Household satellite account*, Statistics Finland and the National Consumer Research Centre, Helsinki.

Predictors of time famine among Finnish employees – Work, family or leisure?

Timo Anttila, Tomi Oinas and Jouko Nätti

Timo Anttila
Department of Social Sciences and Philosophy
University of Jyväskylä
FIN-40014 Finland
e-mail: antiei@yfi.jyu.fi

Tomi Oinas
Department of Social Sciences and Philosophy
University of Jyväskylä
FIN-40014 Finland
e-mail: toinas@yfi.jyu.fi

Jouko Nätti
Department of Social Research
University of Tampere
FIN-33014 Finland
e-mail: Jouko.Natti@uta.fi

Abstract

The recent survey data indicates that the time famine is a common experience among employees, while the data of time use indicates increased leisure time. Similarly, there are different views on the causes of time famine. Firstly, in working life research time famine is usually explained by increasing requirements of work life. Secondly, in gender studies time famine is considered to be a product of family obligations. Thirdly, some authors interpret time famine as a phenomenon relating to the intensification of leisure. The aim of the study was to examine the extent and causes of time famine among Finnish employees. The analysis was based on the Finnish Use of Time data (1999–2000) and focused on 15-64-year old employees (n=4866). The first aim of the study was to compare different measures of time famine. The descriptive analysis indicated that time famine was overrepresented among women and those who were aged between 25-54 years, who were well-educated, and had children at home. The second aim was to examine predictors of time famine. The predictors of time famine were classified in three groups: work, family, and leisure factors. The logistic regression analyses were conducted separately for men and women. The analysis focused on two indicators of time famine representing different dimensions. Lack of time indicated general time famine and being busy during the diary day indicated more day-specific situation. The two approaches to time famine – general and day-specific – raised different explanations. The general feeling of the lack of time was predicted all three predictor groups. Daily busyness was related strongly to work factors and only weakly to family obligations or leisure activities. Thus, time famine can be examined with different ways, which produce similar picture on the overrepresentation of it among women, well-educated and families with children. However, the predictors of time famine do vary depending on gender and how time famine is measured.

1   Introduction

Recently there has been a lively discussion concerning the increased experiences of time pressure and time famine, which can be considered as new social problems of post-industrial societies (Garhammer, 2002; Rosa, 2003). While the experience of time scarcity seems to be a common phenomenon – especially with regard to time devoted to family life – the time use studies show that the amount of time spent on free time activities and the time spent with the family have actually increased in the second half of the 20th century (Robinson and Godbey, 1999; Gershuny, 2000). Some researchers claim that when people feel time-pressured, it may be an illusion and a consequence of choice rather than a necessity (Goodin et al., 2005).

Time is popularly identified with "famine" and "squeeze" (Hochschild, 1997; Robinson and Godbey, 1999; Florida, 2002; Jarvis, 2005). Researches have used at least following concepts to describe the perception of lack of time: 'time famine' (Robinson and Godbey, 1999); 'time poverty' (Garhammer, 2002); 'feeling stressed' (van der Broek et al., 2004) and 'time stress' (Ruuskanen, 2004). Related phenomenon – intensification of time – is described by concepts: 'time-squeeze' (Clarkberg and Moen, 2001; Southerton, 2003); 'time pressure' (van der Lippe, 2003); 'time crunch' (McKenzie Leiper, 1998); 'feeling rushed' (Bittman and Wajcman, 2000) and 'harriedness' (Zuzanek et al., 1998; Southerton, 2003). In this study we use the concept of time famine as a broad concept to cover the various dimensions of the phenomenon.

1.1   The time famine – objective and subjective measurement

Time famine – as well as time – can be understood both as a quantitative and as a qualitative phenomenon. On the one hand, time famine can be explained by the quantitative nature of time, according to which the limited amount of time has to be allocated into different activities. On the other hand, according to cultural or psychological interpretations of time, we can assume that the perception of time (famine) is individual, and therefore a subjective perception of time famine is not in direct proportion to the objective time use of individuals (Moen, 2003).

In a similar way, the operationalisation of time famine can be based on either objective or subjective measurement (van der Broek et al., 2004). In the time use data approach, time famine is commonly measured by combining paid working time and unpaid homeworking and by looking at how many (or few) hours of free time there are left for people (van der Broek et al., 2004; Zuzanek et al., 1998; Goodin et al., 2005). With this objective measure, it is possible to examine the time structure of the actual time use.

The subjective assessment of perceived time famine is usually based on single questions concerning the feelings of hurriedness (van der Lippe, 2003; Gunthorpe and Lyons, 2004). The subjective definition of time famine includes the perception that there is not enough time

to do everything required (Gunthorpe and Lyons, 2004). According to Reeves and Szafran (1996), time famine illustrates the desire to spend either more or less time in certain activity. Clarkberg and Moen (2001) have combined the objective and subjective approaches by defining time famine as a difference between working time preferences and actual working hours; the bigger difference there is between preferred and actual hours, the greater is the time famine.

Van der Broek, Breedveld, de Haan, de Hart and Huysmans (2004) have compared objective (work, care, education commitments in hours per week) and subjective perception of time pressure (feeling 'stressed' on one or more days of the survey week) among Dutch population using Time Use Surveys. All in all, both women and men became busier during 15-year-period. In 2000, nearly half of the population reported that they had felt stressed on at least one day. The researchers found out that certain family position (parents with children), labour market position (working), task combination (paid work and care), educational level (tertiary), sex (female), and age (20–49 years) were linked to *subjective time pressure*. In respect of background characteristics, the *objective time pressure*, i.e. the level (hours per week) of time commitments, differed only slightly from the subjective time pressure. Despite the lower subjective time pressure, men faced a higher level of time commitments. Similarly, in respect of the level of education, the relationship between subjective and objective time pressure was not so clear-cut. Despite the fact that a higher proposition of highly educated reported feelings of stress during the survey week, the time use of the less educated group included more committed time, i.e. higher objective time pressure.

In addition to the expenditure of time in certain activities (household work, childcare, or leisure), the time-use researchers have also tried to assess the effects of the *contamination* of time (more than one activity at a time) and the *fragmentation* of time (changes in either the activity or the context in which that activity takes place) on time pressure. Bittman and Wajcman (2000) state that the contemporary view of increased time pressure may have more to do with the fragmentation than with any measurable reduction in primary leisure time. Women have less free time, and their free time is often contaminated by other activities or the presence of children. Moreover, women's free time is not as beneficial to them as men's in terms of reducing the feelings of time pressure. (Bittman and Wajcman, 2000; Mattingly and Bianchi, 2003).

1.2 Explanations of time famine

There are different views on the causes of time famine in research literature, which can be classified in three groups. Firstly, time famine is linked to increasing requirements of work life (Green, 2006) and to the fast technological and organisational changes (Castells, 1996; Sennet, 1998). Secondly, time famine has been seen as a consequence of unequally distributed family obligations (Hochchild, 1989; Gunthorpe and Lyons, 2004). Thirdly, some authors interpret time famine as a phenomenon relating to the increasing consumer expectations and

consequently changes in the density of leisure (Linder, 1970; Gershuny, 2005; Jarvis, 2005; Sullivan, 2007).

Wendy Gunthorpe and Kevin Lyons (2004) have studied the role of work and family-related factors in predicting chronic subjective time pressure (measured by the question:" How often do you feel rushed or pressed for time?") The tested variables were gender, age, marital status, labour force participation, worker status, occupation, industry of employment, hours worked per week, weekend work, family type, number of children, and the age of the youngest child. The analysis of these factors showed, firstly, that the time pressure affected the two genders differently, and secondly, time pressure reflected the time costs associated with work and family responsibilities. Some work-related factors and family characteristics were powerful predictors of time pressure. Especially, the number of weekly working hours, the presence of children, and the age of the youngest child were strongly linked to time pressure. The persons in the age group of 25–54 years, i.e. those in prime age in working life, were most exposed to chronic time pressure.

In Finland, the hectic work life is, at least partly, the legacy of the deep economic recession in the 1990s. According to working condition surveys, the perceptions of busyness increased notably in Finland during the period 1977–1997. Busyness was most common among women in the age groups of 25–45 years and in work places that had been objects of different productivity and efficiency programs. From 1997 to 2003 the perceptions of hurriedness slightly diminished; however, they stayed at a high level in female dominated occupations (Lehto and Sutela, 2005). Moreover, European Working Condition Surveys (Parent-Thirion et al., 2007) have shown an increasing trend of perceptions of busyness at work. Especially Finnish women suffer from the feelings of hurry. This could be explained by women's high level of education and a high proportion of full-time work.

In the Finnish full-time work culture (Anttila, 2005; Jacobs and Gerson, 2004) women are very likely to feel 'dual-burden' as a consequence of 'juggling' both paid employment and their role as a person in charge of the orchestration of family activities. Previous Finnish studies on households time use have shown that women spend more time in household work compared to men. In addition, women perform most of the household work internationally; a comparative study of ten EU countries found out that women perform approximately 60% of household work (Eurostat, 2004).

Besides work and family-related factors, time famine has also been explained by leisure activities. Following Linder's (1970) 'The Harried Leisure Class'-theme, Oriel Sullivan (2007; 2008) emphasises the connection between perceptions of time pressure and distinctive consumption practices. According to Linder, specialized work led to higher productivity and people gain greater access to (leisure) consumption. The greater outputs of work had to be balanced with the outputs from leisure. The harried leisure class would attempt to maximize time-yield in all areas of life, also leisure. This could be done by consuming higher quality goods, consuming faster or consuming simultaneously several goods. The result is that leisure

becomes 'less leisurely'. In order to create a link to the literature on 'harriedness', Sullivan (2007) introduced a measure of the 'pace' of leisure, which takes account both of the range and the weekly frequency of participation in out-of-home leisure activities (see also Sullivan and Katz-Gerro, 2007). Sullivan says that these kinds of out-of-home leisure activities express, "active leisure behaviours that take both time and money to engage in, and consequently provide a link to the socio-economic and time resources, which may be pertinent in the assessment of the socio-economic correlates of 'harriedness' in the late modern period".

2   Aims, data and methods

Aims

The aim of the study is to examine the extent and causes of time famine among Finnish employees.

The first aim of the study is to compare different measures of time famine. The extent of perceived time famine is studied by using four subjective and one objective indicator: feeling busy during the diary day, frequency of business, lack of time and the preference for shorter working hours, as well as one more objective measure of total working time (paid work, household work, and studies).

The second aim is to examine predictors of time famine. Based on earlier research our design includes three groups of explanatory factors: work characteristics, family obligations and out of home leisure activities. We expect that these factors have different effects on lack of time experiences and on day level busyness. The analysis focuses on two indicators of subjective time famine representing different dimensions. Lack of time indicates general time famine and being busy during the diary day indicates more day-specific situation. The logistic regression analyses are conducted separately for men and women.

Data

The analysis is based on the Finnish Use of Time data (1999–2000). The time use survey is an extensive interview survey in which the participants keep accurate diaries on their time use during the entire days. The survey examines the time used for work, household work, sleep, and leisure activities, as well as the location and the person with whom the time is spent. With the time use diary data, it is possible to study the rhythm and sequencing of daily activities, the occurrence of multiple simultaneous activities, the duration of specific activities, and the social context of activities (Gershuny and Sullivan, 1998). The last survey in 1999–2000 was a part of the Harmonised European Time Use Survey (HETUS), coordinated by Eurostat (and the University of Essex) and collected in 1999–2002 in most EU countries. These analyses focus on 15–64 year-old employees (n = 4,866 diary days). In addition analyses of predictors of time famine are limited to weekdays only (n = 2,435 diary days).

In the 1999–2000 survey, the data was collected from every member of the household who was over 10 years old. The data includes the use of time diaries (covering 10,561 days) and interviews (over 5,332 respondents, constituting over 3,000 households). The primary and secondary activities, as recorded by the respondents, were coded according to a 185-category activity classification. The interview data includes information about the main activity (employed, unemployed, studying, etc.), working hours (length, pattern), voluntary work, hobbies and health (altogether 111 questions). The response rate was 56% among the households and 52% among the individuals, and the data corresponds well to the original sample. In this paper we focus on the individual level data and use the information from both the daily time use diaries and the interview questions.

The Finnish Use of Time data was collected by using a complicated sampling design, as most time use surveys. The sampling design was a two-phase, single stage cluster sample, where households served as clusters and individuals were elementary units (Väisänen, 2002). Every respondent filled in a diary for two days (weekday and weekend day). Thus, the individual diaries within the family are intra-correlated like every individual's two diary days. Assuming that the sample was drawn by a simple random sample, it can result in the underestimation of variances when analyzing the data from complex samples. Therefore, for example the estimated standard errors of statistics are usually too small. If the complex sampling design is not accounted for and estimation done by assuming a simple random sample (with replacement), the obtained estimates are likely to be biased. (Pahkinen and Lehtonen, 2004; Landis et al., 1982) In order to account for complex sampling design in Finnish Use of Time data, a SPSS 15.0 add-on package complex samples was used in analysis. The package uses a Taylor Series Linearization method to develop corrected standard errors and confidence intervals for statistics.

Predictors of time famine

The work factors included contracted time i.e. daily work hours, working time arrangement, work-time autonomy and occupation. Contracted time includes short brakes and lunch hours during work days.

In this study, we conceptualized the work hours as having five dimensions: the number of hours worked (*duration*), when (*timing*) and where (*place*) the hours are worked, the degree of time autonomy individuals have over their working hours (*time autonomy*) and work-time intensity (*tempo*) (Adam, 1995; Noon and Blyton, 1997; Fagan, 2001). These dimensions are highly dependent of occupation or social class (Fagan, 2001). Time pressure or poverty is not only caused by the duration of work hours but also the timing and intensity of work hours are crucial factors (Warren, 2003).

Measures of family obligations included family situation and committed time i.e. housework hours. Committed time included household work, child care, shopping, services and repairs.

Following Oriel Sullivan's (2007) insightful analysis of cultural voraciousness as an indicator of the pace of life, we added to the analysis an interview variable, which describes a person's attendance to cultural activities. Cultural voraciousness or pace of leisure was constructed from variables on participation in cultural activities during the last 12 months. These activities included: movies, theatre, dance performance, concert, opera, art gallery or museum, other museum, library, and sports events. On each activity the extent of participation was classified in four categories: not attending at all in 12 months, attending at least once in last 12 months, attending at least once in last four weeks and attending several times in last four weeks. Index of cultural voraciousness was constructed by summing the frequency of participation in these activities.

Like Bittman and Wajcman, (2000) and Mattingly and Bianchi (2003) we presume that time famine is affected by the structure of time use, the frequency of secondary activities, and the fragmentation of time use. However, at least in the Finnish Use of Time data the measures of expenditure, fragmentation (length of the longest episode), and contamination (minutes with conjoint activity) had extremely high correlations with each other within each category of time use. This was due to the strong interconnectedness of these measures. These correlations were so high that they produced serious multicollinearity in the logistic regression analysis. Separate analyses were conducted in order to compare the effects of expenditure, contamination, and fragmentation of housework. These analyses revealed, that when controlling the total time spent in housework, the fragmentation and contamination of housework had only minor effects or no effect at all on busyness during the diary day. We therefore decided not to include the measures of contamination and fragmentation of housework in the analyses.

Methods of analysis

The analysis methods include descriptive analysis (the extent of time famine) and logistic regression (the predictors of time famine). Four different logistic regression analyses were conducted separately for men and women and for lack of time and daily hurriedness: the first model included only work factors, second model only family obligations, third model only pace of leisure and the last model included all factors simultaneously. This strategy allows us to compare the relative explanatory power of work factors, family obligations and pace of leisure before accounting for other factors. In addition, comparing results from first three models with last model allows for more refined explanation of the process by which various factors influence the time famine.

3   Results

3.1   Extent of time famine

The extent of time famine was studied by using four subjective and one objective indicator (Table 1). Firstly, day-specific business was measured by asking respondents if they were

busy or not during the diary day: third of the employees (34%) reported busyness. Secondly, more general feeling of business was examined by asking how often respondents felt busyness (continuously, every now and then or almost never): one out of four (28%) felt themselves busy continuously and two thirds every now and then.

Thirdly, those respondents who felt busy (continuously or every now and then) were asked if they had to give up things they would like to do on regular weekdays because of the lack of time: almost two thirds of employees (65%) respondent positively. Fourthly, almost a quarter (23%) reported that they preferred shorter working week compared to the current working week. In addition, a more objective measure of total working time (paid work, household work, studies) was constructed.

These analyses indicated that time famine was overrepresented among women, those in prime working age, who had children at home, among managers and professionals. In addition those who worked standard day work and who had flexible working hours experienced more time famine, but differences were small. Several of these work related factors were connected to occupational position i.e. daywork and flexible work hours were more common in high occupational positions.

3.2   Predictors of time famine

For a more reliable picture of actual causes of time famine we needed a multivariate approach. This was done by using logistic regression analysis. For the further analysis, two indicators representing different dimensions of time famine were selected; on the one hand the lack of time indicates general experience of time famine, on the other being busy during the diary day indicates more a day-specific situation. Analyses are limited to weekdays only. There are two reasons for this restriction. Firstly, the indicator of lack of time concerns only weekdays. Secondly, this restriction ensures that most of the respondents have been in paid work at diary day.

Lack of time

Tables 2 and 3 show the logistic regression analyses on the experiences of the lack of time for men and women respectively. The figures presented in Tables 2 to 5 are odds ratios.

The first step included work-related factors. Occupation was the only work-related factor having an effect on the lack of time for both sexes. The higher a position person had in the occupational hierarchy, the higher the risk of the lack of time experiences. For women also contracted time i.e. work hours increased lack of time experiences. Work factors explained for men and women six and five % of lack of time experiences respectively.

Table 1
Extent of time famine

	Busy during the diary day[1] (%)	Always busy[1] (%)	Lack of time[1] (%)	Prefers shorter work hours[1] (%)	Total work time[2] (mean)
Gender		*	**	**	
Male	33	27	61	20	490
Female	35	30	68	26	499
Age		***	***	***	***
15-24	30	24	59	11	436
25-34	31	31	70	18	490
35-44	36	32	70	27	517
45-54	35	27	59	28	501
55-64	34	21	57	21	484
Family situation	**	**	***	***	***
Unmarried, no children	27	26	56	11	446
Couple, no children	36	24	61	26	485
Couple, children	35	33	73	28	533
One adult, children	39	35	73	28	516
Occupation	*	***	***	*	*
Managers	42	43	76	28	527
Professionals	36	33	75	28	507
Technicians, experts	34	30	66	22	493
Clerks	34	27	65	20	490
Workers	30	22	53	21	484
Working time pattern	**	*		*	
Daytime work	35	30	66	24	498
Shift work	27	22	60	21	489
Other	31	26	64	17	471
Flexible working hours		**	***		
Yes	33	31	69	21	497
No	32	25	60	25	487
Total	34	28	65	23	494

[1] χ^2-test; [2] F-test; Note: *** Statistically significant at the 0.01 level, ** at the 0.05 level, and * at the 0.10 level. Model: Complex Samples Crosstabs and Descriptives procedures of SPSS 15.0 software are used to adjust statistical tests for complex sampling design
Source: Time Use Survey, Statistics Finland, 1999-2000.

Of family obligations only the family situation was connected to lack of time experiences (model 2). Compared to singles, both women and men with a spouse and children experienced more often lack of time. In addition, men who were single parents had approximately 2.6 times greater risk for the lack of time experiences than singles. This effect was however non-significant due to the small amount of observations in this group. Family factors explained for

men above four and for women circa two % of variation in lack of time experiences.

Table 2
Predictors of lack of time[1], men weekdays (odds ratios)

Variables	Model 1	Model 2	Model 3	Model 4
WORK FACTORS			-	-
Work time pattern (Daytime work = ref.)				
Shift work	1.296			1.262
Other	0.846			0.826
Working time autonomy (No = ref.)	1.438			1.405
Occupation (Workers = ref.)				
Managers	1.991 *			1.096
Professionals	2.389 ***			1.417
Technicians and associate professionals	1.798 *			1.376
Clerks	1.106			0.946
Contracted time (paid work minutes)	1.000			1.011
FAMILY OBLIGATIONS	-		-	
Family situation. (Unmarried, no children = ref.)				
Couple, no children		1.341		1.312
Couple with children		2.541 ***		2.445 ***
One adult with children		2.608		2.505
Committed time (housework min.)		0.984		1.015
PACE OF LEISURE	-	-		
Cultural voraciousness			0.188 **	1.170 ***
Nagelkerke R^2	0.060	0.043	0.085	0.145
Model significance	**	***	***	***
N	928	929	929	928

[1] Has to give up things one would like to do on regular weekdays because of the lack of time (yes, no)
Note: *** Statistically significant at the 0.01 level, ** at the 0.05 level, and * at the 0.10 level.
Model: Complex Samples Logistic Regression procedure of SPSS 15.0 software is used to adjust statistical tests for complex sampling design
Source: Time Use Survey, Statistics Finland, 1999-2000.

Third step included pace of leisure. Cultural voraciousness increased the likelihood of perceived lack of time for both men and women. This variable explained eight and four % of the variance in experiences of lack of time for men and women respectively.

Table 3
Predictors of lack of time[1], women weekdays (odds ratios)

Variables	Model 1	Model 2	Model 3	Model 4
WORK FACTORS		-	-	
Work time pattern (Daytime work = ref.)				
Shift work	0.859			0,882
Other	1,345			1,481
Working time autonomy (No=ref.)	1.156			1.069
Occupation (Workers = ref.)				
Managers	3.705 **			2.682 *
Professionals	2.360 ***			1.624 *
Technicians and associate professionals	1.433			1.201
Clerks	1.642 *			1.451
Contracted time (paid work minutes)	1.054 **			1.073 **
FAMILY OBLIGATIONS	-		-	
Family situation. (Unmarried, no children = ref.)				
Couple, no children		1.064		1.162
Couple with children		1.913 **		2.032 **
One adult with children		1.788		1.961
Committed time (housework min.)		0.968		1.032
PACE OF LEISURE	-	-		
Cultural voraciousness			1.121 ***	1.111 ***
Nagelkerke R^2	0.047	0.024	0.043	0.098
Model significance	***	**	***	***
N	1144	1144	1144	1144

[1] Has to give up things one would like to do on regular weekdays because of the lack of time (yes, no)
Note: *** Statistically significant at the 0.01 level, ** at the 0.05 level, and * at the 0.10 level.
Model: Complex Samples Logistic Regression procedure of SPSS 15.0 software is used to adjust statistical tests for complex sampling design
Source: Time Use Survey, Statistics Finland, 1999-2000.

The fourth model included all the three predictor groups. In the final model occupation lost its significance entirely for men and weakened greatly for women, when pace of leisure was added in the model. The fact that the effect of occupation diminished greatly when lifestyle differences were accounted for shows how easily the occupation can be misinterpreted as causing lack of time. The difference between sexes is caused by the fact that the overall level

of pace of leisure is higher for women. Contrary to occupation, coefficients and their significance stayed nearly the same for family situation when the effects of all other factors were accounted for. The full model explained 14% of lack of time experiences for men and 10% for women.

Results on the relative contribution of work factors, family obligations and pace of leisure reveal that all three predictor groups explained lack of time experiences. On the one hand, for men the pace of leisure and family situation predicted lack of time, for women also work related factors were significant. On the other hand, for men the model had greater explanatory power than for women.

Cultural voraciousness, which is used as a measure of the pace of leisure, had strong effect on the lack of time for both men and women. The more intensively a person attended various cultural activities i.e. the higher standards one had concerning free time, the more often they felt lack of time. It is plausible to assume that the experiences of lack of time are connected to higher lifestyle standards or expectations. These expectations are in turn connected to the socioeconomic status; the higher the status is, the higher are the demands. This explains why occupation had first a strong effect and why it diminished or disappeared when the lifestyle was controlled.

Busy during the diary day

Tables 4 and 5 show the logistic regression analysis on feeling busy on diary day for men and women respectively. The first step of analysis included again only work-related factors. For both sexes work hours was important factor explaining hurriedness.[1] Instead, occupation explained hurriedness only for men. For men the higher the occupational position the more likely were feelings of hurriedness, but for women occupation had no affect on hurriedness. These differences are probably the product of high occupational and sectored segregation by gender apparent in Finnish labour markets (Melkas, 1997). In addition, for both men and women working time arrangement also predicted hurriedness even when controlling for work hours and occupation. Those employees who worked shifts were less hurried than employees who worked standard daywork. Work factors explained as much as 20% and 19% of hurriedness for men and women respectively.

Both family situation and housework hours did affect the hurriedness for both sexes (model 2). The presence of children was clearly linked to increased hurriedness. Also married or cohabiting couples without children were more hurried than singles, irrespective of sex. Surprisingly, for both sexes the more housework hours a person did the less hurried he or she was. However, this effect is caused by the fact that housework hours reflect reversely the effect of

---

[1] To control for the distinction between full-time and part time employed separate analyses were done for only full-time employed men and women. The effect of paid work hours on busyness during diary day remained unchanged. Because of the small share of part-time workers in Finland and also in our dataset separate analyses for part-time employed was not feasible.

paid work hours on hurriedness if paid work hours are not controlled in the model. Family factors explained five and three % of day-level business for men and women respectively.

For men, also cultural voraciousness increased the likelihood of perceived daily busyness, but not for women. For men pace of leisure explained only two % of the variation in busyness on diary day.

In the final model work-related factors remained significant. Contracted time and higher occupational status increased and shift work decreased perceived daily busyness. On the contrary, the effects of family related factors changed dramatically when work factors and pace of leisure was controlled for. Family situation lost its significance for both sexes and the coefficient of housework hours changed its direction for women but lost its significance entirely for men. These changes were the result of controlling for work factors, especially work hours. Work hours were strongly and negatively correlated with housework hours, which explain why the coefficients changed directions. When controlling for work hours the increase in housework hours increased feelings of hurriedness for women, as it is plausible to expect. For men housework hours have no effect on hurriedness when work hours are controlled. Similarly, differences in hurriedness between persons in different family situation was clearly an spurious effect caused by differences in the amount of work hours.

The pace of leisure or cultural voraciousness had no effect for women and only a minor effect for men on busyness. This is reasonable, since day-specific hurriedness seems to be explained by day-specific factors. General lifestyle features and expectations do not affect at all or only slightly on the daily hurriedness. The overall model explained circa 20% of hurriedness for both sexes, of which work factors are responsible of almost all. This means that work hours are clearly the most important factors explaining day-level feelings of hurriedness. Family obligations or free time activities play only minor role in day-level busyness.

For both women and men, the day specific work hours thus had the strongest effects on the feeling of hurriedness. The more time is spent in paid work and also in housework for women, the more they are at a risk of feeling busy. The effect of paid work hours was slightly stronger for women. It is notable that these effects are strong when all other factors, such as family situation and occupation, are controlled.

Compared to the analysis on the lack of time experiences, there were no differences between men and women in the explanatory power of the models. In addition, compared to the lack of time experiences, the models explained considerably more variance of feelings of busyness during the diary day. Especially for women this difference was great, particularly when noted that the only significant effects, with working time patterns as an exception, were work and housework hours. This logically shows that the day-specific time use factors explain day-specific time famine.

Table 4
Predictors of busyness during the diary day[1], men weekdays (odds ratios)

Variables	Model 1	Model 2	Model 3	Model 4
WORK FACTORS		-	-	
Work time pattern (Daytime work = ref.)				
Shift work	0.473 **			0.472 **
Other	0.882			0.914
Working time autonomy (No=ref.)	0.777			0.775
Occupation (Workers = ref.)				
Managers	2.874 **			2.234 *
Professionals	1.991 **			1.653 *
Technicians and associate professionals	1.802 **			1.609 *
Clerks	1.297			1.137
Contracted time (paid work min.)	1.229 ***			1.254 ***
FAMILY OBLIGATIONS	-			
Family situation. (Unmarried, no children = ref.)				
Couple, no children		1.707 *		1.341
Couple with children		1.982 **		1.219
One adult with children		3.310		2.177
Committed time (housework min.)		0.843 ***		1.052
PACE OF LEISURE	-	-		
Cultural voraciousness			1.072 **	1.064 *
Nagelkerke R^2	0.196	0.049	0.016	0.209
Model significance	***	***	**	***
N	1046	1122	1048	1046

[1] Was respondent busy during diary day (yes, no); Note: *** Statistically significant at the 0.01 level, ** at the 0.05 level, and * at the 0.10 level. Model: Complex Samples Logistic Regression procedure of SPSS 15.0 software is used to adjust statistical tests for complex sampling design

Source: Time Use Survey, Statistics Finland, 1999-2000.

Table 5
Predictors of busyness during the diary day[1], women weekdays (odds ratios)

Variables	Model 1	Model 2	Model 3	Model 4
WORK FACTORS		-	-	
Work time pattern (Daytime work = ref.)				
Shift work	0.663 *			0.642 *
Other	1.043			1.102
Working time autonomy (No = ref.)	0.807			0.808
Occupation (Workers = ref.)				
Managers	0.837			0.832
Professionals	0.867			0.839
Technicians and associate professionals	0.875			0.851
Clerks	0.930			0.949
Contracted time (paid work minutes)	1.257 ***			1.333 ***
FAMILY OBLIGATIONS	-		-	
Family situation. (Unmarried, no children = ref.)				
Couple, no children		1.551 *		1.088
Couple with children		1.724 **		1.009
One adult with children		1.946 *		1.220
Committed time (housework min.)		0.885 ***		1.148 ***
PACE OF LEISURE	-	-		
Cultural voraciousness			0.988	1.004
Nagelkerke R^2	0.187	0.033	0.001	0.205
Model significance	***	***		***
N	1232	1248	1232	1232

[1] Was respondent busy during diary day (yes, no); Note: *** Statistically significant at the 0.01 level, ** at the 0.05 level, and * at the 0.10 level. Model: Complex Samples Logistic Regression procedure of SPSS 15.0 software is used to adjust statistical tests for complex sampling design
Source: Time Use Survey, Statistics Finland, 1999-2000.

We can see clear differences in factors that explain on the other hand general feeling of lack of time and again day-level feelings of hurriedness. This finding is in line with our presupposition that day-specific factors should have more influence of day-specific feeling on busyness, and that background factors concerning the family situation and lifestyle should have a greater effect on the more abstract feeling of the lack of time.

4   Discussion

The aim of the study was to examine the extent and causes of time famine among Finnish employees. The extent of time famine was studied by combining both objective and subjective perspectives. On the one hand, following earlier studies (see van der Broek et al., 2004; Zuzanek et al., 1998), we examined the time structure of actual (objective) time use. The subjective assessment of perceived time famine was, on the other hand, based on single questions concerning the feelings of general lack of time, the diary day specific feelings of business, frequency of perceived busyness and the preference for shorter working hours (see van der Lippe, 2003; Gunthorpe and Lyons, 2004).

Time famine was a relatively common experience among wage earners. The descriptive analysis indicated that time famine was overrepresented among women, well-educated and those who had children at home. Thus, the results of the current study are in line with those of previous studies (van der Broek et al., 2004; Gunthorpe and Lyons, 2004). In addition, a more objective measure of total working time (paid work, household work, studies) was constructed. In Finland, as in many OECD countries (see Bittman and Wajcman, 2000), total working time was very similar between women and men.

Predictors of time famine were examined separately for general and day-specific busyness raising different explanations. The general feeling of the lack of time was predicted all three predictor groups, although there were interesting gender differences. For men the pace of leisure and family situation predicted lack of time, for women also work related factors were significant when controlling other factors. In bivariate analysis high occupational status was the best work-related predictor of the lack of time. However, this effect diminished for women and disappeared for men when family obligations and the pace of leisure were controlled. This was in line with earlier studies. Gunthorpe and Lyons (2004) state that the occupation is probably not sufficiently sensitive to measure a range of factors that correlate with perceptions of time pressure at work, such as productivity-driven appraisals and controls in the workplace. Second reason could be that occupation in and of itself is not predictive of chronic time pressure, but instead interacts with other factors such as hours of work and family responsibilities to predispose a person to feeling more time pressured (Gunthorpe and Lyons, 2004).

The higher overall level of pace of leisure for women explains why the effect of occupation only diminished for women and disappeared totally for men. The results indicate that general feeling of lack of time is not necessarily associated with occupation per se, but with expectations and standards concerning lifestyle. These expectations and standards are in turn connected to socioeconomic status; the higher the status, the higher the standards. Occupation is one of the crucial elements of socioeconomic status in addition to education and income. This interconnectedness created a seemingly strong association between lack of time and occupation, which was obviously a reflection of lifestyle.

In contrast to general lack of time, daily busyness was related strongly to work factors and only weakly to family obligations or leisure activities. For men the high occupational status, work hours and working time arrangement predicted perceptions of business, while unexpectedly among women the occupational position did not have any effect. For both men and women, shift work decreased the risk of feeling busy during the diary day compared to those who had a standard day work. Also the more hours men and women spend in paid work the more likely they felt busy. In addition, the amount of housework predicted daily business among women.

Thus, occupational status seems to have different role in predicting general or day-specific business among women and men. Among women, occupational status predicts general lack of time; among men, occupational status predicts day-specific busyness.

This is doubtless the product of both clear occupational and sector segregation by gender in Finnish labour markets.

During this decade hurriedness has been seen as one of the indicators that distinguished the people of higher status from the people with lower status: being busy is a symbol of full and valued life, a badge of honour. Thus those in high status occupations tend to overestimate their busyness in order to emphasize their status. (Gershuny, 2005). This phenomenon can partially explain the results that high occupational position increases the experiences of time famine among men.

All in all, the two approaches to time famine, general and day-specific, raised different explanations. The general feeling of the lack of time, i.e. perceptions that one has to give up of some things because of the lack of time, was predicted by all three predictor groups, although there were interesting gender differences. The time famine was thus connected to work, family and leisure related factors and should therefore be interpreted as a consequence of both choice and necessity (see Goodin et al., 2005).

In line with the view that women are more likely to experience 'dual-burden' than men, our results showed that there were some differences between sexes in effects of paid work hours on feelings of lack of time. Paid work hours predicted time famine only among women. This is probably caused by the fact that the overall level of paid work hours is clearly higher for men.

The view that voracious culture consuming produce time famine was supported. Pace of leisure predicted general lack of time both among women and men. In addition, cultural voraciousness also predicted daily busyness among men, but not among women. Moreover, the previously found differences between occupational groups or social strata in time famine are at least partly the result of occupational differences in work demands and lifestyle. High levels of status and cultural capital are known to be highly associated with cultural omnivorousness and voraciousness (Sullivan, 2007; 2008).

References

Adam, B. (1995), *Timewatch – The social analysis of time*, Polity Press, Oxford.

Anttila, T. (2005), *Reduced working hours – Reshaping the duration, timing and tempo of work*, Jyväskylä Studies in Education, Psychology and Social Research, No. 258, University of Jyväskylä, Jyväskylä.

Bittman, M. and J. Wajcman (2000), The rush hour – The character of leisure time and gender equity, in: *Social Forces*, Vol. 79, 165-189.

van der Broek, A., Breedveld, K., de Haan, J., de Hart, J. and F. Huysmans (2004), *Trends in time – The use and organization of time in the Netherlands, 1975–2000,* The Hague: Social and Cultural Planning Office.

Castells, M. (1996), *The rise of the network society – The information age, economy, society and culture*, Vol. 1, Blackwell Publishing, Oxford.

Clarkberg, M. and P. Moen (2001), Understanding the time-squeeze, in: *American Behavioral Scientist*, Vol. 44, 1115–1136.

Eurostat (2004), *How Europeans spend their time – Everyday life of women and men, 1998 – 2002,* Office for Official Publications of the European Communities, Luxembourg.

Fagan, C. (2001), The temporal reorganisation of employment and the household rhythm of work schedules, in: *American Behavioral Scientist*, Vol. 44, 1199-1212.

Florida, R. (2002), *The rise of the creative class - And how it's transforming work, leisure and everyday life*, Basic Books, New York.

Garhammer, M. (2002), Pace of life and enjoyment of life, in: *Journal of Happiness Studies*, Vol. 3, 217–256.

Gershuny, J. and O. Sullivan (1998), The sociological uses of time-use diary analysis, in: *European Sociological Review*, Vol. 14, 69–85.

Gershuny, J. (2000), *Changing times, work and leisure in postindustrial society*, Oxford University Press, Oxford and New York.

Gershuny, J. (2005), Busyness as the badge of honour for the new superordinate working class, in*: Social Research,* Vol. 72, 287–314.

Goodin, E.R., Rice, J.M., Bittman, M. and P. Saunders (2005), The time-pressure illusion – Discretionary time vs. free time, in: *Social Indicators Research*, Vol. 73, 43-70.

Green, F. (2006), *Demanding work – The paradox of job quality in the affluent economy*, Princeton University Press, Princeton and Oxford.

Gunthorpe, W. and K. Lyons (2004), A predictive model of chronic time pressure in the Australian population – Implications for leisure research, in: *Leisure sciences*, Vol. 26, 201–213.

Hochschild, A. (1989), *The second shift – Working parents and the revolution at home*, University of California Press, Berkeley, CA.

Hochschild, A. (1997), *The time bind – When work becomes home and home becomes work*, Metropolitan Books, New York.

Jacobs, J. and K. Gerson (2004), *The time divide – Work, family and gender inequality*, Harvard University Press, Cambridge, MA.

Jarvis, H. (2005), Moving to London time – Household co-ordination and the infrastructure of everyday life, in: *Time & Society*, Vol. 14, 133–154.

Landis, R.J., Lepkowski, J.M., Eklund, S.A. and S.A. Stehouwer (1982), A Statistical methodology for analyzing data from a complex survey – The first national health and nutrition examination survey, in: *Vital and Health Statistics*, Vol. 92, 82–1366.

Lehto, A.-M. and H. Sutela (2005), *Threats and opportunities – Findings of Finnish quality of work life surveys 1977–2003*, Statistics Finland, Helsinki.

Pahkinen, E. and R. Lehtonen (2004), *Practical methods for design and analysis of complex surveys*, 2nd ed., Wiley, Chichester.

Linder, S. (1970), *The harried leisure class*, Columbia University Press, New York.

van der Lippe, T. (2003), *Time pressure of Dutch employees*, paper presented at the 25th IATUR Conference, Brussels, www.vub.ac.be/TOR/iatur/abstracts/doc/paper-42.ppt.

Mattingly, M. and S. Bianchi (2003), Gender differences in the quantity and quality of free time – The U.S.experience, in: *Social Forces*, Vol. 81, 999–1030.

McKenzie Leiper, J. (1998), Women lawyers and their working arrangements – Time crunch, stress and career, in: *Canadian Journal of Law and Society*, Vol. 13, 117-134.

Melkas, H. (1997), Occupational segregation by sex in nordic countries – An empirical investigation, in: *International Labour Review*, Vol. 136, 341-364.

Moen, P. (2003), *It's about time, couples and careers*, Cornell University Press, Ithaca and London.

Noon, M. and P. Blyton (1997), *The realities of work*, Macmillan, Basingstoke.

Reeves, J.B. and R.F. Szafran (1996), For what and for whom do you need more time?, in: *Time & Society*, Vol. 5, 237–251.

Parent-Thirion, A., Fernández Macías, E., Hurley, J. and G. Vermeylen (2007), *Fourth European Working Conditions Survey,* European Foundation for the Improvement of Living and Working Conditions, Dublin.

Robinson, J.P. and G. Godbey (1999), *Time for life – The surprising ways Americans use their time*, The Pennsylvania State University Press, University Park, Penn.

Rosa, H. (2003), Social acceleration – Ethical and political consequences of a desynchronised high-speed society, in: *Constellations*, Vol. 10, 3–33.

Ruuskanen, O.-P. (2004), *An econometric analysis of time use in Finnish households*, Acta Universistatis Oeconomimicae Helsingiensis A-245, Helsinki School of Economics, Helsinki.

Sennet, R. (1998), *The corrosion of character – The personal consequences of work in the new capitalism*, W.W. Norton & Company, New York & London.

Southerton, D. (2003), Squeezing time – Allocating practices, coordinating networks and scheduling society, in: *Time & Society*, Vol. 12, 5–25.

Sullivan, O. (2007), Cultural voraciousness – A new measure of the pace of leisure in a context of 'harriedness', in*: electronic International Journal of Time Use Research*, Vol. 4, 30–46.

Sullivan, O. (2008), Busyness, status distinction and consumption strategies of the income rich, time poor, in: *Time & Society*, Vol. 17, 5–26.

Sullivan, O. and T. Katz-Gerro (2007), The Omnivore Thesis revisited – Voracious cultural consumers, in: *European Sociological Review*, Vol. 23, 123–137.

Warren, T. (2003), Class- and gender-based working time? – Time poverty and the division of domestic labour, in*: Sociology*, Vol. 37, 733–752.

Väisänen, P. (2002), *Estimation procedure of the Finnish time use survey 1999-2000*, Paper presented at the 24th IATUR Conference, Lisbon, https://www.testh2.scb.se/tus/tus/doc/Vaisanen_IATUR02paper.pdf.

Zuzanek, J., Beckers, T. and P. Peters (1998), The 'harried leisure class' revisited – Dutch and Canadian trends in the use of time from the 1970s to the 1990s, in: *Leisure Studies*, Vol. 17, 1–19.

Terms of marriage and time-use patterns of young wives – Evidence from rural Bangladesh

Sajeda Amin and Luciana Suran

Sajeda Amin
Population Council
One Dag Hammarskjold Plaza
New York, NY 10017, USA
e-mail: samin@popcouncil.org

Luciana Suran
Population Council
One Dag Hammarskjold Plaza
New York, NY 10017, USA
e-mail: lsuran@tortowheatonresearch.com

Abstract

This paper explores the relationship between marriage arrangements and daily activities of young married women, using detailed time-use data from an adolescent study in rural Bangladesh. Measures of marriage arrangement are payment of dowry and the relative wealth status of natal and marital families. The data were collected in three rural districts in 2001 and 2003. Using multivariate regression analysis, the results show that women's time spent in domestic work, socializing, and self-care is significantly associated with marriage arrangement variables. Those who paid dowry spent more time in domestic work and less time in self-care relative to those who did not pay dowry. These patterns of association are similar to those the authors found in an earlier study between marriage arrangements and domestic violence, where paying dowry and marrying up are associated with greater violence. This paper contributes evidence regarding the non-market determinants of women's time use patterns and highlights the contribution of marriage-related decisions to women's well-being.

JEL-Codes: D1, J22, J16, J12

Keywords: Marriage, time use, Bangladesh, gender, leisure, work

1   Introduction

Families in rural Bangladesh invest heavily in the marriages of daughters as a way of ensuring their daughters' well-being. Making a good match often receives priority over a good education or investments in human capital that would lead to success in the labour market (Mahmud and Amin, 2006). A good marriage is the outcome of many factors besides education – family wealth, good reputation, good connections, and the availability of suitable grooms and funds for dowry (Amin and Cain, 1997). This paper follows on earlier work by the authors to explore how well these marriage investments deliver on the promise of a good life for young women after marriage.

Contrary to expectations of the bride's family that dowry (marriage payment made to the groom and his family by the bride's family) will ensure better treatment of girls in marriage, Suran et al. (2004) found that the payment of dowry is associated with an increased likelihood of domestic violence in the early years of marriage. They found the relationship to be non-linear: while it is true that among those who pay dowry, more dowry is associated with less violence, marriages that take place with no dowry are associated with less violence than those that involved the highest dowries.

By exploring a detailed data source on young women's time-use patterns in conjunction with detailed data collected on their marriage arrangements, we shed light on the more general relationship between marriage arrangements and marital well-being. We analyse time-use data based on 24-hour recall to determine the amount of time spent in domestic work, self-care, productive work and social time in relation to marriage variables and other background variables. Our objective is to understand the implications of marriage decisions for the day-to-day lives of young married women. If dowry is indeed a way to ensure a daughter's well-being in her marital home, as many families assume (Amin and Huq, 2008), then more dowry should be associated with more social time, less work, and more rest. Hypergamy, or marrying a groom from a wealthier family, would produce similar outcomes. Because a groom from a better-off family is more desirable, all else being equal, hypergamy is associated with greater dowry paid (Rao, 1993).

2   Theoretical background

There are relatively few examples of detailed analysis of time-use data in developing-country settings. One comprehensive review of available time-use studies (Ilahi, 2000) concludes that such data are particularly important for understanding dynamics when nonmarket economic activities are significant determinants of well-being. In many parts of the world women's childrearing and domestic activities fall into this category. Studies of time use that focus on

the length of the workday find substantial differences in time-use patterns by age, gender and socioeconomic status (Cain, 1977; Cain et al. 1979). Time-use studies have been crucial in understanding gender differences in work patterns and women's domestic responsibilities and in explaining gender differences in labour market participation across societies. For example, comparisons across four rural communities in South Asia documented significant variation in women's involvement in agricultural work and showed substantial domestic work burdens for women in all communities (Jain, 1985).

Much of this analysis of time use focuses on productive work, with all forms of leisure as a residual category. Larson and Verma's (1999) review of time-use literature points to the importance of studying patterns of leisure time as it relates to more productive outcomes – for example, the consequences of time spent in organized sports and with friends for outcomes such as school performance. These issues primarily pertain to unmarried adolescents. While this literature suggests that it is important to explore the finer points of leisure time and its nature, it offers little by way of understanding leisure as an indicator of quality of life per se or what the implications may be for married adolescents.

Examining variations in the nature of time use as a reflection of status is a major preoccupation of leisure studies (Katz-Gerro, 2002, 2004). Gender differences in leisure time are also analysed to understand differences between men's and women's patterns of cultural consumption and time spent in sports in addition to status attainment generally (Jackson and Henderson, 1994).

The promise of comparing time use among women with different life experiences as a quality-of-life measure, specifically as an indicator of empowerment, finds support in the women's status literature (Basu and Koolwal, 2005). Analysts increasingly recognize that status has multiple dimensions. Although it is common to measure status using knowledge and attitude variables related to contributions to the household and other forms of altruistic behaviour or behaviours that make women more productive or functionally useful, it is not widely recognized that taking care of women's own needs may have important implications for women's status as well. It has been argued to be particularly important as a determinant of their health (Agarwal, 1997). Basu and Koolwal (2005) argue that self-indulgence, the ability to act in ways that serve women's own needs, has particular benefits for women's well-being. Using activity prompts that indicate such leisure activities as reading the paper, listening to the radio and watching television, they find these variables to be associated with better health outcomes. They find that self-indulgent variables – which they also label 'unproductive freedoms' – stand in sharp contrast in their association with women's own health status to variables that indicated women's responsible behaviour towards others. They interpret these associations not as causal but rather as related to factors such as good status in the household and control over resources that lead to more self-indulgent behaviours on the one hand and better health on the other.

We explore correlates of time spent in two types of self-indulgence – social time and self-care – in addition to productive and domestic work, as measures of the post-marriage domestic

environment. Our measure of social time includes visiting friends and relatives and captures some aspects of social networking and freedom of movement. Our experience in rural Bangladesh, particularly our observations of the severely circumscribed lives of young, married women, does not lead us to expect much variability in this measure across a sample of recently married women. Rather we focus on activities that we label self-care, including time spent resting (whether sick or otherwise, but not sleeping), bathing and grooming. In the way we categorize our data, self-care is leisure time that is spent alone and some aspects of it such as personal grooming may be interpreted as culturally sanctioned leisure activity that has connotations of self-indulgence.

When a young bride first enters her marital home, the restrictions on her social interactions increase even as her social networks shrink to little more than her immediate family members. She is expected to spend her time learning her new roles in running the household and doing her share of domestic activities. It is generally considered inappropriate for a young bride to talk, play or socialize with neighbors. However, a caring husband or mother-in-law might indulge a young bride by allowing her extra time to rest or groom herself. These indulgences are indicated by family members buying her hair oil and fragrant soap or cosmetics. Even among women who are thus indulged by family members, however, whether a new bride actually spends time grooming herself, we hypothesize, depends on the extent to which she is confident about her status in the marital household and reasonably assured that such behaviours will not reflect poorly on her upbringing and be frowned upon.

3 Methods and material

As part of a project on adolescent livelihoods[1], survey data were collected in 2001 and 2003 from female adolescents aged 13-21 who were chosen randomly from 90 villages in three districts of rural Bangladesh. In 2001, 2,386 female adolescents were contacted successfully and completed the initial interviews. During a follow-up survey conducted from January to June 2003, 2,214 of the original female respondents were contacted and re-interviewed. .[2]

Detailed time-use data were collected as part of the questionnaire, which included information on individual and family variables. Time-use diaries were constructed for the day prior to the

---

[1] The project, entitled Kishori Abhijan (Adolescent Girls' Adventure), was a UNICEF-funded initiative on adolescent livelihoods implemented by two development NGOs, the Bangladesh Rural Advancement Committee (BRAC) and the Centre for Mass Education in Science (CMES), in three districts of rural Bangladesh. The Bangladesh Institute of Development Studies, in collaboration with the Population Council, conducted a two-and-a-half-year investigation to document the implementation and results of the project. Kishori Abhijan enrolled fewer than 20 per cent of the survey respondents because the survey was meant to be a representative sample of adolescents generally and not just of adolescents in the livelihood program. The majority of married respondents did not participate in Kishori Abhijan.

[2] 584 of the 2,386 respondents with whom follow-up interviews were attempted had migrated, mostly owing to marriage. Interviewers were able to re-interview 476 of these respondents because they had relocated elsewhere within the same district.

interview using a sequential recall of activities. Beginning by recording the time at which the respondent woke up, the interviewer marked off and recorded activities in an open-ended manner on a time grid. The interviewer asked and recorded whether the activity was conducted while taking care of a child. If a respondent reported doing two or more activity at the same time, a follow-up question determined how much effort was devoted to each and time was allocated proportionately. Sixty-eight types of activity were later classified into productive work, domestic work, self-care, social time and sleep. Interviewers recorded the starting and ending time of each activity, and this information was later converted into hours and minutes.

We limited our sample to currently married women (N = 1,278). Time-use data were taken from the 2003 survey, while data on background characteristics such as marriage, education and parental characteristics were first collected in 2001 and updated, when relevant, in 2003. The questionnaire also included detailed information concerning the circumstances surrounding marriage, including dowry, marriage timing and the characteristics of husbands' and natal families.

The regression results are interpreted only in associational rather than causal terms. We present regression results from models in which the proportion of time spent in different time-use categories is represented. We compared these results with those of Tobit models where the total amount of time rather than the proportion of time was estimated. The two methods yielded identical results in terms of the signs and significance of coefficients.

We realize that factors unobserved in the data may determine both marriage arrangements and time-use patterns. Qualitative data from a study in northern Rajshahi suggest that factors such as a compromised family situation, bad reputation, volatile temper or disability may result in a deleterious marriage arrangement with negative consequences for women's well-being after marriage (Amin and Huq, 2008). To test for the existence of such a selection effect, we estimated a Heckman selection model. The selection equation reflected whether dowry was paid and the explanatory variables were age at marriage, wealth of bride's household and bride's education. The likelihood ratio test for independence of the two equations (selection equation and time use) revealed that the two equations were independent.

In light of this result, we are justified in estimating only the time-use equation and including dowry payments as an explanatory variable. It is nevertheless important to understand differences between dowry payers and non-payers to better interpret the results on dowry. These are discussed in the following section.

4 Results

Table 1 contains data on the variables used in the analysis. Since the original sample was adolescents aged 13 – 21 in 2001, the study is limited to young married women. The mean age of the respondents was 20.4 years in 2003. The mean age at marriage of these married respon-

dents is 15.3 years (data not shown), and more than 75% of respondents had ever attended school, for an average of 4.7 years of schooling. Three-fourths of marriages involved a dowry payment, which averaged about 9,849 taka[3]. On average, the respondents have 1.2 children. The regional distribution of this sample of married women is influenced by the age patterns of marriage. Since age at marriage is generally later in Chittagong district, a lower proportion of the sample is from that district compared to the two other districts. The districts differ in other ways and these differences are discussed later in the paper.

Poverty status and relative wealth of natal and marital families are of interest in this analysis. Wealth status of natal and marital families is a composite measure calculated from a list of possessions. These are dummy indicators for whether the household owns a radio, television, bed, quilt/ blanket, chairs/ table, power tiller, shallow machine (pump), rice mill, rickshaw /van, bicycle, motor bike, dhenki (manual rice thresher), cattle, goats and electricity in the house. All households in the sample are ranked by where they fall in terms of this possessions index. Wealth inequality between natal and marital families of the respondent is a variable of interest in the analysis and is constructed by comparing the relative ranking of natal and marital family. While this measure allows us to rank households, because the distribution of the score is not smooth but lumped on certain numbers, it does not capture the degree of difference between households well. The majority (40%) of marriages were between families of similar status and approximately 34% and 26% of respondents married up and down respectively.

Dowry is also introduced as a relative rather than an absolute measure and is adjusted for inflation using the price of rice as a deflator (for justification of the choice of deflator see Amin and Cain (1997)). Five categories of dowry payments have been defined, with no dowry used as the reference category. Among those who paid dowry, respondents were categorized into relative dowry quartiles within their district. Dowry is measured as a district-specific variable because marriage markets and practices are local and the overall level of dowry varied considerably from district to district.

Table 2 shows some salient characteristics of dowry payers and non-payers. There are no apparent differences in terms of age, number of children and relative wealth status between dowry payers and non-payers. However, in general those who do not pay dowry appear to be from a higher economic status and they are also more likely to be married into households of high economic status. Those who do not pay dowry are also more likely to be married to men in high status non-agricultural occupations. Dowry payers are less likely to be educated whether education is measured in terms of the respondent's own education or her mother's, her husband's or her father's education. Our hypothesis is that not paying dowry has come to symbolize a stronger bargaining position for women in the marriage market. Their status may derive from education, wealth or from other characteristics not captured in the data such as religiosity or family name.

---

[3]   1 US$ = 59 Bangladeshi taka in 2005

Table 1
Distribution of dependent variables, married adolescent women,
Kishori Abhijan Survey, Bangladesh, 2001 and 2003

Variables	Variable type	Mean
Age (years)	Continuous	20.4
Years of education	Continuous	4.7
% paid dowry at marriage	Binary*	74.4
Mean inflation-adjusted dowry (Taka)	Continuous	9,849
% with children	Binary*	75.9
Number of children	Continuous	1.2
Husband is in Business or Salaried Employment		35.6
% randomly sampled[a]	Binary	87
District	Categorical	
% from Chapainawabganj		44.9
% from Chittagong		15.7
% from Sherpur		39.4
Relative wealth of wife's and husband's family (%)		
Wife = husband		40.5
Wife <husband		33.8
Wife > husband		25.7
Natal Family's Relative Wealth Ranking		
Highest Quartile		22.0
3rd Quartile		24.6
2nd Quartile		33.0
Lowest Quartile		20.5
Husband's Family's Relative Wealth Ranking		
Highest Quartile		26.7
3rd Quartile		24.6
2nd Quartile		31.6
Lowest Quartile		17.1

* Not included in model – shown for descriptive purposes only; To ensure that enough respondents would join a program, researchers purposively sampled girls who were thought to be more likely to join (i.e., younger girls with parents who had a history of involvement in NGOs), representing 13% of the current sample after allowing for missing information. To control for bias associated with this non-random selection in a subset of the sample, a binary variable equaling 1 if the respondent was randomly sampled and 0 otherwise was entered in all models.

Source: Authors' calculation, Kishori Abhijan Surveys, 2001 and 2003.

Such status may translate into assumptions that grooms will benefit from a marriage alliance in kind rather than cash and therefore grooms and their families are likely to demand and receive less "up front" at marriage. These supportive factors may not allow women to do many radically liberated things but may allow them to indulge in taking care of themselves better. In addition, paying a dowry may also have direct implications for quality of life in the initial years of marriage. Paying a dowry may compromise a woman's bargaining position after mar-

riage. It is likely that the fact of paying a dowry is interpreted as a measure of her inferior qualities so that the groom requires compensation for marrying her. This may then set wives on a path of poor treatment in the husband's family, leading to a heavy work burden and less time for self-care. From our conversations with parents we got the sense that for most poor households not paying or marrying for choice were not in their realm of possibilities. They appeared to operate under the assumption that paying dowry and more of it to the extent they could afford it, would be a marginally better decision. The possibility that the motives of grooms who demand dowry and drive a hard bargain may be suspect is not a common perspective for the poor. However, it is also clear that these choices are only one of the many inferior choices that are forced upon women by poverty.

Table 2
The characteristics of dowry payers and non-payers

Variables	Mean/Proportion Dowry Payers	Mean/Proportion Dowry Non-payers
Age of respondent in years	20.33	20.50
Average number of children borne by woman	1.21	1.21
Proportion of marriages where		
Wife and husband equal status	0.41	0.39
Wife is wealthier	0.25	0.29
Husband is wealthier	0.34	0.32
Husband has a high status nonagricultural occupation	0.32	0.45
Average proportion of marriages with dowry in division		
Chapainawabganj	0.40	0.63
Sherpur	0.41	0.27
Chittagong	0.19	0.11
Natal family's wealth quartile		
Highest quartile	0.19	0.29
Third quartile	0.23	0.29
Second quartile	0.33	0.32
Lowest quartile	0.24	0.10
Husband's family wealth quartile		
Highest quartile	0.25	0.33
Third quartile	0.23	0.28
Second quartile	0.32	0.30
Lowest quartile	0.20	0.09
Average years of education of respondent	4.30	5.71
Father has more than primary education	0.27	0.33
Mother has more than primary education	0.13	0.19
Husband has more than primary education	0.43	0.58

Source: Authors' calculation, Kishori Abhijan Surveys, 2001 and 2003.

We ran multivariate regressions using per cent of time spent in the various activity categories as the dependent variable. Measuring childcare is difficult particularly when it is not exclusive or for pay and is provided by a caregiver who looks after a child while doing other activities throughout the day. Most women do not report childcare as a simultaneous activity with cooking or cleaning, which might take precedence in reporting. Our measure is more likely to identify episodes such as bathing and feeding a child when it is being done as an exclusive or a primary activity. Aspects of childcare that are underreported are watching the child or supervising schoolwork or play.

Before presenting our results, we mention several caveats. Most importantly, although we use causal models, we acknowledge that many of the behaviours we consider are determined by common factors. The same factors that determine marriage arrangements may also determine time use. Our purpose is not to suggest causal models but to demonstrate how variables are grouped together to form patterns. Second, although the sample is drawn from a cohort of women twenty-three years or younger, we expect this to be a relatively small bias given the very early age at marriage in Bangladesh and the high proportions of girls who are married by the age of nineteen. The five categories of time use examined are domestic work, productive work, self-care, social time and sleep[4]. The list of activities included in the first four categories appears in Appendix 1. All respondents reported some time spent in sleep, self-care and domestic work. Only 72% reported activities that we classify as socializing, and 40% reported activities that we classify as productive work (data not shown)[5].

Table 3 shows the distribution of the dependent variable. On average women in the sample spent 7% of their time in productive work, 21% in self-care, 28% in domestic chores and 6% in social time/ leisure. The remaining 38% was spent sleeping. Since few women work outside the home and many households are engaged in subsistence farming in the study areas, the category of productive work comprises mostly home-based agricultural processing activities and animal care. As a result the lines of distinction between domestic work and productive work are somewhat blurred. Cash-earning opportunities in high-status jobs are rare in the study population since it is unusual for young married women to engage in such work.

Table 4 shows coefficients associated with covariates of time spent in four activity categories from multivariate regression analysis. The dependent variables are the percentage of total time in spent in domestic work, productive work, self-care and social time/ leisure activities during

---

[4]   The respondent was asked to report all activities she engaged in within the twenty-four hours preceding the interview beginning with time of waking and ending with time the respondent went to sleep. Sleep time was derived as the remainder. After this listing was completed, she was asked whether a child was in her care during the activities reported. For example, a woman could report childcare during sleep. In fact, a substantial percentage of respondents reported performing childcare during sleep in both 2001 (40 per cent) and 2003 (48 per cent). Another possibility is that mothers who did not report childcare during sleep may have had relatives or other persons living in the household who also take care of children.

[5]   Given that many activities in a woman's life are related to subsistence, we used our knowledge of the local economy and previous analyses of time use in rural Bangladesh conducted by Cain (1977), Amin (1997), and others to classify particular tasks around the house as productive. Tasks that are not directly remunerative may nevertheless be classified as such, if they represent a cost-saving activity.

the twenty-four hours prior to the survey. The independent variables included are district of residence, age of respondent at the time of the survey, husband's occupation in a high-status non-agricultural sector, relative status of natal and marital households compared, husband's household status ranking, dowry quartile, number of children borne by the woman and a control for sample type.

Table 3
Distribution of time spent in broad activity categories during the
twenty-four hours prior to interview, 2003, married women only

Variables	% of time spent
Social time/leisure	6
Productive work	7
Self-care	21
Domestic work	28
Other, including sleep	38

Source: Authors' calculation, Kishori Abhijan Surveys, 2001 and 2003.

4.1 Domestic Work

Domestic work varied significantly by district, with women in Chittagong and Sherpur spending more time in this category than women in Chapainawabganj. Age is positively associated with domestic work, suggesting that this type of work burden increases quite substantially as women get older. Women whose husbands are in a non-agricultural occupation spend less time proportionately in this type of work. The amount of domestic work increases with number of children. Relative to women who paid no dowry, those who did so spent significantly more time in domestic work but only for the two lowest quartiles. Those who paid higher amounts were not significantly different from those who paid no dowry. To the extent that even small dowry amounts are associated with wealth status, this result is consistent with time-use patterns reported in other studies in rural Bangladesh where women in wealthier families have longer work hours, particularly in agricultural households. This is usually because it is uncommon for wealthy landowners to hire help for domestic work even though they might do so for agricultural work (Cain et al., 1979; Amin, 1997). Rather, when wealthy families hire agricultural workers, the domestic work burden for women in the household increases because they are responsible for preparing food for hired hands compensated in cash and meals.

4.2 Productive Work

The next column shows regression coefficients associated with covariates of productive work. Only 7% of total time reported was spent in productive work (Table 3). Our data confirm that productive work is not a major preoccupation for young married women in rural Bangladesh. Only 40% of respondents reported some productive work, of which approximately half was in combination with childcare (data not shown). Productive work increases significantly with

age and decreases significantly with education and the number of children, by far the most important factor associated with productive work. Productive work is also significantly higher among women in the two poorest quartiles. Relative wealth is also significantly related. Women whose husbands are less wealthy than their natal family spend less time in productive work, while women whose husbands are wealthier than their natal family are more likely to spend time in productive work. Dowry is not significantly associated with productive work.

District of residence is a significant covariate of the percentage of time spent in productive work as reported by respondents. Women in Sherpur (the poorest district) and Chittagong (the wealthiest and most conservative district) spent less time in productive work relative to women in Chapainawabganj.

4.3   Time Spent in Self-Care

Column 3 in Table 4 shows factors associated with the amount of time women devote to self-care. The average respondent spent 21% of the previous day in self-care activities (Table 3). Our knowledge of the local culture leads us to interpret more time spent in self-care, in the presence of appropriate controls, as one of the ways in which a married woman can pamper herself – a form of self-indulgence. Although such behaviour may be frowned upon and it is common for young women to be chastised by mothers-in-law for spending too much time on themselves, these activities are permitted nevertheless. A husband may also express his appreciation of his new bride by buying her fragrant soap, shampoo and hair oil, so that she may indulge herself with these products. These little rituals also make time spent in self-indulgence a public statement of higher status. Thus, this indicator is perhaps the most sensitive time-related status indicator associated significantly with many of the covariates considered. In a setting where women's time use is strongly dictated by the needs of the household and by restrictions on her mobility outside the home, taking extra time to bathe, groom or simply rest is one of the limited ways in which young women can legitimately pamper themselves.

Amount of time spent in self-care increases slightly but significantly with education. Women in Chittagong spend more time in self-care relative to women in Chapainawabganj, and women in Sherpur spend less time in self-care. Relative to women who married into a household of similar economic status, women who married down (into a poorer family) spend less time on self-care. Women who married up (husband's family is richer) spent significantly more time in self-care relative to women who married a husband of equal status. Paying dowry is related to less time spent in self-care. Relative to women who paid no dowry, those in the lowest dowry quartiles were not significantly different, but women in the two middle dowry quartiles spent significantly less in self-care. As may be expected, women who have children spend less time in self-care.

Table 4
Regression coefficient estimates from analysis of time spent in various activities,
Bangladesh, 2003

Variables	Domestic Work	Productive Work	Self Care	Social / Leisure Time
District: Chapainawabganj (base)				
Chittagong	2.194 ***	-2.201 ***	1.557 *	1.730 ***
	(0.795)	(0.638)	(0.881)	(0.589)
Sherpur	1.083 *	-2.734 ***	-1.387 **	1.199 ***
	(0.582)	(0.467)	(0.645)	(0.431)
Age	0.393 ***	0.235 **	-0.212	-0.197 **
	(0.120)	(0.096)	(0.133)	(0.089)
Husband's occupation non agrar	-1.266 **	0.287	0.177	0.990 **
	(0.577)	(0.463)	(0.639)	(0.428)
Relative wealth of wife and husband's family (Base: Wife= husband)				
Wife> husband	-0.224	-1.051 *	1.280 *	0.269
	(0.686)	(0.551)	(0.760)	(0.508)
Wife< husband	0.555	1.335 **	-1.852 **	-0.259
	(0.666)	(0.534)	(0.737)	(0.493)
Husband's family's relative wealth ranking (Base: Highest quartile)				
3rd quartile	-0.846	0.271	-0.467	0.553
	(0.775)	(0.622)	(0.858)	(0.574)
2nd quartile	-1.241	1.160 *	-1.366	0.410
	(0.843)	(0.676)	(0.933)	(0.625)
Lowest quartile	-1.106	1.598 *	-1.479	-0.134
	(1.105)	(0.887)	(1.224)	(0.819)
Years of education	-0.079	-0.167 **	0.218 **	0.232 ***
	(0.092)	(0.074)	(0.102)	(0.068)
Dowry quartile: no dowry (base)				
Dowry (lowest quartile)	1.616 *	0.358	-0.860	-0.423
	(0.838)	(0.672)	(0.928)	(0.621)
Dowry (2nd quartile)	1.628 **	0.366	-2.182 **	-0.088
	(0.823)	(0.661)	(0.912)	(0.610)
Dowry (3rd quartile)	0.600	0.643	-1.866 **	-0.307
	(0.806)	(0.647)	(0.892)	(0.597)
Dowry (highest quartile)	0.691	0.054	-1.023	-0.652
	(0.804)	(0.645)	(0.890)	(0.596)
Number of Children	3.515 ***	-0.943 ***	-2.850 ***	0.424
	(0.374)	(0.300)	(0.414)	(0.277)
Sample Type	-2.548 ***	1.694 ***	0.018	0.707
	(0.817)	(0.656)	(0.905)	(0.605)
Constant	15.80 ***	3.961 *	30.05 ***	7.866 ***
	(2.552)	(2.048)	(2.826)	(1.891)
Observations	1275	1275	1275	1275
R-squared	0.213	0.055	0.143	0.043

Notes: Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Authors' calculation, Kishori Abhijan Surveys, 2001 and 2003.

4.4   Social Time

We define social time as any time spent playing, visiting, attending a social ceremony or hanging out with friends and relatives in the absence of other activities. Such activities account for only 6% of married women's time in the 24-hour recall period. Participation in such activities varies within the three study areas. In the context of rural Bangladesh, these are bolder ways for young, married women to indulge themselves and thus are qualitatively different from self-care in how they should be interpreted.

Coefficients associated with covariates of social time estimated from multivariate regression analysis are shown in the last column of Table 4. Our estimates show that young women spend significantly more time socializing time in Chittagong and Sherpur relative to Chapainawabganj. Social time decreases significantly with current age for married women and increases with their level of education. Social time is not significantly associated with the number of children a young women has borne. However, social time does not seem to be associated in a significant way with variables indicating marriage arrangements. Neither the relative wealth of natal and marital families nor level of dowry payments is significantly associated with the amount of social time reported.

4.5   Regional Variation

As we have noted above the three districts vary considerably in their pattern of time use even though in terms of social, ethnic and religious composition they are not different from each other. Thus, these differences bear further exploration. During the baseline study, these differences were documented in great detail. In terms of the lives of young women, perhaps the most significant dimension is variation in mean ages at marriage and proportions who have attended school (shown in Table 5). In Chittagong marriage occurs later and more girls attend school. These differences translate into young women having more friends, being more likely to have worked for pay and generally having wider social networks relative to both the other two districts where the mean age at marriage is considerably earlier (data not shown). However, the situation of married women in Chittagong stands in sharp contrast. Once women are married they appear to lead more circumscribed lives relative to women in Chapainawabganj and Sherpur. In Chittagong they are less likely to use contraception after marriage, more likely to report having been physically abused and sexually coerced and more likely to want larger families. Most economic indicators show that Chittagong is the wealthiest of the three districts and Sherpur the poorest. Other studies have shown stronger prevalence of religious practice in Chittagong as well as stronger resistance to social change with respect to women (Amin et al., 2002).

Table 5
Variation of sample characteristics by district, Bangladesh 2003

	Chapainawabganj	Chittagong	Sherpur
Mean age at marriage	15	17.2	15
Proportion of girls in school	33	45.0	25.0
Proportion of girls who are married	57	28	61
Among married women under age 24			
% ever conceived	75	81	72
% currently using contraception	38	31	43
% currently pregnant	3	15	4
% sexually coerced	42	66	33
% physically abused	13	21	30
Mean desired family size	1.35	2.07	1.67
Households with electricity	24	52	16
Households with television	12	21	6

Source: Authors' calculation, Kishori Abhijan Surveys, 2001 and 2003.

5 Discussion

We explored the patterns of association between women's individual and marriage characteristics and the ways in which women spend time. The analysis confirms our general hypothesis that marriage characteristics are important determinants of the quality of life after marriage as measured in terms of time allocation of young married women. However, there are important differences in terms of how they influence different categories of time use. Marriage characteristics have a stronger influence on domestic work and time spent in self-care than on productive work or social time. One reason that marriage influences on productive time or social time are not detected as strongly may be that young married women spend very little time in directly productive activities or in socializing. Paying dowry and small amounts of dowry in particular, is associated with more time in domestic work and less time in self-care. Using dowry payments and relative wealth status as measures of marriage status, we find that women who paid dowry reported more domestic work and less time on self-care relative to women who did not pay dowry. These associations between time use and marriage variables were similar to the association we found in an earlier study between marriage arrangements and gender-based violence (Suran et al., 2004). By contrast, the associations with women's education worked in a diametrically opposite way: better-educated women had more social time and spent more time in self-care and less time in productive work. If parents pay dowry with the expectation that daughters will lead a better life after marriage, our data do not bear out that expectation.

It is noteworthy that participation in productive work, although varying widely at the district level, was not strongly associated with marriage investments. The pattern of variation at the

district level suggests that women's participation in work that is not traditionally considered to be in the female domain is determined more by community norms than by household or individual factors. Women in the less conservative division of Rajshahi, where Chapainawab-ganj is located, have historically had relatively greater freedom (Amin et al, 2002) and have also engaged in higher levels of productive work relative to the more conservative but prosperous district of Chittagong and the poorer district of Sherpur.

Our analysis demonstrates that educating daughters and not paying dowry have similar associations with time-use patterns. This finding suggests that educating daughters and not paying dowry are related to the ability to break from societal norms and this ability is probably the latent variable that underlies most of these associations. Although our analysis contributes to the evidence base on marriage arrangements and their outcomes, we have not been able to shed light on a question of central concern in Bangladesh, namely why dowry payments persist and continue to rise when there is no evidence that girls who marry with dowry are better off. However, we have shown here, as well as in our earlier analysis of the covariates of gender-based violence, that whereas women who pay more dowry may fare better than those who pay less, women who pay no dowry are even better off than those who pay the highest amounts of dowry.

This evidence points to the need to explore further the characteristics of those marriages that take place with no dowry. The patterns of association we have presented here provide further detail on how marriage comes to be a defining moment in a woman's life. Dowry demands, as we have specified it and as it is commonly understood in contemporary Bangladesh, represents a form of monetization of the marriage exchange. Indeed, it is specifically the demands in kind and of "valued security" that are prohibited and abhorred in legislation on dowry. While there may be other negative aspects of marriage exchange, such as competitive gift giving and status competition, those are more difficult to identify and distinguish. Srimati Basu has written eloquently about some of the traditions of gift giving observed in Bengali society (Basu, 2005). Not paying dowry then is simply a measure of the ability to resist monetizing the marriage exchange. A second and apparently distinct set of influences is captured in the relative status of natal and marital families. We interpret this to be a reflection of the continuation of support from the natal family in determining a young woman's bargaining position in her marital household. By highlighting these associations with marriage, we emphasize the importance of paying particular attention to the practice of marriage as a key determinant of the status of women in Bangladesh.

Appendix

Appendix 1Activities recorded in 24-hour time recall

Domestic Work	Productive Work
Cooking/washing utensils	Cleaning/weeding/planting/irrigation
Cleaning courtyard/house	Looking after field
Purchasing food and other items	Looking after poultry/livestock
Purchasing non-food items only	Harvesting/carrying crop
Washing/drying clothes	Threshing/drying/husking
Repairing house	Selling crop
Drying cow dung for fuel	Collecting vegetables and fruits
Attending sick person	Processing harvests
Other household work	Separating jute fiber
Breastfeeding	Drying fish
Other intensive feeding	Processing fish
Bathing children	Fishing
Nursing sick child	Feeding fish
	Selling fish
	Day labour (agri)
	Day labour (non-agri)
Self-Care	Contract labour
Rest	Other labour
Bathing, grooming, toilet	Cottage industry
Resting while sick	Carpentry
Eating	Private tutoring
	Pulling rickshaw/van
Social Time	Driving motor vehicle
Playing with child	Begging
Playing	Repairing farm equipment
Visiting other district	Helping business work
Moving around	Slaughtering animal
Attending social ceremony	Teaching
Visiting friends/relatives	Moving around for work
	Other mechanical work
	Tailoring
	Cutting tree/bamboo
	Collecting fuel and firewood

References

Agarwal, B. (1997), Bargaining and gender relations – Within and beyond the household, Food Consumption and Nutrition Division Discussion Paper No. 27, International Food Policy Research Institute, Washington DC.

Amin, S. (1997), The poverty-purdah trap in rural Bangladesh – Implications for women's roles in the family, in: *Development and Change*, Vol. 28, No. 2, 213–233.

Amin, S. and M. Cain (1997), The rise of dowry in Bangladesh, in: Jones, G.W., Douglas, R.M., Caldwell, J.C. and R.M. D'Souza (eds), *The continuing demographic transition*, Oxford University Press, Oxford, 290–306.

Amin, S., Basu, A.M. and R. Stephenson (2002), Spatial variation in contraceptive use in Bangladesh – Looking beyond the borders, in: *Demography*, Vol. 39, No. 2, 251–267.

Amin, S. and L. Huq (2008), *Sending girls to school in Bangladesh*, Working paper No. 12, Population Council, New York, http://www.popcouncil.org/pdfs/wp/pgy/012.pdf.

Basu, A.M. and G.B. Koolwal (2005), Two concepts of female empowerment – Some leads from DHS data on women's status and reproductive health, in: Kishor, S. (ed.), *A focus on gender – Collected papers on gender using DHS data*, ORC Macro, Calverton MD, 15–33.

Basu, S. (2005), The politics of giving – Dowry and inheritance as feminist issues, in: Basu, S. (ed.), *Dowry and Inheritance*, Women Unlimited, New Delhi.

Cain, M.T. (1977), The economic activities of children in a village in Bangladesh, in: *Population and development Review*, Vol. 3, No. 3, 201–27.

Cain, M.T., Khanam, S.R. and S. Nahar (1979), Class, patriarchy and women's work in Bangladesh, in: *Population and Development Review*, Vol. 5, No. 3, 405–438.

Ilahi, N. (2000), *The intra-household allocation of time and tasks – What have we learnt from the empirical literature?*, Policy research report on gender and development working paper series, No. 13, The World Bank Development Research Group/Poverty Reduction and Economic Management Network, Washington, DC.

Jackson, E.L. and K.A. Henderson (1994), Gender-based analysis of leisure constraints, in: *Leisure Sciences*, Vol. 17, 31–51.

Jain, D. (1985), The household trap – Report on a field survey of female activity patterns, in: Jain, D. and N. Bannerjee (eds), *Tyranny of the household – Investigative essays on women's work*, Shakti Books, Delhi, 215–249.

Katz-Gerro, T. (2002), Highbrow cultural consumption and class distinction in Italy, Israel, West Germany, Sweden, and the United States, in: *Social Forces,* Vol. 81, No. 1, 207–229.

Katz-Gerro, T. (2004), Cultural consumption research – Review of methodology, theory, and consequence, in: *International Review of Sociology*, Vol. 14, No. 1, 11–29.

Larson, R. and S. Verma (1999), How children and adolescents around the world spend time – Work, play, and developmental opportunities, in: *Psychological Bulletin*, Vol. 125, 701–736.

Mahmud, S. and S. Amin (2006), Girls' schooling and marriage in rural Bangladesh, in: Hanum, E. and B. Fuller (eds), *Research on the sociology of education*, Vol. 15, Children's lives and schooling across societies, JAI Elsevier/Science, Boston, 17–99.

Rao, V. (1993), Dowry "inflation" in rural India – A statistical investigation, in: *Population Studies,* Vol. 47, No. 2, 93–283.

Suran, L., Amin, S., Huq, L. and K. Chowdury (2004), *Does dowry improve life for brides? – A test of the bequest theory of dowry in rural Bangladesh*, Policy research division working paper No. 195, Population Council, New York, http://www.popcouncil.org/publications/wp/prd/195.html.

Time use and rurality – Canada 2005

Hugh Millward and Jamie Spinney

Hugh Millward
Department of Geography
Saint Mary's University
923 Robie St.
Halifax, NS, Canada B3H 3C3
e-mail: hugh.millward@smu.ca

Jamie Spinney
School of Geography and Earth Sciences
McMaster University
Hamilton, ON, Canada L8S 4K1
e-mail: jamie.spinney@smu.ca

Abstract

This paper provides a preliminary assessment of rurality as a factor affecting where and how people use their time, in a North American context. Rurality is a complex concept, but two key aspects are the degree of urban influence, and economic dependence on resource industries (farming and fishing particularly). Using dichotomous variables from the 2005 Canadian time use survey, we find that rural residence and resource employment both strongly influence time use and travel behaviour. Responding to fewer and more distant opportunities, people with rural residence participate less than urbanites in paid work, education, and shopping, and thus on average spend less time in these activities. Differences in time use between resource and non-resource workers are generally less marked than those related to urban versus rural workers. However, resource workers spend significantly less time in care-giving and sports, and more time in shopping and education. Participation in many activities is lower for resource workers, but those who participate spend significantly more time in paid work, domestic work, shopping, and education. Rural residents were found to spend considerably less time in travel than urban dwellers. On average, they take fewer trips per day, of shorter average duration, and spend less time in travel. Resource workers take significantly fewer trips than non-resource workers, spend less total time in travel, and have trips of lower average duration.

JEL-Codes: Q00, R11, R12, Z10

Keywords: Rurality, time use, resource industries, travel, Canada

1   Introduction

Theoretical and empirical work on time use has largely focused on the behaviour of urban or suburban actors, so that there is only a modest body of literature on rural time use. Much of this, moreover, relates to the developing world. There has been very little work on rural time use in the modern (and postmodern) countryside, or on rural-urban contrasts in time use or space-time behaviour. This paper is intended to help remedy this lack. It provides a Canada-wide perspective on rural-urban contrasts, using two dichotomous indicators of rurality contained in the 2005 Canadian General Social Survey on Time Use (GSS-TU). One indicator focuses on the residence location of respondents, and assigns 'urban' and 'rural' designations to localities based on commuting flows to cities and larger towns. A second indicator relates to employment in the traditional rural resource-based industries, most notably farming, but also fishing, forestry, and mining. The paper assesses how these two aspects of rurality, separately and in combination, affect time use. Given lower population densities in rural areas, and longer distances between activity opportunities, much of the focus will necessarily be on the time aspects of travel behaviour.

Following a discussion of expectations regarding rural-urban contrasts in time use, the core of the paper is an empirical analysis of data from time use information collected in 2005 in Cycle 19 of the General Social Survey. Using both participation rates and daily time budgets, we first examine how rural residence and resource employment affect time allocations for ten major activity categories, and use non-parametric tests to assess the significance of between-group differences. We then consider how rural residence and resource employment affect a range of travel behaviour measures, and again gauge the significance of between-group differences. Identified differences are related to our initial expectations, and we attempt to explain unexpected results. The paper concludes by suggesting the need to employ more nuanced measures of rurality, drawing on the work of rural geographers and sociologists.

Traditionally, rural and urban ways of life were quite distinct, with country folk engaged in resource-based primary production, and town dwellers employed in the manufacturing or service sectors. Both groups lived close to their workplaces. Widespread use of automobiles, however (say, after 1950 in Canada), led to 'time-space convergence' (Janelle, 1969; Knowles, 2006) which extended urban commuting fields (a.k.a. 'daily urban systems' or labor market areas) well beyond the built-up area, and greatly altered socio-economic characteristics within this 'urban field' (Friedmann and Miller, 1965; Russwurm, 1976; Plane, 1981; Stabler and Olfert, 1996). Lewis and Maund (1976) modeled the impacts in terms of migration flows: rural dwellers within commuting range of the city are no longer forced to out-migrate for employment, while concurrently many urbanites move into the countryside. The limit of this commuter zone is typically suggested as around one hour's drive from major urban employment nodes, which underlines the importance of time use in the structure of modern rural areas. Commuting and housing development can significantly alter the landscape,

economy, and social character of the more intensively exurbanized portions of the commuter belt (Lamb, 1983; Dahms, 1998; Millward, 2000).

Pryor (1968), Robinson (1990, particularly ch. 2), Bell (1992), and Bryant et al. (1982), all provide useful discussions of the urban impact on the countryside and on rural ways of life. They agree with Pahl (1966) that there exists a 'rural-urban continuum', such that a simple urban/rural dichotomy is seldom useful or appropriate. They see utility in defining differing degrees of rurality based on social, economic, demographic, and land use criteria (Cloke, 1977; Harrington and Donoghue, 1998). However, others advise caution in the use of statistically-based indices (Halfacree, 1993), and view rurality as a socially-defined construct, such that 'objective' measures are neither possible nor desirable. The terms 'countryside' and 'rural' are no longer easy to define, and in many seemingly rural areas, the traditional 'productivist' resource-based industries provide little more than scenic amenity. However, while the terms 'post-productive' (Ilbery and Bowler, 1998) and 'post-rural' (Hoggart, 1990; Murdoch and Pratt, 1993) have some applicability within commuter belts (and densely settled countries like England or Germany are composed almost entirely of overlapping commuter belts), we should bear in mind that thinly-settled countries like Canada and Australia contain vast rural territories lying outside urban fields, which continue to be highly dependent on resource industries (Smailes et al., 2002; Millward, 2005).

Time use research with a specific rural focus has been typically concerned with agricultural and village life in subsistence economies. Anthropologists in particular have theorized on varying perceptions of time, work, and leisure, and conducted empirical work on time inputs for 'work' in a variety of hunting, gathering, and farming communities (e.g. Minge-Klevana, 1980; Grossman, 1984; Skoufias, 1993). Of particular interest here are the detailed stopwatch observations made by Blaikie (1971) to estimate time outlays for agricultural operations in north India. Other studies have focused on age and gender differences in rural time use, since such differences are often quite marked in traditional societies (Whitehead, 1999; Robson, 2004; Biran et al., 2004; Su et al., 2006). Age and gender effects in developed countries have also received some attention (Meiners and Olson, 1987; Beach, 1987; Davidson, 1989; Gordon and Caltabiano, 1996; Droogleever Fortuijn, 1999).

Rural-urban contrasts are seldom considered as an explanation for inter-personal, inter-settlement, or inter-regional differences in time use, primarily because major time use surveys are either urban-only, or national samples lacking rural-urban coding of respondents (e.g. Gershuny, 2000; Pentland et al., 1999; Robinson and Godbey, 1999). Artemov's (1981) comparison of athletic activity for urban and rural residents is a rare exception, and another is Atkinson's (1994) urban-rural comparison of time in child care. Perhaps more important is work by Harvey (1994), whose affiliation with Statistics Canada allowed access to geographical coding of the 1986 GSS-TU not available to the public. He divided survey respondents into three categories labelled metropolitan areas, larger towns, and rural/small town, and tabulated those against time in major activities. Though he did not test for statistical significance, he shows that more time is allocated to paid work and less to domestic work in metropolitan areas, whereas travel time to work is longer both in metropolitan and rural areas.

Time geography is a distinct sub-discipline, concerned with location, movement, and activity in space-time (Parkes and Thrift, 1975; Thrift and Pred, 1981; May and Thrift, 2001). Like other time use researchers, time geographers have given very little attention to rural areas or small towns. There are a few studies of time-use and travel distance schedules in traditional resource-based rural communities (e.g. Blaikie, 1971; Grossman, 1984), while Hagerstrand (1996) employs space-time imagery to great effect in tracing activity patterns in a small rural area of Sweden undergoing modernization (and co-incidentally traces his own childhood). Nutley (1985) discussed time-space constraints in the context of rural mobility research, and Tillberg Mattsson (2002) has operationalized these ideas in a study of rural-urban differences in children's leisure time, and parental chauffering activities. This paucity of studies reflects the lack of time diaries for rural areas, and particularly of those with geo-referenced activity data.

There is evidence that ubiquitous processes of modernization and globalization (Featherstone, 1990; Tomlinson, 1999; Gradstein and Justman, 2002) are leading to greater similarities in lifestyles. Differences in age, gender, income, social rank, and nationality impose fewer constraints than previously, leading to convergence in values, mores, and behaviour (Baumol, 1986), and reduced differentials in time use and travel (Fisher et al., 2007; Nowotny, 1994; Peters, 2006). It is reasonable to suppose that rural and urban modes of life, at least in developed economies, are also converging, fostered in particular by time-space convergence (Janelle, 1969; Knowles, 2006), which has allowed urbanites and ruralites to enjoy the advantages of each other's milieux, and indeed to move daily along the rural-urban continuum.

Significant differences, however, are likely to remain. In remote rural areas beyond the urban field, for example, there is likely to be more participation in household work, owing to traditional male/female division of labour, and to fewer opportunities for paid work. Residents of remote rural areas are also likely to spend less time overall in paid work. Such areas are typically heavily dependent on resource industries (and particularly agriculture), which are restructuring to become less labour-intensive (Healey and Ilbery, 1985; Troughton, 1986; Marsden et al., 1990; Bowler, 1992). They thus exhibit higher levels of unemployment (Gilg, 1983; Wimberley, 1993), and lower participation in the workforce. They are also typically in demographic decline (Pacione, 1982; Feser and Sweeney, 2003; Millward, 2005; Malenfant et al., 2007), leading to a higher dependency ratio, and (again) lower workforce participation (Robinson, 1990, 59-92; Furuseth, 1998; Smailes et al., 2002; Feser and Sweeney, 2003). Harvey's (1994) tabulations from Canada's 1986 national time survey show rural areas have less participation in paid work, and rural participants work fewer hours than urban ones. Commuter belts in the rural-urban fringe, however, often have lower unemployment rates and higher workforce participation than either remote rural areas or the inner city.

Geographers and transport planners are particularly interested in space-time activity, rather than simply time-use, and this leads us to consider both activity settings and travel between settings. The longest journeys are typically journeys-to-work, and we might expect rural residents to drive further to work, on average, than urbanites. However, in traditional (i.e. more remote) rural areas, resource-based employment in farming and fishing is often still impor-

tant, and much of this activity takes place at or near home, with little or no commute required. Also, at-home self-employment in a variety of home businesses is important in rural areas, as a means to supplement household income, and as a response to a lack of conventional paid employment (du Plessis and Cooke-Reynolds, 2005). Finally, employees in small towns and larger villages often live very close to their work. For these reasons, the average person's journey-to-work may take no more time in the country than in the city, though the average participant's may be somewhat longer. Harvey's (1994) tabulations for 1986 accord with these expectations, though differences were not tested for significance.

For journeys to shop and socialize, much activity in rural areas may remain highly localized, focused on the village unit. But declining populations and increased mobility (near-universal car ownership) have greatly altered threshold and range conditions for most rural goods and services, so that many smaller villages now lack even basic facilities such as a school, church, general store, or gas station. The increasingly sparse and dispersed nature of rural opportunities (Furuseth, 1998), particularly for 'higher-order' goods and services, may be reflected in longer journey distances than in the city.

2   Contrasts in time use by rural-urban residency

Although work by Cloke and others (e.g. Cloke, 1977; Harrington and Donoghue, 1998) suggests a wide range of variables related to 'rurality', key ones relate to population density, location relative to a major urban centre, and a resource-based economy. Prior to 2005, the Canadian national time use survey, like other such surveys, provided information only on the latter, by specifying employment type for workforce respondents (grouped for this study into 'resource' versus 'non-resource' employment). The 2005 GSS-TU survey provides a complementary binary indicator of respondent rurality, by specifying residence location according to the degree of urban commuter influence ('urban' versus 'rural' districts). This variable distinguishes between those living in either census metropolitan areas (CMA's) or census agglomerations (CA's) (= 'urban') and those living elsewhere, in rural areas or small towns (= 'rural' or RST). The categorization is crude and somewhat misleading, since CMA's and CA's are labour-market (commuter-shed) areas that often include broad swathes of countryside, within which much farming may occur. Conversely, non-CMA/CA areas may contain towns up to 10,000 population, and may also have commuting to nearby cities, though at a lower level than within a CMA (less than 50% of labour force working in the central urban core). A more nuanced definition of rural residence has been developed by Statistics Canada, which further subdivides RST areas by the degree of metropolitan influence (Malenfant et al., 2007), but unfortunately it was not employed in the 2005 time use survey. The survey also excludes Prince Edward Island from rural-urban categorization, owing to privacy concerns related to its small sample size.

With Prince Edward Island excluded, the sample has 19,004 respondents, of which 22.6% are RST. The sampling design employed a complicated mix of random and stratified sampling,

but most sub-samples (e.g. rural women in Ontario) are proportionally accurate. In this paper, we chose not to estimate population parameters using person-weights, but to investigate only the parameters of the sample and sub-samples. This allowed us to compute non-parametric significance of rural-urban differences, using the Mann-Whitney test. Non-parametric (difference-of-ranks) testing is much preferable to t-testing, since most variables are highly positively skewed. However, Mann-Whitney cannot be performed on population estimates, owing to the overwhelming proportion of tied ranks. Two-tailed significance is reported, since this is more stringent than 1-tailed testing.

Table 1 shows daily time budgets, in average minutes per day, for ten activity categories, for all respondents in both rural and urban residence sub-samples. These values include travel time related to each activity. Rural-urban differences may at first sight appear rather small, since only two of them (employed work and domestic work) exceed 15 minutes. All but one of the differences, however, are significant at the 0.01 level. In other words, such differences would occur by chance in random samples less than 1% of the time, and we are therefore 99% confident that they are not produced randomly. Since sample sizes are smaller, rural-urban differences are less significant when calculated only for those in the workforce (Table 1, right side), but even so seven of the ten activity categories show differences at the 0.05 significance level.

Table 1
Mean activity schedules (mins/day), all respondents 2005;
population aged 15 and over (unweighted sample data)

Activity category (incl. related travel)	All respondents			Workforce respondents		
	Rural	Urban	Rural-urban diffs. signif.[1] (2-tailed)	Rural	Urban	rural-urban diffs. signif.[1] (2-tailed)
0 Employed work	206	229	**.00 –**	312	326	**.02 –**
1 Domestic work	148	117	**.00 +**	134	102	**.00 +**
2 Care-giving	24	28	**.00 –**	28	31	**.05 –**
3 Shopping / Services	42	47	**.00 –**	39	44	**.00 –**
4 Personal Care	647	640	**.01 +**	614	611	.11 +
5 Education	19	31	**.00 –**	19	31	**.00 –**
6 Organizational	26	23	**.01 +**	22	20	.07 +
7 Entertainment events	90	85	**.00 +**	87	84	**.03 +**
8 Sports/Hobbies	65	67	**.00 –**	55	59	**.00 –**
9 Media/Communication	172	171	.94 +	129	131	.14 –
N	4,289	14,715		2,730	9,773	

[1] Mann-Whitney difference-of-ranks tests. Bold figures are significant at <.05. Signs show rural mean minus urban mean.

Source: Calculated from main file, GSS 2005 Time Use Survey, and averaged over a 7-day week.

As expected, respondents in the rural residence category spend significantly less time in paid work, and more time in domestic work. Also as expected, the large all-sample difference for paid work (-23 minutes) is entirely attributable to lower participation; in contrast to Harvey's (1994) finding, rural respondents working on the sample day actually worked slightly longer

than their urban counterparts (Table 2). Rural and urban areas show similar participation in domestic work, so that rural participants (even when restricted to those with paid employment) worked significantly longer.

Table 2
Mean activity schedules (mins/day), for participants[1] only;
workforce respondents, population aged 15 and over, 2005 (unweighted sample data)

Activity category (incl. related travel)	All workforce			Employed on sample day		
	Rural	Urban	Rural-urban diffs. signif.[2] (2-tailed)	Rural	Urban	rural-urban diffs. signif.[2] (2-tailed)
0 Employed work	530	528	.74 +	541	534	.41 +
1 Domestic work	181	151	**.00 +**	171	135	**.00 +**
2 Care-giving	129	134	.70 –	122	126	.79 –
3 Shopping / Services	117	120	**.00 –**	111	114	**.00 –**
4 Personal Care	647	640	**.01 +**	614	611	.18 +
5 Education	364	359	.68 +	336	339	.89 –
6 Organizational	164	162	.40 +	157	153	.36 +
7 Entertainment events	188	189	.64 –	184	187	.95 –
8 Sports/Hobbies	149	144	.62 +	139	136	.67 +
9 Media/Communication	206	204	.26 +	163	162	.89 +

[1] Those reporting participation in the activity, on the day of the survey. Sample sizes vary by activity.
[2] Mann-Whitney difference-of-ranks tests. Bold figures are significant at <.05. Signs show rural mean minus urban mean.

Source: Calculated from main file, GSS 2005 Time Use Survey, and averaged over a 7-day week.

Against expectations, shopping (including travel-to-shop) takes up significantly less time in rural areas, both on average and per participant. This suggests a rational accommodation to the lack of nearby shopping opportunities, and particularly the lack of shopping choice: trips may be longer, but they are made less frequently. Another activity category showing significant differences for participants is personal care: on average, rural respondents spend seven minutes/day more on sleep, meals, etc., which is indicative of a somewhat more relaxed pace. Again, this result is related to lower participation in the paid workforce, in that the rural employed spend only three extra minutes per day, which is not significantly different.

Significant all-sample differences exist for several other activity categories, but their participant differences are not significant. Rural areas show less time in education (including travel-to-education) for all respondents, but more time for participants. This result accords with our expectations, in that rural school children have longer distance journeys-to-school, whereas there are few participants in further education. More time is spent in organizational activity, both on average and by doers, perhaps reflecting the importance of church, voluntary fire-hall, and community centre in rural life. On average, more time is spent on entertainment events, too, but time per participant is similar in urban and rural areas, because rural areas have a higher proportion of participants (and perhaps events are shorter). Sports and hobbies take up significantly less time in rural areas, but this reflects lower participation: for doers, the aver-

age time is greater, though not significantly so. Time spent in media and communication activities is remarkably similar in rural and urban areas, as is the participation rate.

3 Resource / non-resource contrasts in time use

An alternative indicator of rurality available in the 2005 GSS-TU, at least for those in the paid workforce, is employment in resource-based primary industries of farming, fishing, forestry, and mining. Most respondents with such employment are farmers or farmworkers, but in certain regions of Canada (e.g. Newfoundland, the Maritime Provinces, the 'Near-North', and British Columbia) forestry, fisheries, and even mining often employ more people, and indeed agriculture is entirely absent in certain districts. The broader notion of 'resource' employment is therefore more widely applicable than a narrow 'farm' category. By separating resource workers from other workers, both in 'urban' and 'rural' residence areas, we can assess the importance of traditional rural employment as a factor affecting time use.

Tables 3 and 4 show mean time budgets for four sub-samples in the workforce. Recall that 'urban' residence areas comprise not only the built-up areas of larger cities, but extensive commuter zones around them, sometimes up to 100 km from the city centre. This explains why almost 40% of resource workers in the sample (245 of 611) are located in these CMA and CA zones. However, resource workers comprise only 2.5% of the sample in urban areas, but 13.4% of the sample in rural and small-town (RST) areas. Even in the latter, though, they are definitely a minority.

The resource rural group stands out as spending most time in employed (paid) work activities (Table 3), and this is particularly true for participants (Table 4). Time spent in paid employment is equally low for non-resource participants in both urban and rural areas. The right-hand column in Table 4 shows the resource / non-resource difference for paid work to be highly significant, whereas the final column in Table 2 shows the rural-urban difference to be insignificant. Thus, for participants in this activity, type of employment seems more influential than location of residence.

Workforce respondents in rural areas spend more time in unpaid domestic work than those in urban areas, irrespective of employment type. The resource / non-resource difference is significant for participants (Table 4), but the rural-urban difference is even more significant, both for all respondents and for participants only (Tables 1 and 2). Domestic work occupies more time in rural areas in part because a smaller proportion of the workforce has paid work (unemployment levels are higher), allowing housework to take up the 'slack'. Somewhat paradoxically, however, the rural resource group of respondents shows very little time in household care-giving activities (e.g. childcare). Presumably, such care is largely undertaken by non-workforce respondents (i.e. unpaid mothers in farm households).

Table 3
Mean activity schedules (mins/day) by Location & Employment;
workforce respondents, population aged 15 and over, 2005 (unweighted sample data)

Activity category (incl. related travel)	Resource employment rural	Resource employment urban	Non-resource employment rural	Non-resource employment urban	Res-nonres emplt diffs signif[1] (2-tailed)
0 Employed work	337	302	308	326	.92 –
1 Domestic work	132	107	134	102	.43 +
2 Care-giving	13	29	30	31	**.00 –**
3 Shopping / Services	38	46	40	44	**.00 +**
4 Personal Care	609	607	614	611	.66 –
5 Education	10	45	21	31	**.01 +**
6 Organizational	26	17	22	20	.82 +
7 Entertainment events	88	87	86	84	.20 +
8 Sports/Hobbies	52	56	56	60	**.05 –**
9 Media/Communication	135	143	128	131	.38 +
N	366	245	2,364	9,528	

[1] Mann-Whitney difference-of-ranks tests. Bold figures are significant at <.05. Signs show resource mean minus non-resource mean.

Source: Calculated from main file, GSS 2005 Time Use Survey, and averaged over a 7-day week.

Table 4
Mean activity schedules (mins/day) by location & employment, participants[1]; workforce respondents, population aged 15 and over, 2005 (unweighted sample data)

Activity category (incl. related travel)	Resource employment rural	Resource employment urban	Non-resource employment rural	Non-resource employment urban	Res-nonres emplt diffs signif[2] (2-tailed)
0 Employed work	588	556	533	533	**.00 +**
1 Domestic work	189	145	168	135	**.04 +**
2 Care-giving	97	133	125	126	.50 –
3 Shopping / Services	128	135	109	114	**.05 +**
4 Personal Care	609	609	614	611	.70 –
5 Education	360	475	335	335	**.02 +**
6 Organizational	189	156	152	153	.60 +
7 Entertainment events	183	185	184	187	.71 –
8 Sports/Hobbies	139	139	139	136	.60 +
9 Media/Communication	171	171	162	162	.22 +

[1] Those reporting participation in the activity, on the day of the survey. Sample sizes vary by activity.
[2] Mann-Whitney difference-of-ranks tests. Bold figures are significant at <.05. Signs show resource mean minus non-resource mean.

Source: Calculated from main file, GSS 2005 Time Use Survey, and averaged over a 7-day week.

Shopping and education are two other activity categories showing significant resource / non-resource differences. Resource workers in both urban and rural settings spend more time shopping than non-resource workers, and the time differential is particularly large for partici-

pants (Table 4). Perhaps this reflects the fact that farmers and fishers typically live in isolated households, or in small communities lacking shops, and must spend more time in shopping travel. However, the rural-urban difference is somewhat more significant than the resource / non-resource difference (Table 2 versus Table 4), in part owing to the number of resource workers in so-called urban areas.

Time spent in education is very low overall for the rural resource group (Table 3), but much higher when computed for participants only (Table 4). The urban resource group has very high levels, whether computed for all workforce or participants only. These figures can be understood in the context of very low participation in education activities among the workforce generally, and in the rural resource workforce particularly. For participants, a comparison of the right-hand columns shows that resource / non-resource differences are highly significant (Table 4), but rural-urban differences are insignificant (Table 2).

4 Contrasts in travel behaviour by rural-urban residency

Travel behaviour is overtly geographical, since it concerns shifts in location between activity settings and sites. Travel occurs because of a demand to participate in out-of-home activities, and may be viewed at aggregate levels (such as the spatial separation of people and jobs: see Hamilton, 1982; Ma and Banister, 2007), or at the level of individual behaviour (e.g. trade-offs between costs and benefits of travel, spatial constraints, etc.) (see Jones et al., 1983; Peters, 2006). The GSS-TU 2005 contains detailed episode data for travel activities, including purpose, timing, duration, and mode of travel. It does not, however, report on distances traveled for these episodes.

4.1 Total travel

Tables 5 and 6 show aggregate data on mean daily number of trips, total daily travel time, and mean trip duration. Table 5 shows means for all respondents, and Table 6 for participants only. Although our expectation was for similar total amounts of travel, both Tables show daily travel for rural (RST) residents to be considerably and significantly less than daily travel for city (CMA/CA) residents. The average rural dweller (Table 5, left half) takes fewer trips per day (confirming findings by Pucher and Renne, 2005), the trips are slightly shorter in duration, and overall travel time is 8.4 minutes (or 12%) less. In part, this reflects lower participation in travel, with more people at home all day. For participants (Table 6, left half), the mean number of trips is more similar (though still significantly different at the 95% confidence level), and the difference in total travel time is reduced to 5.2 minutes.

Looking only at those in the workforce (i.e., excluding homemakers, retirees, incapacitated, and full-time students), rural-urban differences are similar in direction and significance, but reduced somewhat in amounts (right side of Tables 5 and 6). As we might expect, workforce

members take more trips than the population as a whole, and spend more time on travelling. Rural workforce members, on average, spend 2.1 minutes less per day in travel than urban counterparts, but for 'doers' the value is only 1.0 minute less.

Table 5
Rural-urban differences in daily travel, all respondents;
population aged 15 and over, 2005

Travel variable	All respondents			Workforce respondents		
	Rural means	Urban means	Rural-urban diffs. signif.[1] (2-tailed)	Rural means	Urban means	Rural-urban diffs. signif.[1] (2-tailed)
Number of trips (per day)	3.0	3.2	**.00 –**	3.3	3.6	**.03 –**
Total travel time (mins/day)	61.7	70.1	**.00 –**	72.8	80.5	**.00 –**
Average trip duration (mins/day)	23.5	25.0	**.00 –**	21.8	23.9	**.00 –**
Travel time by trip purpose (mins/day)						
Paid work (to / from)	15.8	20.2	**.00 –**	24.0	28.6	**.00 –**
Child care	3.2	4.8	**.00 –**	3.7	5.4	**.01 –**
Shopping	17.5	18.9	**.00 –**	17.1	18.2	.10 –
Education	1.9	2.7	**.00 –**	1.9	2.7	.75 –
Organizational	4.2	3.8	.55 +	3.7	3.7	.23 +
Entertainment events	11.6	11.4	**.00 +**	14.3	13.0	**.00 +**
Sports & hobbies	3.9	5.1	**.00 –**	4.0	5.4	**.01 –**

1. Mann-Whitney difference-of-ranks test. Bold figures are significant at <.05. Signs show rural mean minus urban mean.

Source: Calculated from Episode and Main files, GSS 2005 Time Use Survey, and averaged over a 7-day week.

4.2   Travel duration

Travel may be categorized as obligatory (e.g. journey-to-work), discretionary or leisure-related (such as journey-to-socialize), or intermediate (journeys for shopping and childcare). Our expectations were for somewhat longer duration journeys to work, school, and shopping for rural participants, but possibly shorter durations for discretionary trips. These expectations are only partially met. Table 5 shows travel for non-leisure activities to be of significantly lower duration in rural areas, although average time differences per person per day seem slight for childcare, shopping, and education. The situation is different, however, when we compute durations for those who participated in a particular travel type on the day of the survey. For such 'doers', mean travel times per activity are much longer (Table 6), and the rural-minus-urban difference changes its sign for shopping and education. For example, workforce 'doers' (right side) spend significantly more time in travel for these activities. The sign-shift is related to lower participation in education and shopping in rural areas, which is surely partly reflective of fewer, smaller, and more widely-spaced schools and shops. The activity centres themselves tend to be less attractive and, in addition, participants must invest more travel time and expense to reach them.

Table 6
Rural-urban differences in participant[1] daily travel;
population aged 15 and over, 2005

Travel variable	All participants			Workforce participants		
	Rural means	Urban means	Rural-urban diffs. signif.[1] (2-tailed)	Rural means	Urban means	rural-urban diffs. signif.[1] (2-tailed)
Number of trips (per day)	3.7	3.8	**.03 –**	3.8	3.9	**.00 –**
Total travel time (mins/day)	76.8	82.0	**.00 –**	83.4	87.2	**.00 –**
Average trip duration (mins/day)	23.5	25.0	**.00 –**	24.9	25.9	**.00 –**
Travel time by trip purpose (mins/day)						
Paid work (to / from)	47.7	52.6	**.00 –**	48.3	52.6	**.00 –**
Child care	42.1	47.3	**.00 –**	40.9	45.0	**.00 –**
Shopping	43.8	42.3	.07 +	43.5	40.9	**.00 +**
Education	53.5	48.0	.77 +	52.5	47.3	**.00 +**
Organizational	49.3	46.8	.18 +	49.1	49.5	.84 –
Entertainment events	44.1	49.2	**.00 –**	50.8	53.3	**.00 –**
Sports & hobbies	43.1	46.1	**.00 –**	46.6	47.0	**.00 –**

[1] Those reporting participation in the activity, on the day of the survey. Sample sizes vary by activity.
[2] Mann-Whitney difference-of-ranks tests. Bold figures are significant at <.05. Signs show rural mean minus urban mean.

Source: Calculated from main file, GSS 2005 Time Use Survey, and averaged over a 7-day week.

Travel to entertainment, and for sports and hobbies, also shows significant rural-urban differences, whether computed for all respondents (Table 5) or for participants only (Table 6). Proportionally, the means for all respondents are much lower in rural areas for travel to sports and hobbies (Table 5), but this partly reflects lower participation rates. For participants, means are proportionally more similar, particularly for those in the workforce (Table 6), though still significantly different. Perhaps surprisingly, though indicative of a sense of community, rural areas have somewhat higher participation in entertainment and organizational activities than do urban areas. Travel to organizational events (often churches and service clubs) is of marginally longer duration in rural areas, but not significantly so (and shorter for workforce participants). Travel to entertainment events (including social visiting) is of significantly longer duration for all respondents (Table 5), but is significantly shorter for participants (Table 6). These findings suggest that social life in rural areas is village centered and fairly localized, whereas in urban areas people often gravitate to the city centre for social activities.

5 Resource / non-resource contrasts in travel behaviour

This section examines differences in travel behaviour between resource and non-resource workforce groups.

5.1   Total travel

Tables 7 and 8 report mean travel behaviour for the four rurality categories, plus levels of significance for differences between resource and non-resource workforce groups. Table 7 shows that resource workers take significantly fewer trips than non-resource workers, spend significantly less total time in travel, and have trips of lower average duration. Rural resource workers have particularly few trips and low overall travel time, whereas urban resource workers have characteristics similar to rural non-resource employees. Urban non-resource workers (by far the largest group) have the most trips and longest travel durations.

Table 7
Location and employment differences in daily travel, workforce respondents;
population aged 15 and over, 2005

Travel variable	Resource employment rural	Resource employment urban	Non-resource employment rural	Non-resource employment urban	Res-nonres emplt diffs signif[1]
Number of trips (per day)	2.8	3.4	3.4	3.6	**.00** –
Total travel time (mins/day)	63.0	78.6	74.3	80.6	**.00** –
Average trip duration (mins/day)	19.5	22.7	22.1	24.0	**.00** –
Travel time by trip purpose (mins/day)					
Paid work (to / from)	19.5	23.2	28.7	24.7	**.00** –
Child care	1.4	3.6	5.4	4.1	**.00** –
Shopping	16.8	20.9	18.1	17.2	**.00** +
Education	0.5	2.5	2.7	2.1	**.02** –
Organizational	2.6	4.3	3.7	3.9	.94 –
Entertainment events	12.9	15.0	12.9	14.5	.08 +
Sports & hobbies	4.7	3.0	5.4	4.0	.10 –
N	366	245	2,364	9,528	

[1] Mann-Whitney difference-of-ranks test. Bold figures are significant at <.05. Signs show resource mean minus non-resource mean.

Source: Calculated from Episode and Main files, GSS 2005 Time Use Survey, and averaged over a 7-day week.

There is lower participation in travel among the rural resource group, which was expected. Travel differences are less apparent when we consider only those respondents with trips on the survey day (Table 8). For these 'doers', number of trips and average trip duration are similar for all four groups, and only total travel time is significantly lower for resource workers. A comparison of the right-hand columns in Tables 6 and 8 shows that rural-urban differences are more significant than resource / non-resource contrasts.

5.2   Travel duration

Viewing averages for all workforce respondents (Table 7), we see that resource workers spend significantly less time in journeys to/from work, for child care, and for education, but significantly more time in journeys to shop. These differences, however, are largely ac-

counted for by different rates of participation in the travel types, with the rural resource group having particularly low propensity to travel for any of these purposes. When we consider participants only (Table 8), resource workers travel longer for paid work (though not significantly so), and differences for child care and education are also no longer significant. Only journeys-to-shop show significant differences, with the two resource groups travelling almost 10 minutes further per day, on average.

Table 8
Location and employment differences in participant[1] travel, workforce;
respondents in workforce, population aged 15 and over, 2005

Travel variable	Resource employment rural	Resource employment urban	Non-resource employment rural	Non-resource employment urban	Res-nonres emplt diffs signif[2]
Number of trips (per day)	3.6	4.0	3.9	3.9	.21 –
Total travel time (mins / day)	80.4	93.0	87.0	83.8	**.04 –**
Average trip duration (mins / day)	24.9	26.9	25.9	25.0	.17 +
Travel time by trip purpose (mins/day)					
Paid work (to / from)	55.9	57.5	47.5	52.5	.26 +
Child care	35.1	38.4	41.3	45.1	.42 –
Shopping	51.6	51.2	42.4	40.7	**.01 +**
Education	26.7	46.9	54.4	47.3	.41 –
Organizational	35.4	58.6	51.2	49.3	.74 –
Entertainment events	45.9	53.4	51.6	53.3	.97 –
Sports & hobbies	53.5	33.6	45.5	47.2	.26 –

[1] Those reporting participation in the activity, on the day of the survey. Sample sizes vary by activity.
[2] Mann-Whitney difference-of-ranks tests. Bold figures are significant at <.05. Signs show resource mean minus non-resource mean.
Source: Calculated from main file, GSS 2005 Time Use Survey, and averaged over a 7-day week.

But our focus on mean values provides a crude and somewhat misleading view of travel behaviour. All travel duration variables are highly positively skewed, so that mean values poorly reflect typical values, and differences in means are often not indicative of differences in medians, or differences in ranked values. Distributional shapes are illustrated in Figure 1, which shows daily travel to paid work for those engaging in such travel (participants) in the four rurality groups. Although all four groups show positive skew, with medians less than means, there are some noteworthy differences. Both rural groups have similar distributions; they show high percentages with duration below 20 minutes/day, suggesting much travel either within or to small towns and villages. The non-resource/urban group has a distinctly different distribution, with a much lower percentage below 20 minutes/day. In this latter group, which is by far the largest, there are comparatively few short-duration daily commutes, and more in the medium range (40-60). However, research elsewhere suggests that commuter times in smaller Canadian CMA's and CA's are very similar to RST times, and only in million-plus cities are times noticeably longer (Clark, 2000, 20; Turcotte, 2006, 15).

Figure 2 shows histograms of shopping travel for participants, for the four rurality groups. In general, few people travel more than 60 minutes per day for shopping, and even fewer more than 100 minutes. Median values are similar for all groups, and three of the four distributions show the expected negative exponential time decay. The resource/urban shape is somewhat different, however, in that the 0-20 minute bar is truncated. This suggests that farmers in the orbit of cities or larger towns by-pass local village shops (if they exist) to reach larger stores in the suburbs. In comparison, farmers living far from cities (the resource rural group) are presumably travelling to the nearest village having the necessary type of store, since alternative city stores are too distant to be attractive. Similarly, those in the non-resource/rural group, who mainly reside in villages and small towns, are often able to shop directly in their own community; this accounts for their exceptionally high percentage of travel under 20 minutes (47%).

Figure 1
Histograms of travel duration for journeys to/from paid work, for four rurality groups
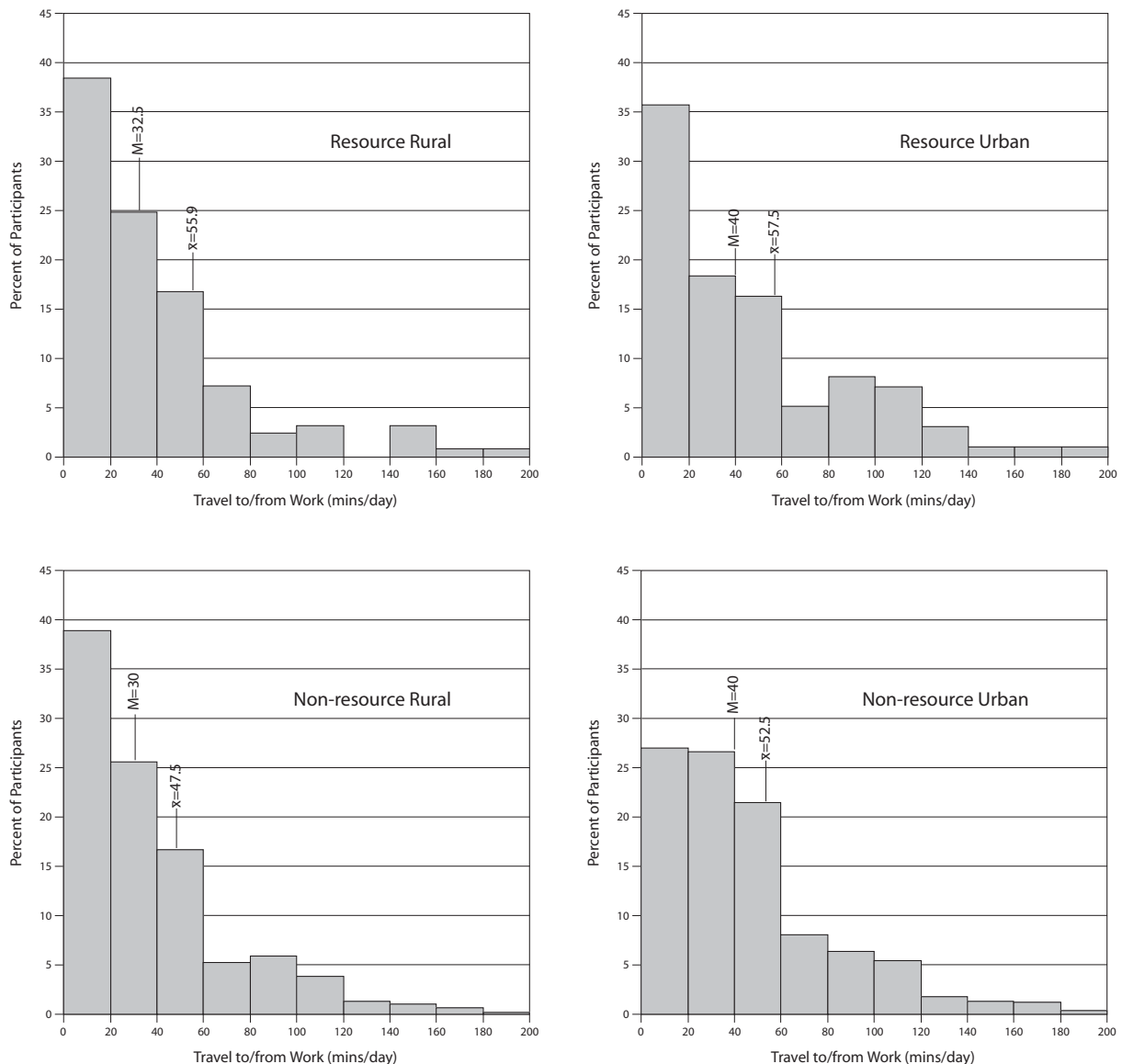
Source: Own illustration based on the GSS 2005 Time Use Survey and averaged over a 7-day week.

Figure 2
Histograms of travel duration for journeys to/from shopping, for four rurality groups
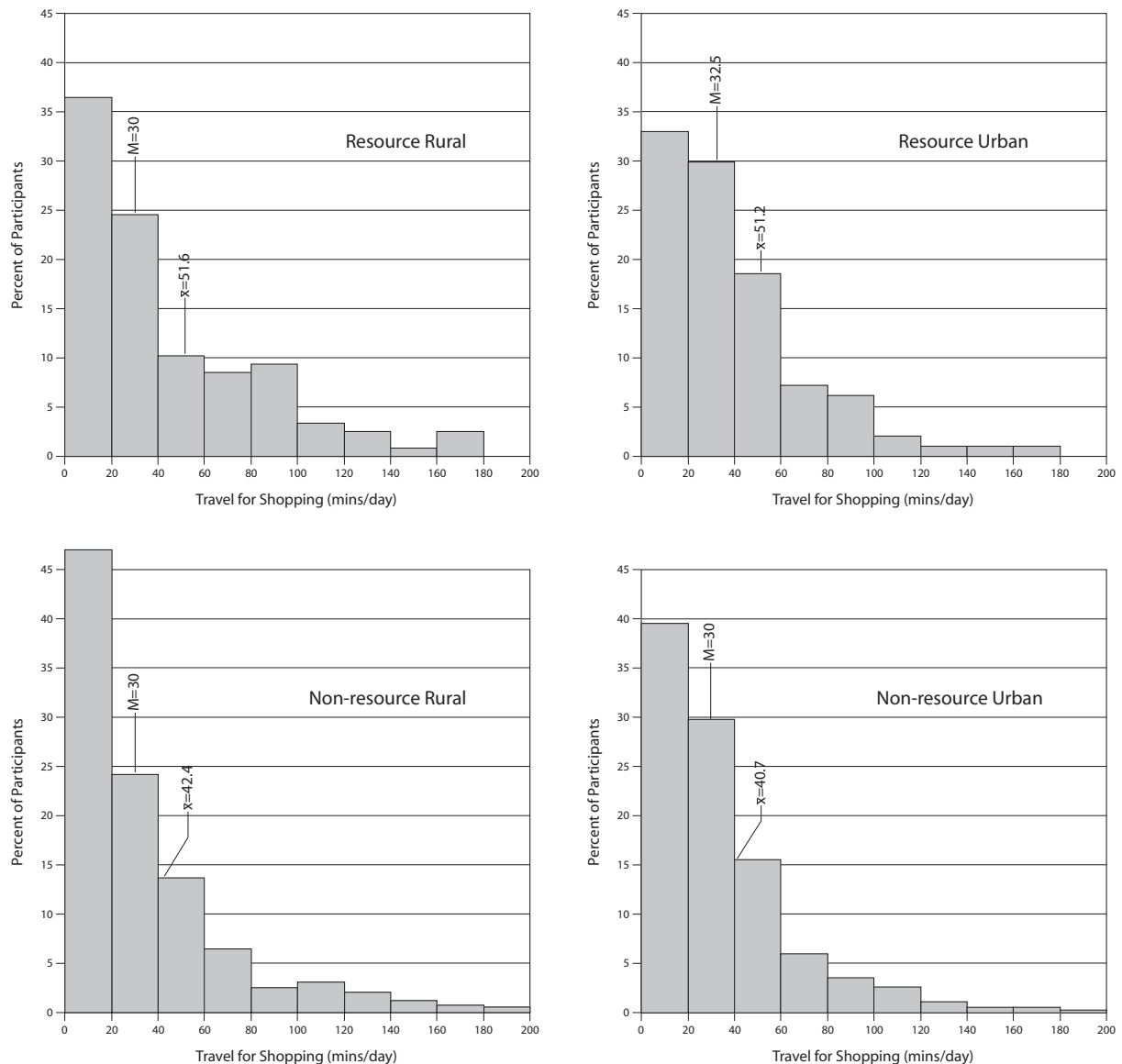
Source: Own illustration based on the GSS 2005 Time Use Survey, and averaged over a 7-day week.

6   Summary and further work

This paper employed data from the 2005 Canadian national time use survey to investigate how rurality affects time-use and travel behaviour. We used two dichotomous variables as complementary indicators of respondent rurality. One specifies residence location according to the degree of urban commuter influence ('urban' versus 'rural' districts) and the second specifies employment type for workforce respondents ('resource' versus 'non-resource' employment). We are aware that the residence categorization is unsatisfactory, since both categories can include urbanized areas and rural landscapes. It should be thought of as distinguishing between 'metropolitan-influenced' areas and the rest (rural and small town areas).

The employment indicator is a more direct and unequivocal measure of rurality, since it shows whether or not the respondent's livelihood is related to the traditional 'productivist' industries of the rural economy (most typically farming, but also fishing, forestry, and mining).

Perhaps the most important finding in this study is that, for time use and travel times, rurality still matters. Despite debate in the literature regarding the declining importance of rural-urban differentiation, and even whether the term rural has continuing validity, we find that in almost all ways rurality significantly affects mean time use. This is particularly true when we look at time use for all respondents, and somewhat less true for 'doers' (those participating in a given activity or trip type), indicating that rurality affects time use to a large extent through its impact on participation rates. Responding to fewer and more distant opportunities, rural people participate less in paid work, education, and shopping, and thus on average spend less time in these activities.

We expected both residence location and employment to influence time use and travel behaviour, but had no prior expectations as to which would prove more important. Regarding location, we expected rural areas and small towns to maintain a more traditional way of life, with fewer job opportunities, less participation and time in paid work, more time in domestic work, and less participation and time in education. These expectations were largely met, but there were a few surprises when looking at participant behaviour: rural 'doers' spend significantly more time in paid work, and less time in shopping.

Differences in time use between resource and non-resource workers are generally less marked than those between urban and rural workers. As a group, resource workers spend significantly less time in care-giving and sports, and more time in shopping and education, but there are considerable differences between urban and rural resource workers. Participation in many activities is lower for resource workers, but resource participants spend significantly more time in paid work, domestic work, shopping, and education.

Rural-urban differences in travel times have not been considered by previous researchers, in Canada or elsewhere, and are thus an important component of this study. Remote rural areas often lack nearby opportunities for employment, shopping, education, socializing, and recreation, but in contrast smaller towns or large villages may provide a wide range of such opportunities within a small area. Given the crude nature of the GSS-TU rural/urban binary variable, our expectations regarding travel behaviour were therefore ambivalent and uncertain. Somewhat surprisingly, rural residents were found to spend considerably less time in travel, overall, than urban dwellers. On average, they take fewer trips per day, of shorter average duration, and spend 12% less time in travel. Participation in travel is lower in rural areas, however, so that differences for participants are much reduced. Rural residents spend significantly less time in travel to/from work, childcare, shopping, and education, but participants spend significantly more time in travel for shopping and education activities.

Another important component of this study is the difference between resource and non-resource workers. Resource workers take significantly fewer trips than non-resource workers,

spend less total time in travel, and have trips of lower average duration. Rural resource workers have particularly few trips and low overall travel time, even for participants, while the urban resource group has travel behaviour more akin to that of urban non-resource workers. In general, resource / non-resource differences are smaller and less significant than urban-rural location differences.

Clearly, the two major aspects of rurality included in this paper – rural location and resource-based employment – appear to have strong influences on time use and travel behaviour. Of the two, whether people reside inside or outside the commuter orbit of a city or large town has a larger impact, in aggregate. As a next step, it would be useful to gauge the importance of the two rurality factors relative to other major causes of difference, notably age, sex, and the main activity of the respondent (paid worker, student, homemaker, retiree, etc.). To date, time use researchers have focused almost exclusively on these other factors, and largely ignored locational or geographical ones (Robinson and Godbey, 1999, 17).

However, the simple rural-urban locational split currently employed in the GSS-TU can only take us so far, and this paper's findings strongly indicate the need for a more nuanced rural location index, which will allow us to separate remote rural areas from small towns and urban-oriented commuter-shed areas. Such a categorization has already been developed by Statistics Canada (metropolitan-influence zones, described in Malenfant et al., 2007), but it needs to be included in the GSS-TU data files. Perhaps even more useful would be data files that code respondents by small geographic areas, such as census tracts, postcode districts, or census dissemination areas. Researchers would then be free to construct rurality categories of their own.

Although this paper reports on rurality and time use in only one country, we feel it has much broader significance. Canada is, after all, a large and modern nation, with a full range of rurality conditions. In the highly urbanized corridor between Windsor and Quebec City, for example, the countryside lies mostly within commuting range of cities, and is experiencing many of the pressures and changes common to other crowded regions. In contrast, in the Prairies and the Maritimes cities are few and far between, and most areas may be regarded as 'extreme rural' (Cloke, 1977) or 'remote rural'. An obvious extension to the present work would be to investigate whether there are regional differences in the impacts of rurality. A more difficult and longer-range project would be to compare the Canadian results with those in other countries and regions. However, there are great barriers to such international comparison: despite considerable harmonization between national time use surveys (Gershuny, 2000), few surveys contain data on rurality indicators, even at the crude level reported by the Canadian survey.

References

Artemov, V.A. (1981), Athletic activity in the lifestyle of urban and rural residents (based on time-budget data), in: *International Review for the Sociology of Sport, Vol. 16, No. 1, 53-59,* http://irs.sagepub.com /cgi/reprint/16/1/53.

Atkinson, A.M. (1994), Rural and urban families' use of child care, in: *Family Relations*, Vol. 43, 16-22.

Baumol, W. (1986), Productivity growth, convergence, and welfare – What the long-run data show, in: *American Economic Review*, Vol. 76, 1072-1085.

Beach, B. (1987), Time use in rural home-working families, in: *Family relations*, Vol. 36, 412-416.

Bell, M. (1992), The rural-urban continuum as a system of identity, in: *Rural sociology,* Vol. 57, 65-82.

Biran, A., Abbot, J. and R. Mace (2004), Families and firewood – A comparative analysis of the costs and benefits of children in firewood collection and use in two rural communities in sub-Saharan Africa, in: *Human Ecology*, Vol. 32, 1-25.

Blaikie, P. (1971), Spatial organization of agriculture in some North Indian villages – Part 1, in: *Transactions of the Institute of British Geographers*, Vol. 52, 1-40.

Bowler, I. (1992), The industrialization of agriculture, in: Bowler, I. (ed.), *The geography of agriculture in developed market economies*, Longman, Harlow, 7-31.

Bryant, C., Russwurm, L. and A. McLellan (1982), *The city's countryside*, Longman, London.

Chapin, F. (1974), *Human activity patterns in the city – Things people do in time and in space*, Wiley, New York.

Clark, W. (2000), Traffic report – Weekday commuting patterns, in: *Canadian Social Trends*, No. 11-008, 18-22.

Cloke, P. (1977), An index of rurality for England and Wales, in: *Regional Studies*, Vol. 11, 31-46.

Dahms, F. (1998), Settlement evolution in the Arena Society in the urban field, in: *Journal of Rural Studies*, Vol. 14, 299-320.

Davidson, O. (1989), Doing home work down on the farm, in: *Nation*, Vol. 249, No. 3, 87-90.

Droogleever Fortuijn, J. (1999), Daily life of elderly women in a rural area in the Netherlands, in: *GeoJournal*, Vol. 48, 187-193.

Du Plessis, V. and M. Cooke-Reynolds (2005), Self-employment activity of rural Canadians, in: *Canadian Social Trends*, Vol. 76, 18-23.

Ellegard, K. and B. Vilhelmson (2004), Home as a pocket of local order – Everyday activities and the friction of distance, in: *Geografiska Annaler – Series B Human Geography*, Vol. 86, 281-296.

Featherstone, M. (ed.) (1990), *Global culture – Nationalism, globalization and modernity*, Sage, London.

Feser, E. and S. Sweeney (2003), Out-migration, depopulation, and the geography of US economic distress, in: *International Regional Science Review*, Vol. 26, 38-67.

Fisher, K., Egerton, M., Gershuny, J. and J. Robinson (2007), Gender convergence in the American heritage time use study (AHTUS), in: *Social Indicators Research*, Vol. 82, 1-33.

Friedmann, J. and J. Miller (1965), The urban field, in: *Journal of the American Institute of Planners*, Vol. 31, 312-319.

Furuseth, O. (1998), Service provision and social deprivation, in: Ilbery, B. (ed.), *The geography of rural change*, Longman, Harlow, 233-256.

Gershuny, J. (2000), *Changing times – Work and leisure in postindustrial society*, Oxford University Press, Oxford.

Gilg, A. (1983), Population and employment, in: Pacione, M. (ed.), *Progress in rural geography*, Croom Helm, Beckenham/Kent, 74-105.

Goodchild, M., Klinkenberg, B. and D. Janelle (1993), A factorial model of aggregate spatiotemporal behaviour – Application to the diurnal cycle, in: *Geographical Analysis*, Vol. 25, 277-294.

Gordon, W. and M. Caltabiano (1996), Urban-rural differences in adolescent self-esteem, leisure boredom and sensation-seeking as predictors of leisure-time usage and satisfaction, in: *Adolescence*, Vol. 31, 883-901.

Gradstein, M. and M. Justman (2002), Education, social cohesion, and economic growth, in: *The American Economic Review*, Vol. 92, 1192-1204.

Grossman, L. (1984), Collecting time-use data in third world rural communities, in: *The Professional Geographer*, Vol. 36, 444-454.

Hagerstrand, T. (1970), What about people in regional science?, in: *Papers and Proceedings of the Regional Science Association*, Vol. 24, 7-21.

Hagerstrand, T. (1996), Diorama, path and project, in: Agnew, J., Livingstone, D. and A. Rogers (eds.), *Human geography: an essential anthology*, Blackwell, Oxford, 650-674.

Halfacree, K. (1993), Locality and social representation – Space, discourse and alternative definitions of the rural, in: *Journal of Rural Studies*, Vol. 9, 23-37.

Hamilton, B. (1982), Wasteful commuting, in: *The Journal of Political Economy*, Vol. 90, 1035-1053.

Harrington, V. and D. Donoghue (1998), Rurality in England and Wales 1991 – A replication and extension of the 1981 rurality index, in: *Sociologia Ruralis*, Vol. 38, 178-203.

Harvey, A. (1994), Changing temporal perspectives and the Canadian metropolis, in: Frisken, F. (ed.), *The changing Canadian metropolis – A public policy perspective – Vol. 1*, Institute of Governmental Studies Press, Berkeley, 151-199.

Healey, M. and B. Ilbery (eds.) (1985), *The industrialization of the countryside*, Geobooks, Norwich.

Hoggart, K. (1990), Let's do away with rural, in: *Journal of Rural Studies*, Vol. 6, 245-257.

Ilbery, B. and I. Bowler (1998), From agricultural productivism to post-productivism, in: Ilbery, B. (ed.), *The geography of rural change*, Longman, Harlow, 57-84.

Janelle, D. (1969), Spatial reorganization: a model and concept, in: *Annals of the Association of the American Geographers*, Vol. 59, 348-364.

Janelle, D. (1993), Urban social behaviour in time and space, in: Bourne, L. and D. Ley (eds.), *The changing social geography of Canadian cities*, McGill-Queen's University Press, Montreal, 103-118.

Janelle, D. (2001), Time-space, in: Smelser, N. and B. Baltes (eds.), *International encyclopedia of the social and behavioural sciences*, Pergamon-Elsevier Science, Amsterdam, 15746-15749.

Janelle, D. and M. Goodchild (1983), Transportation indicators of space-time autonomy, in: *Urban Geography*, Vol. 4, 317-337.

Jones, P., Dix, M., Clarke, M. and I. Heggie (1983), *Understanding travel behaviour*, Gower, Aldershot Hants.

Knowles, R. (2006), Transport shaping space – Differential collapse in time-space, in: *Journal of Transport Geography*, Vol. 14, 407-425.

Lamb, R. (1983), The extent and form of exurban sprawl, in: *Growth and Change*, Vol. 14, 40-48.

Lewis, G. and D. Maund (1976), The urbanisation of the countryside – A framework for analysis, in: *Geografiska Annaler B*, Vol. 58, 17-27.

Ma, K.-R. and D. Banister (2007), Urban spatial change and excess commuting, in: *Environment and Planning A*, Vol. 39, 630-646.

Malenfant, E., Milan, A., Charron, M. and A. Belanger (2007), *Demographic changes in Canada from 1971 to 2001 across an urban-to-rural gradient*, Cat. No. 91F0015MIE, No. 008, Statistics Canada, Demography Division, Ottawa.

Marsden, T., Lowe, P. and S. Whatmore (eds.) (1990), *Rural restructuring: global processes and local responses*, Wiley, London.

May, J. and N. Thrift (eds.) (2001), *Timespace – geographies of temporality*, Routledge, London.

Meiners, J. and G. Olson (1987), Household, paid, and unpaid work time of farm women, in: *Family Relations*, Vol. 36, 407-411.

Miller, H. (2005), Necessary space – Time conditions for human interaction, in: *Environment & Planning B – Planning & Design*, Vol. 32, 381-401.

Millward, H. (2000), The spread of commuter development in the Eastern Shore zone of Halifax, Nova Scotia, 1920-1988, in: *Urban History Review*, Vol. 29, 21-32.

Millward, H. (2005), Rural population change in Nova Scotia – 1991-2001 – Bivariate and multivariate analysis of key drivers, in: *The Canadian geographer*, Vol. 49, 180-197.

Minge-Klevana, W. (1980), Does labor time decrease with industrialization?, in: *Current Anthropology*, Vol. 21, 279-298.

Murdoch, J. and A. Pratt (1993), Rural studies: modernism, postmodernism and the 'post-rural', in: *Journal of Rural Studies*, Vol. 9, 411-427.

Nowotny, H. (1994), *Time – The modern and postmodern experience*, Polity Press, Cambridge, UK.

Nutley, S. (1985), Planning options for the improvement of rural accessibility – Uses of the time-space approach, in: *Regional Studies*, Vol. 19, 37-50.

Pacione, M. (1982), The viability of smaller rural settlements, in: *Tijdschrift voor Economische en Sociale Geografie*, Vol. 73, 149-161.

Pahl, R. (1966), The rural-urban continuum, in: *Sociologia ruralis*, Vol. 6, 299-327.

Parkes, D. and N. Thrift (1975), Timing space and spacing time, in: *Environment and Planning A*, Vol. 7, 651-670.

Pentland, W., Harvey, A., Lawton, P. and M. McColl (eds.) (1999), *Time use research in the social sciences*, Kluwer Academic/Plenum Publishers, New York.

Peters, P. (2006), *Time, innovation, and mobilities – Travel in technological cultures*, Routledge, New York.

Plane, D. (1981), The geography of urban commuting fields, in: *The Professional Geographer*, Vol. 33, 182-188.

Pred, A. (1996), The choreography of existence: comments on Hagerstrand's time-geography and its usefulness, in: Agnew, J., Livingstone, D. and A. Rogers (eds.), *Human geography – An essential anthology*, Blackwell, Oxford, 636-649.

Pryor, R. (1968), Defining the rural-urban fringe, in: *Social Forces*, Vol. 47, 202-215.

Pucher, J. and J.L. Renne (2005), Rural mobility and mode choice – evidence from the 2001 National Household Travel Survey, in: *Transportation*, Vol. 32, 165-186.

Robinson, G. (1990), *Conflict and change in the countryside*, Bellhaven, London.

Robinson, J. and G. Godbey (1999), *Time for life – The surprising ways Americans use their time*, 2nd edition, Pennsylvania State University Press, University Park, Pennsylvania State University.

Robson, E. (2004), Children at work in rural northern Nigeria: patterns of age, space and gender, in: *Journal of Rural Studies*, Vol. 20, 193-210.

Russwurm, L. (1976), Country residential development and the regional city form in Canada, in: *Ontario Geography*, Vol. 10, 79-96.

Skoufias, E. (1993), Labor-market opportunities and interfamily time allocation in rural households in South Asia, in: *Journal of Development Economics*, Vol. 40, 277-310.

Smailes, P. (2002), From rural dilution to multifunctional countryside: some pointers to the future from South Australia, in: *Australian Geographer*, Vol. 33, 79-95.

Smailes, P., Argent, N. and T. Griffin (2002), Rural population density: its impact on social and demographic aspects of rural communities, in: *Journal of Rural Studies*, Vol. 18, 385-404.

Stabler, J. and M. Olfert (1996), Spatial labor markets and the rural labor force, in: *Growth and Change*, Vol. 27, 206-230.

Su, B., Shen, X. and Z. Wei (2006), Leisure life in later years: differences between rural and urban elderly residents in China, in: *Journal of Leisure Research*, Vol. 38, 381-397.

Taylor, P. and D. Parkes (1975), A Kantian view of the city: a factorial-ecology experiment in space and time, in: *Environment and Planning A*, Vol. 7, 671-688.

Thrift, N. and A. Pred (1981), Time-geography: a new beginning, in: *Progress in Human Geography*, Vol. 5, 227-286.

Tillberg Mattsson, K. (2002), Children's (in)dependent mobility and parents' chauffeuring in the town and the countryside, in: *Tijdschrift voor Economische en Sociale Geografie*, Vol. 93, 443-453.

Timmermans, H., Arentze, T. and C.-H. Joh (2002), Analysing space-time behaviour: new approaches to old problems, in: *Progress in human geography*, Vol. 26, 175-190.

Tomlinson, R. (1999), *Globalization and Culture*, University of Chicago Press, Chicago.

Troughton, M. (1986), Farming systems in the modern world – Agricultural industrialization, in: Pacione, M. (ed.), *Progress in agricultural geography*, Croom Helm, London, 93-123.

Turcotte, M. (2006), The time it takes to get to work and back – 2005, Statistics Canada, Ottawa, http://www.stat can.gc.ca/pub/89-622-x/89-622-x2006001-eng.pdf.

Whitehead, A. (1999), 'Lazy men', time-use, and rural development in Zambia, in: *Gender and Development*, Vol. 7, No. 3, 49-61.

Wimberley, R. (1993), Policy perspectives on social, agricultural, and rural sustainability, in: *Rural Sociology*, Vol. 58, 1-29.

Keeping in touch – A benefit of public holidays using time use diary data

Joachim Merz and Lars Osberg

Joachim Merz
Department of Economic, Law and Behavioural Social Sciences
Leuphana University Lüneburg
Research Institute on Professions (Forschungsinstitut Freie Berufe, FFB)
Campus Scharnhorststr. 1
21335 Lüneburg, Germany
e-mail: merz@uni-lueneburg.de

Lars Osberg
Department of Economics
Dalhousie University
Halifax, Nova Scotia B3H 3J5, Canada
e-mail: Lars.Osberg@dal.ca

Abstract

This paper argues that public holidays facilitate the co-ordination of leisure time but do not constrain the annual amount of leisure. Public holidays therefore have benefits both in the utility of leisure on holidays and (by enabling people to maintain social contacts more easily) in increasing the utility of leisure on normal weekdays and weekends. The paper uses the variation in public holidays across German Länder based on more than 37.000 individual diary data of the actual German Time Use Survey of 2001-02 to illustrate the positive association between more public holidays and social life on normal weekdays and weekends. These benefits are additional to the other, direct benefits of public holidays.

1   Introduction

In thinking about how to organize labour and leisure in modern societies, why (in all societies) do we not just leave the issue as a purely private decision? What are the benefits of *public* holidays? What is the optimal number of such holidays?

This paper argues that – within the range of variation now observed in affluent economies – the major social function of public holidays is to facilitate co-ordination in the timing of leisure. Co-ordination of leisure time has costs (e.g. in congestion of leisure facilities) and benefits (in making it easier for people to arrange to get together socially). In this paper, we focus on one aspect of the benefits. We argue that the easier socialization enabled by co-ordination has benefits that extend beyond time use on public holidays to time use on normal workdays and normal weekends, because "keeping in touch" on holidays helps maintain social contacts and enables easier social matching *at other times* – i.e. on normal workdays and weekends. Hence, if public holidays facilitate social leisure time matching and increase the marginal utility of leisure on normal workdays and weekends, the increase in the utility value of leisure time on those days should be counted as a benefit. The focus of this paper is, therefore, on illustrating the the possible role which public holidays might play in time use on "normal" (i.e. non-holiday) weekdays and weekends.

Public holidays ensure that most individuals will have leisure time at the same time, but public holidays do not typically force individuals to consume more leisure in any given year. In, for example, the German data which we use, Bavaria has the most public holidays (17), while other Länder have from 13 to 16 public holidays (see Appendix A) – but even Bavarian workers still have 348 other days each year in which they could vary their working time to compensate for any unwanted "excess" leisure on their 17 public holidays. Employers and employees can agree to shorter private vacations, weekend working or longer hours of work on normal workdays if that is in their mutual interest, or workers can look for new jobs with different hours, or for second jobs. Both workers and firms have multiple possible margins of adjustment to enable them to optimize their total annual consumption of leisure time[1] - but public holidays are a unique type of leisure time which is co-ordinated with others.

From this co-ordination perspective, the fact that Bavarians have 17 public holidays, while residents of Berlin, Bremen, Hamburg and some other Länder have only 13, can be seen as a 30% differential in non-weekend[2] co-ordinated leisure time (i.e. public holidays) across German Länder. What implications might this variation in leisure co-ordination have?

---

[1]   The predictability and long standing nature of public holiday entitlements means that workers and firms have had lots of opportunity to adjust at other margins of labour supply. If, as we argue below, the marginal utility of leisure time increases when the number of public holidays increases, total desired consumption of leisure – and total utility – will rise, but it still remains true that the number of public holidays is typically not a binding constraint on total annual leisure consumption.

[2]   Although religious duty to observe the Sabbath can explain the historic origins of the 'weekend', in a secular and multi-cultural society the co-ordination of leisure time is its primary social function. In the recent litera-

The theoretical context of our analysis is the large literature on social interaction/social capital (e.g. Osberg, 2003b) which stresses the importance of social norms and public arrangements to optimal co-ordination of human activity (in this case, daily work and leisure) for individual well-being (Osberg 2003, Jenkins and Osberg 2005, Merz 2002 b). Our emphasis on the social implications of working hours contrasts with the purely individualistic orientation of *labour market/labour supply analyses* (e.g. Ehrenberg and Smith 2003, Ashenfelter and Layard 1986, Ashenfelter and Card 1999). The empirical basis of our analysis is embedded in time use research which focuses on time as a comprehensive dimension of describing the universe of daily activities (Gershuny, 2002; Merz, 2002a; Merz and Ehling, 1999, Harvey, 1999).

Section 2 of this paper extends the model of social leisure time matching advocated in Osberg (2003) and Jenkins and Osberg (2005) to recognize the fact that having a social life requires social contacts, which typically atrophy if people "don't keep in touch". It conjectures that in Länder with more public holidays, greater possibilities for leisure co-ordination will mean that individuals typically have a longer list of social contacts, and will consequently be able to match more easily with others to consume social leisure on normal non-holiday workdays, Saturdays and Sundays. Section 3 uses the more than 37.000 individual diaries of the actual German Time Use Study 2001/02 to examine these hypotheses – Section 3.1 describes the data, while Section 3.2 presents simple summary statistics and Section 3.3 uses a regression approach to assess the correlation between public holidays and social time, arts and cultural activities and community meetings. The literatures on social capital, health and culture have separately emphasized the social value of each of these types of time use, and our model of time use predicts higher levels of individual well-being where individuals can choose from more leisure time options. Section 4 therefore discusses the public policy implications.

We recognize that we have only considered some of the benefits of public holidays, and that a fuller analysis should also consider the costs of more public holidays and the extent of diminishing returns to the number of public holidays. We also recognize that in a cross-section of data we cannot hope to rigorously disentangle causation and correlation. Nevertheless, the point of this paper is to illustrate the possible importance of a benefit of public holidays – improved leisure time co-ordination – which has not previously received much, if any, attention.

2 The utility value of "Keeping in touch" – A model

The core hypothesis of this paper, and of Jenkins and Osberg (2005), is that an individual's time use choices are typically contingent on the time use choices of others, because the utility

---

ture, Jacobsen and Kooreman (2005) have examined the implications of relaxation of constraints on shopping hours in Holland for market work, shopping, and "leisure" (the aggregate of all other activities) while Skuterud (2005) has analyzed Sunday shopping regulation in Canada. In general, the more that weekend days come to resemble weekdays, the greater is the relative importance of public holidays as a leisure time co-ordination device.

derived from leisure time often benefits from the presence of companionable others. Jenkins and Osberg argued that although the labour supply literature has often started from the premise that individuals maximize the utility they derive from their own consumption of market goods and non-work time, time spent in isolation is, for most people, only pleasurable in small doses. Many of the things that people actually want to do in their non-work time are more pleasurable if done with others – foreign travel or choral singing are particularly clear examples. Indeed, many activities (such as playing soccer or bridge) are impossible without others. However, the huge variety of leisure tastes that people have means that individuals have the problem of locating Suitable Leisure Companions – 'somebody to play with' – and of scheduling simultaneous free time. Consequently, if paid work absorbs more of other people's time, each person will find their own leisure time scheduling and matching problem more difficult to solve (i.e. their leisure hours will be of less utility). As a result, imperfect co-ordination can leave everybody worse off than they need be – there is an externality to individual labour supply choices that implies the possibility of multiple, sometimes Pareto-inferior, labour market equilibria.

Jenkins and Osberg 2005, however, took the number of social contacts of each individual as given. In this paper, we add to the previous model the realistic assumption that social contacts will depreciate if not used for some time. This endogeneity of social contacts implies that localities where individuals are more easily able to renew their social contacts will, other things equal, also be localities where the marginal utility of leisure time (and total utility) is greater.

A model of the division of time between work time, and solo and social leisure time

Traditionally, neo-classical labour supply theory has used a one period model, and has assumed that each individual maximizes a utility function dependent on consumption (*C)* of goods and services and leisure (*L*). Equation 1 summarizes the total time (*T)* available constraint for hours of paid work (*H*) and non-work time (*L*). Equation 2 expresses the money income constraint on consumption, which is driven by the wage rate per hour actually worked which is available in the paid labour market (*w*).[3]

The innovation of this article is to suppose that individuals can spend their non-work time either alone or in social leisure[4]. We denote the non-work hours spent alone as *A* and the non-work time spent in social leisure as *S*. The total time constraint then becomes (1).

---

[3]   Clearly, this formulation assumes that work hours are available without quantity constraint at a constant real wage, without progressive taxation. Non-labour income (from capital or transfer payments) is assumed to be zero, and any complications of human capital investment through on the job training are ignored. In the real world, non-work time may come in a variety of forms – paid public holidays, paid vacation days or unpaid leisure time [e.g. on weekends and evenings]. When firms pay for public holidays and vacations as well as for time actually worked, workers' compensation per hour actually worked exceeds their nominal hourly wage. However, in our view this is just an issue of packaging. We presume that individuals and firms can see through the packaging of non-work time to the fundamental financial constraint that material consumption cannot exceed earned income, and the total time constraint that hours actually worked plus hours spent in social leisure plus hours spent in solo leisure add up to total available time – as expressed in Equations 1A and 2.

[4]   We shall ignore issues of time spent in household production in order to focus on the leisure time dimension. Alternatively, one can think of household production choices as being part of H, and the goods produced by household labour as part of C.

(1) $H + L = H + A + S = T$

Consumption *C* is still constrained in same manner, as in Equation 2.

(2) $C \leq wH$.

However, the core problem with wanting to have a social life is that one cannot do it unilaterally. Arranging a social life involves a search process which is constrained by the social contacts available to each person, and by the availability of other people. To keep things as similar as possible to the traditional model, we assume that before arranging their social life, individuals have to commit to a specific duration and timing of their work hours.[5] In this revised model, individuals decide how many hours they want to work, and must start each period by making a commitment to a specific number of work hours, at specific times. This decision determines money income, which determines the utility from material consumption. However, at the start of the period, the utility to be derived from social life is necessarily uncertain because the search process for Suitable Leisure Companions involves uncertainty, since some desired social matches may not be feasible. Time spent alone, and not working, is the residual after work and social commitments are honoured.

In the revised model, total utility experienced during a period will be determined by consumption *C*, social leisure time *S* and solo leisure time *A* – as given by (3)[6]:

(3) $U = u(C, A, S)$

This revised model is, therefore, a generalization of the traditional model, and nests the traditional model. In the traditional model, it is only the total amount of non-work time (the sum of social and solo leisure) that matters: the division of that time between time spent with others and time spent alone is irrelevant.[7]

In looking for leisure companions, the probability that a specific leisure match will be feasible can be denoted by p_i, where the subscript *i* indexes the identities of each of *k* possible Suitable Leisure Companions, and the utility associated with that match as $u(S_i)$.[8] The expected utility of a specific social leisure match is then given by $p_i u(S_i)$. Individuals will then maximize their expected utility as in (5):

(4) $\max \mathbf{E}(U) = u(C) + \sum_{i \in k} p_i u(S_i) + u_A[T - H - \sum_{i \in k} p_i(S_i)]$

---

[5]   To keep things simple, we assume that the process of arranging one's social life takes no time at all, even if its results are uncertain, ex ante, at the start of each period (one could call this a 'speed dialling' assumption). Although a referee has suggested that only leisure time spent with non-family members should count as social leisure time, we think it more accurate to see co-resident family members as coming closest to our 'speed-dialling' assumption of zero time cost to arranging social leisure. But even so, when both spouses are employed, it is not necessarily easy to find coincident slots of non-work time to enjoy together, implying a non-zero probability that one's spouse may not be available for any specific proposed leisure activity.

[6]   To avoid excess notation, we suppress for now the subscript t denoting the time period.

[7]   Taken literally, this implies that, with a given amount of consumption goods and work time, a person's utility level would be unaffected were they to be deprived of social leisure altogether – as, for example, in solitary confinement.

[8]   Without loss of generality one could index potential matches by timing, duration, and purpose, as well as by the identity of the other leisure companions.

where u_A is the utility of non-work time spent alone.

The solution of the constrained optimization problem under uncertainty then equalizes the marginal utility of solo leisure MU_A, the marginal utility of social leisure MU_S, and the marginal utility of work MU_H with

$$
\begin{aligned}
MU_A &= \partial E(U)/dA, \\
MU_S &= \partial E(U)/dS, \\
MU_H &= \partial E(U)/dH.
\end{aligned}
$$

(5)

To illustrate how this model compares with the traditional model, consider first how an individual's labour supply decision is usually pictured. The traditional model assumes that paid work hours are continuously available and can be decided with certainty at the start of each period[9] and that there are only two possible uses of total time – which implies that the hours of work decision directly determines hours of leisure time, whose utility is known with certainty. Both material consumption and leisure time are assumed to have diminishing marginal utility, so utility is maximized when the marginal utility of time used for work and for leisure is equal. One can denote the implied optimal labour supply as H^* hours.

In the revised model, paid work enables material consumption in exactly the same way as in the traditional model – utility maximization implies optimal paid working time (H^*). Because each period must be started with a decision about working hours, that decision determines total hours of non-work time. However, the revised model assumes that individuals will try to maximize the utility to be derived from any given amount of non-work time by comparing the utility to be derived from solo and social leisure time. Figure 1 presents a diagrammatic treatment of the choice process. It represents the marginal utility derived from the allocation of time for each individual.

In order for a decision about total work hours (H^*) to be optimal, the expected marginal utility of all three uses of time (work, solo leisure and social leisure) must be equal for each individual. The optimal ex ante division of time between desired solo and social leisure is pictured in the right hand side of Figure 1. Figure 1 presumes a given set of decisions by *other* people as to their working hours, which determines the probability vector p defining the chances that specific leisure match will be feasible.

---

[9] For our present purposes, we can assume either a constant money wage per hour with diminishing marginal utility to additions to material consumption, and/or that the marginal productivity (and wage) of each worker decline with greater working hours.

Figure 1
The implications of fewer current contacts
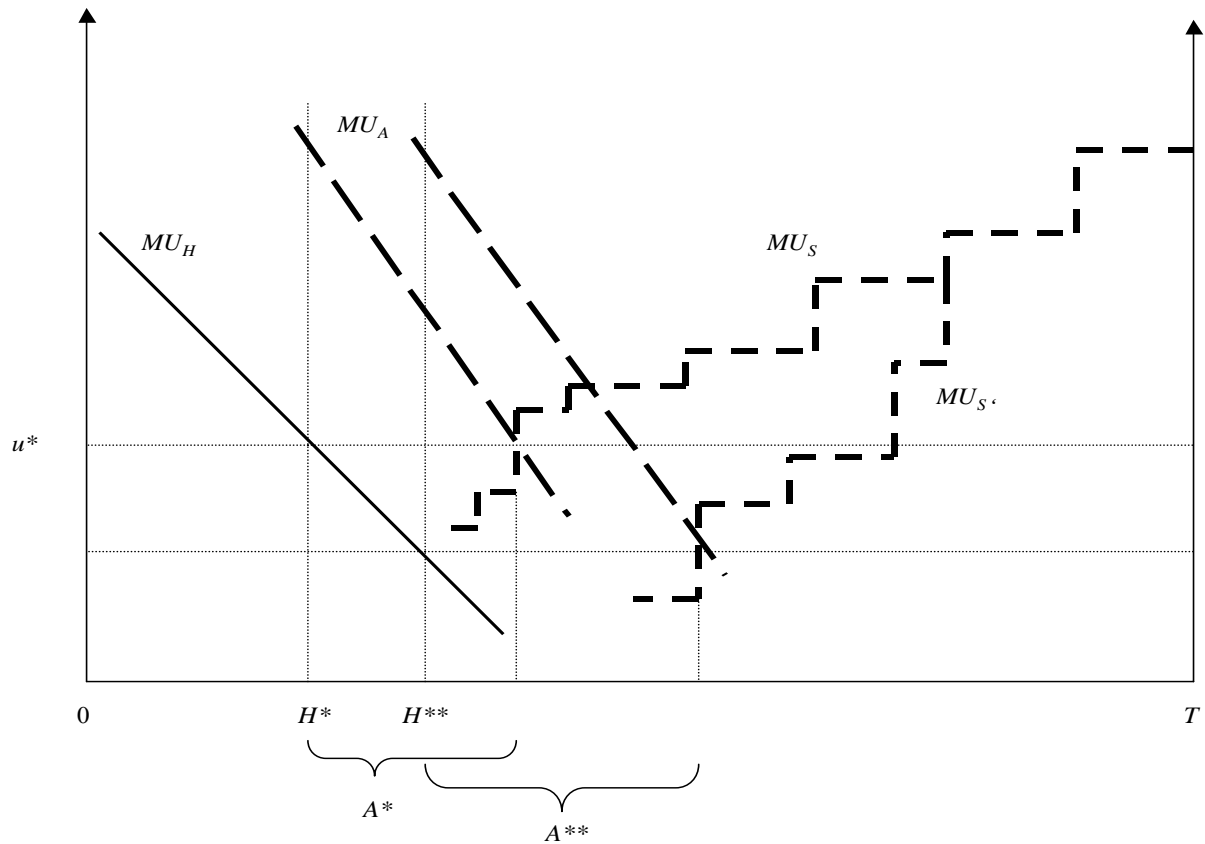
Source: Own illustration.

In order to indicate the uncertainty of the search process for Suitable Leisure Companion(s), dashed lines are used. The marginal utility of social leisure is drawn in discrete steps to represent the idea that because social leisure time must, by definition, involve an agreement with others about the duration of time to be spent together, it will typically come in discrete lumps. The downward slope of the MU_S function represents the idea that potential social matches can be ordered by their expected utility (social matches on the bottom steps, where MU_S is below u^*, correspond to engagements that would be rejected as having less expected utility than time spent alone). The MU_S function is conditional on the labour supply decisions of others, and on the own labour supply decision made at the start of each period. Utility-maximizing individuals will want to choose the division of total time which equates (as nearly as possible) the marginal utility from working, and from social leisure and solo leisure time. Hence, Figure 1 is drawn to illustrate the equilibrium condition that $MU_{H*} = MU_{A*} = MU_{S*}$.

In solving the problem of arranging a satisfactory social life, all individuals face two constraints, which can be summarized as:

(1) "who do you know that you could call?" – which we summarize as the list of k potential contacts available at any point in time; and

(2) "what are the chances they would be available and agree to a date?" – which we summarize in the probability vector p_i defining the chances that specific leisure matches will be feasible.

The probability vector p_i depends on the amount of time potentially available when neither party to the potential match is committed to working. Since the timing and the duration of their mutual engagement cannot overlap with the working time of either party, p_i is clearly negatively associated with both own work hours (H), and the work hours of Suitable Leisure Companions that do not overlap with each person's own work hours (H_S).[10] Together H and H_S characterise the time which is not available for a social match:

(6) $p_i = g(H + H_S)$
         where $g'(H) < 0$, and $g'(H_S) < 0$.

On a public holiday, or on weekends, $H = H_S = 0$. Social leisure matches are then easier to arrange – and it is clear that these activities are highly valued by many people. It is observable that despite the predictable congestion surrounding many public holidays, people do choose to bear greater travel costs in order to spend time with friends and relatives. The greater social activity of individuals on public holidays, compared to other days, is pretty obvious.

However, the question this paper asks is how a greater or smaller number of public holidays may influence what individuals do on other days – Saturdays, Sundays and "normal" (i.e. non-holiday) weekdays. To keep things simple, we assume that the marginal utility derived from the material consumption enabled by own working hours (MU_H) depends only on the amount of such consumption[11]. Our hypothesis is that fewer public holidays means that the probability of arranging good leisure matches (on workdays and normal Saturdays and Sundays) falls, implying that the marginal utility of social leisure time (MU_S) will decline, which can be represented in Figure 1 by the downward shift to the new schedule labelled MU_S.[12] Why might this be the case?

This paper argues that social life is typically characterized by feedback effects – e.g. acquaintanceships that start with an introduction by some other acquaintance or close friendships that develop as the result of repeated contact, which increase the desire for more contact.

---

[10] Since some people are in 'on-call' work situations or have jobs with involuntary overtime or rotating shifts, one should really think of 'hours available for work', rather than 'hours actually worked' in analysing scheduling issues. Equation (6) writes the probability of a successful leisure match as dependent only on the time available to each potential pair of leisure companions. This ignores any capital or other inputs required for a specific leisure activity (e.g. squash court availability) and the consequent possibility of short run congestion effects in leisure industries. If leisure activities require capital inputs and if there were a general decline in working hours, greater congestion in leisure facilities would be likely to produce both some substitution of activities and capital inflow. Strictly speaking, (6) represents the probability of a specific (marginal) leisure match. We leave the specification of a full model of the leisure production function, and the supply of leisure facilities, to further work.

[11] Phrased in more technical terms, we assume that the utility function of Equation 3 is separable in its arguments.

[12] There is no necessary reason to assume that all potential leisure matches are affected equally. All that matters is that the marginal leisure match is affected. Hence Figure 1 is drawn so that MUS = MUS′ over an initial range.

Although some contacts are made every day by anyone who participates in society, it takes repeated contact to maintain a relationship. Since other people may move, change phone numbers or decline an invitation from somebody with whom they have had no contact for a while, contacts that are not revisited will eventually expire. The implication is that more social leisure one has, the more people one meets – and the more invitations to go out one receives, so that the social life that individuals have today depends on the social life that they have had in the past.

A parsimonious approach to modelling these feedback processes is to suppose that some amount of social contact (θ) is always exogenously available to individuals, but other social contact is endogenously determined, because after some period of time (*D*) a social relationship will expire, if not revisited. In real life, each specific relationship of a given person probably has a different maximum period of neglect before expiry, indeed parental and sibling relationships can usually survive years of neglect (i.e. *D* is a large number) – but although marriage was traditionally viewed as being 'forever', it is common now to observe that even the most loving spouse will eventually opt for divorce if ignored for too long. However, to simplify we write the contacts of an individual in any given period (k_t) as a positive function of total social leisure time in the past *D* periods, as in Equation (7).[13]

(7) $k_t = \theta + f(\Sigma^t_{i,t-D} (S_{it}))$ $f' > 0$

Localities with fewer public holidays will therefore be localities where individuals have had less chance in the past to "keep in touch" – and because individuals in such localities have fewer contacts (i.e. $\delta k_t / \delta$ (PUBHOL) > 0), they will have a lower current marginal utility of leisure time. Given the equilibrium condition $MU_{H*} = MU_{A*} = MU_{S*}$, and the decline in the marginal utility of social leisure time ($MU_{S'}$), the model in Figure 1 predicts that the marginal utility of solo leisure schedule (MU_A) shifts to the right, but its shape remains the same (since nothing has happened that would affect the pleasures of a marginal hour of solitary leisure). This implies that the individual's social leisure time declines from *S** to *S*** and hours of work increase from *H** to *H***.

Our model does not presume that social leisure always generates more utility than solo leisure, just that it *sometimes* does. (Since hermits are relatively rare – i.e. it is easy to observe that most people both want some time alone and also voluntarily choose some social leisure – this assumption seems unobjectionable to us.) Given that proposition, the model predicts unambiguously that an individual's working time will increase and social leisure time will decrease, when social leisure time becomes harder to arrange because there are fewer common

---

[13] Alternatively, one could write kt as dependent on the number of successful social matches (nt) in the last D periods, or one could argue that more time spent together in the past will imply a greater readiness on the part of others to accept an individual's social invitations (i.e. δpi /δ(ΣDit (Sit)) > 0) or one could argue that individuals get greater utility from interaction with closer friends (i.e. δu(Si))/δ(ΣDit (Sit)) > 0) – but all these formulations have the same qualitative impact on the expected utility from social leisure – i.e.on $\Sigma_{i \in k}$ piu(S_i). The verbal interpretation of Equation 7 is that some level of contacts (θ) are always available but people who have spent more time socializing in the past have a longer list of social contacts, which expire if not used for some time – i.e. only the last *D* periods produce currently valuable social contacts.

leisure days and some social contacts therefore atrophy from disuse. In the alternative case, when social leisure time is easier to arrange because there are more common leisure days, our model predicts unambiguously that an individual's working time will decrease and social leisure time will increase.

3 Data

To see if this perspective is consistent with observed behaviour, we use the German Time Use Study 2001/02 of the German Federal Statistical Office which collected 37700 time use diaries from 12600 persons in 5400 households (Ehling 1999, 2004). The core tool was a diary kept by all household members - from the age of ten – in which respondents recorded the course of the day in their own words for three days, i.e. two weekdays and one Saturday or Sunday. Survey days were randomly selected and the duration of individual activities was indicated in ten-minute intervals. In addition to what the respondents considered their primary activity, a secondary activity could be entered and respondents were asked with whom activities were performed (this had to be marked in preset categories - children under 10 years, spouse/partner, other household members, other acquainted persons). The location of activities and any mode of travel were recorded in connection with the primary activity. The population sampled comprises all private households shown in the micro-census at their place of main residence, i.e. the German speaking foreign population was included. Total sample size is evenly distributed over 12 months. Activities were described by the respondents, and coded into preset categories – Appendix C lists the independent variables while Appendix D lists the coding descriptions of dependent variables used in this study.

Every participating household filled in a household questionnaire, covering household composition, housing situation and infrastructure of the housing environment, information on time spent providing unpaid help to members of other households in the last four weeks and other assistance received, etc. All persons keeping a diary also filled in an additional individual questionnaire, with detailed questions on the situation of individual household members (e.g. educational qualification, conditions of labour force participation, health, personal ideas regarding time use, etc.). Field work started in April 2001 and was finished in May 2002.

4 Microeconometric results

On average, how much time do people of working age (25 to 54) spend going out for entertainment, participating in civic, political and religious meetings or in any type of non-work activity that involves persons beyond their immediate household? Table 1 compares the responses of Germans by Länder type, where 0 denotes Länder with only the minimum 13 national public holidays, while Länder types 1 to 4 refer to the number of extra public holidays in the Länder in which the respondent livedIt reports the average time spent in each type of

activity separately for "normal" (i.e. non-holiday) weekdays and for Saturdays and Sundays, because time usage clearly differs so much on weekends and weekdays. (We caution that, as Appendix A documents, there are several Länder in each category with one exception – only Bavaria has four extra public holidays. Hence our data cannot distinguish between the impact of the fourth holiday or a specific "Bavaria effect".)

Table 1a
Time spent in social activities by Länder type

	Average minutes per day (including zeroes)					
	Länder type*					
Weekdays	0	1	2	3	4	All Länder
Entertainment	10.48	9.00	12.91	14.37	11.67	12.00
Meetings	2.30	2.09	2.36	2.90	2.78	2.48
Social time	110.41	109.94	119.92	117.07	107.44	114.34
	Länder type*					
Saturdays	0	1	2	3	4	All Länder
Entertainment	31.28	42.63	40.15	49.86	35.08	39.54
Meetings	3.67	4.19	3.14	2.86	7.36	3.99
Social time	214.76	197.49	225.06	214.81	190.84	212.26
	Länder type*					
Sundays	0	1	2	3	4	All Länder
Entertainment	29.03	24.65	36.27	30.30	38.31	32.46
Meetings	6.93	5.49	7.12	6.82	12.53	7.55
Social time	149.59	162.17	171.56	180.40	199.11	171.57

*Länder types: 0 no additional but standard 13 public holidays;
Länder types 1, 2 etc.: respecteive additional (to 13) public holidays.
Source: German Time Budget Survey 2001/02, own computation.

In general, the relationship between average time usage and Länder type is not monotonic (with the exception of social time on Sundays, which increases steadily from an average 150 minutes in the Länder with least holidays to 199 minutes in the Länder with most holidays). Nevertheless, it is almost always true that the average time spent in these three different types of social activity is greater in Länder with more public holidays that in those Länder with the minimum holidays – and the differences can be fairly substantial, in a proportionate sense. In, for example, Länder with three extra public holidays, on a normal non-holiday weekday the average 25 to 54 year old spent 37% more time going out for entertainment, 21% more time going to meetings and 6% more time in all types of non-work activity involving others outside the household.

In the example of time spent on entertainment outside the home on weekdays cited above, the difference between residents of Länder with three extra holidays and those in Länder with zero extra holidays was 37% (= (14.37 − 10.48)/10.48). Expressed on an "average, minutes

per day" basis this was just 3.89 minutes daily, but there are roughly 240 normal working days in a year and social engagements normally come in discrete time commitments with a distinct length. Hence, if entertainment events outside the home are normally about two hours in length, another way to express the difference between residents of Länder with three extra holidays and those in Länder with zero extra holidays is to say that it amounts to about 7.8 additional social engagements per year[14].

Table 1b
Time spent in social activities by Länder type

	Average minutes per day (without zeroes, positive values only)					
	Länder type*					
Weekdays	0	1	2	3	4	All Länder
Entertainment	131,22	161,59	154,02	165,14	147,60	151,36
Meetings	102,17	82,39	76,16	90,90	74,86	83,65
Social time	131,85	132,97	141,95	137,69	130,32	136,28
	Länder type*					
Saturdays	0	1	2	3	4	All Länder
Entertainment	154,27	212,60	189,55	227,00	195,80	193,02
Meetings	122,86	71,65	71,91	107,83	82,42	85,63
Social time	248,99	225,51	269,02	244,75	237,53	249,89
	Länder type*					
Sundays	0	1	2	3	4	All Länder
Entertainment	146,26	125,41	164,18	149,07	160,30	152,87
Meetings	75,35	76,52	68,62	71,64	72,25	71,81
Social time	183,65	198,78	210,16	213,33	223,96	206,31

*Länder types: 0 no additional but standard 13 public holidays;
Länder types 1, 2 etc.: respecteive additional (to 13) public holidays.
Source: German Time Budget Survey 2001/02, own computation.

Arguably, the variation of public holidays in Germany between 13 and 17 days provides information only on a limited subset of the potential variation in public holiday frequency. We do not presume that our results can be casually generalized beyond this observed range – and we cannot prove causality. Nevertheless, as Appendix B illustrates, this observed range is not grossly out of line with the frequency of public holidays in many other affluent countries, and with more than 37,000 diaries in our data set, we have good grounds for statistical confidence in the correlations observed in our data.

---

[14]   Calculated as (3.89*240)/120 = 7.78 and rounding.

Public Holidays and Time Use on Weekdays, Saturdays and Sundays - Regression Results

How sure can one be that there is a statistically significant difference associated with more holidays, given all the many other influences that also affect the time usage of individuals? To assess this we turn to regression models.

Because social activities that do not occur every day (like going out with friends) are only observed with some probability in time diary data on a specific day, it is inevitable that some of our sample will report zero time used on social activities, on any given day. Our objective is to estimate the probability with which an individual of given characteristics will engage in a given social activity, and our hypothesis is that, conditional on other personal characteristics, there will be a positive association between the lander type and time spent in social activity – but only some people record positive values on any given day. As is well known, the Heckman (1979) two step estimator accounts for self-selection (non-random sampling) by controlling for the marginal probability of being in the sample – i.e. adding a variable calculated from a first stage probability model. In our case, we have:

(8)   Step 1: PROBIT-selection estimation, probability of having positive social hours

$$z_i^* = \alpha' v_i + u_i \quad and \quad z_i = 1 \; if \; z_i > 0; z_i = 0 \; otherwise$$

Step 2: selection corrected OLS estimation of respective social hours

$$h_i | z_i^* > 0 = \beta' x_i + \beta_\lambda \lambda_i + \varepsilon_i$$

$$with \; \beta_\lambda = \rho \sigma_\varepsilon \; (\rho = correlation \; coefficient \; between \; u_i \; and \; \varepsilon_i)$$

where σ_ε is the standard deviation and $\lambda_i = \phi\left(\alpha' v_i / \sigma_u\right) / \Phi\left(\alpha' v_i / \sigma_u\right)$ of the Mills' ratio (hazard rate). The correct asymptotic variance-covariance matrix of β ensures the appropriate significances of the parameters to be estimated. An extension of the self-selection problem is the measurement of *treatment effects* and program effectiveness. Our cross sectional social time use Equation is

(9) $$h_i = \beta' x_i + \delta_1 ltype + \delta_2 ltype^2 + \beta_\lambda \lambda_i + \varepsilon_i ,$$

where h_i is the respective social time, x_i are other control variables, ε_i is a normal distributed error term and ltype is indicating whether or not the individual lives in a Land with one, two etc. more numbers of holidays than normal (13 Holidays). The same principal format has been used in other analyses of programs, experiments, and treatments (Heckman, Lalonde and Smith 1999, Angrist and Pischke 2009). The question is: Does δ_j really measure the value and impact of a specific Länder holiday situation (assuming that the rest of the regression model is correctly specified)? As long as the treatment (measured, in our case, by the variable ltype) is not correlated with ε_i then the exclusion restriction works and no further significance correction has to be done. In Equation (4), the variable ε_i represents the influence of purely random variation across individuals and unmeasured omitted variables in the year (2001/02) of data observed. However, the number and nature of public holidays in each Länder have typically been established for many years – holidays differ across Länder be-

cause of the differing significance of local cultural, religious and historical traditions. Hence, ltype could only be correlated with ε_i to the extent that these past traditions are correlated with current variation in unobserved characteristics.

Tables 2 to 4 present our multiple regression results. Their format is similar, because each reports the results of regressing four variables on Länder type and a vector of control variables. In all Tables, the regression coefficients are rounded to two significant digits and reported in standard type, while the probability that particular coefficient is statistically different from zero using a simple T test is reported in smaller, bold face italics. In presenting the average time spent on each activity among all people, Table 1 averaged the time usage of those who participated to some degree in an activity and those who did none of it. Because it might be argued that the determinants of any participation can be different from the factors influencing additional time usage, conditional on participation[15], sample selection bias is a concern. Tables 2 to 4 therefore report the results both of Ordinary Least Squares estimation and the Heckman correction for sample selection bias as of Equation (9)[16]. As the bottom row in each Table indicates, in almost every case the inverse Mills ratio is not statistically significant, implying that sample selection bias is not an issue and that it is the OLS coefficients which are the results of interest.

The model of time use presented in Section 2 argues that the greater availability of social contacts in Länder with more public holidays will be associated with more individual participation in social life (i.e. the net association of Länder type on time spent in Entertainment, Meetings and Social Time will be positive). Primary interest therefore centres on the variable "ltype" (Länder type), which in Table 2a is entered as a quadratic in order that the "ltypesq" (Länder type squared) term can pick up any non-linearities in the relationship between Länder type and time use. This implies that the net association of more public holidays must be read as the joint association of both linear and quadratic terms. In Table 2b, we follow the suggestion of a referee and report the results obtained when we create four dummy indicator variables, letting the 13 holiday Länder be the omitted category (control variables are the same as in Table 2a, but are omitted to save space).

Based on Table 2a, the marginal impact of going from one to two additional public holidays on Entertainment time outside the home on normal non-holiday weekdays can be calculated as +1.46 minutes (= $3.56 - 0.71*(2^2-1^2)$) – or about three additional social engagements per year, on average. If entertainment time is a quadratic function of public holidays, the coefficient estimates of Table 2a imply that the function is maximized at 2.5 additional public holidays.

Using dummy variable indicators, as in Table 2b, one would conclude that there is no statistically significant difference between people living in Länder with zero and one additional holiday, but the difference between one and two additional holidays is about +3.5 minutes per

---

[15]   In the labour supply literature, the analogous decision to participate in the labour force has been called the "extensive margin" while the hours of work decision of workers has been called the "intensive margin".

[16]   The probit model from which the inverse Mills ratio is derived is not reported here for space reasons, but is available on request from the authors.

day, or over twice as large. Table 2b also shows a roughly equivalent size impact of having three additional public holidays, and one cannot reject (at normal ranges of statistical inference) the hypothesis that going to two or three additional public holidays is associated with the same size of increase in entertainment time – which is quite consistent with Table 2a.

Table 2a
Time use on non-holiday weekdays - Germany 2001-02

Variable (rhs)	Entertainment		Meetings		Social Time	
	OLS	HECK	OLS	HECK	OLS	HECK
Personal demographics						
Age	0.11	-4.16	0.14	6.93	1.25	0.87
	0.89	0.67	0.64	0.44	0.52	0.69
Age^2	-0.00	0.05	-0.00	-0.08	-0.02	-0.02
	0.75	0.70	0.75	0.41	0.32	0.58
Woman	-5.57	-46.47	-0.73	-9.98	-14.39	-25.10
	0.00	0.16	0.11	0.48	0.00	0.01
Education						
Intermediate	0.33	10.86	-0.01	-3.40	-2.85	-3.65
	0.80	0.33	0.99	0.72	0.36	0.29
Upper/special upper	-0.43	-13.84	0.51	-6.08	0.71	-5.40
	0.77	0.27	0.36	0.59	0.84	0.17
University	2.25	12.30	-0.39	-0.06	-6.00	-7.16
	0.20	0.38	0.55	1.00	0.15	0.12
Health	-2.99	-31.74	-0.34	-4.27	-10.36	-10.03
	0.00	0.20	0.24	0.45	0.00	0.01
Occupation						
Freelancer	5.23	54.81	-0.80	69.11	32.88	30.63
	0.16	0.07	0.57	0.08	0.00	0.00
Entrepreneur	0.57	59.28	0.20	49.48	29.28	26.18
	0.87	0.09	0.88	0.12	0.00	0.01
Employee	-1.39	28.33	-0.14	27.79	25.06	14.24
	0.53	0.17	0.87	0.16	0.00	0.02
Work timing and fragmentation						
Core/fragmented	-2.37	-20.54	-0.17	7.43	-7.79	-7.25
	0.14	0.20	0.78	0.65	0.05	0.09
Non-core/not fragmented	-3.92	-42.19	-0.15	6.98	-27.04	-29.63
	0.20	0.19	0.90	0.80	0.00	0.00
Non-core/fragmented	-7.56	-63.01	2.26	8.01	-10.81	-11.82
	0.06	0.29	0.14	0.78	0.26	0.27
Cohabitants	-0.16	2.69	0.58	-2.03	-6.32	-5.15
	0.74	0.50	0.00	0.54	0.00	0.00
Young kid	-5.57	-23.51	-1.71	-4.07	-6.99	-11.57
	0.00	0.08	0.00	0.75	0.06	0.01

Table 2a cont.
Time use on non-holiday weekdays - Germany 2001-02

Variable (rhs)	Entertainment		Meetings		Social Time	
	OLS	**HECK**	**OLS**	**HECK**	**OLS**	**HECK**
Eauivalent income (10^{-3})	1.17	0.00	-0.20	-0.00	0.01	0.01
	0.00	*0.83*	*0.17*	*0.95*	*0.00*	*0.00*
Temperature	0.34	4.19	0.01	0.01	0.09	0.39
	0.00	*0.11*	*0.75*	*0.99*	*0.62*	*0.10*
Sun hours	-0.87	-7.65	-0.03	-0.98	-2.18	-1.67
	0.00	*0.19*	*0.81*	*0.68*	*0.00*	*0.18*
Rainfall	0.11	1.11	0.23	3.46	0.01	0.08
	0.41	*0.42*	*0.00*	*0.04*	*0.98*	*0.84*
Workday	-0.03	-0.33	-0.00	-0.11	-0.18	-0.18
	0.00	*0.13*	*0.00*	*0.25*	*0.00*	*0.00*
ltype	3.56	38.57	-0.81	-16.65	12.97	8.96
	0.01	*0.06*	*0.10*	*0.11*	*0.00*	*0.25*
$ltype^2$	-0.71	-7.09	0.31	4.18	-2.85	-2.04
	0.03	*0.09*	*0.01*	*0.24*	*0.00*	*0.27*
Constant	27.07	-102.02	0.50	-127.54	171.69	223.66
	0.10	*0.71*	*0.94*	*0.77*	*0.00*	*0.00*
Mills' lambda		230.27		49.34		-59.65
		0.28		*0.69*		*0.69*
n	*9,757*	*751*	*9,757*	*308*	*9,757*	*8,122*
n censored		*10,546*		*11,060*		*1,874*
adj. R^2 (%)	2.6		0.96		7.58	
Wald Chi2 p-value		283,4		103,6		691,11
		0.000		*0.000*		*0.000*
Test of common exclusion restriction ltype, $ltype^2$:						
F-Test (2; 9,734)	4.57	-	5.61	-	9.06	-
	0.01		*0.00*		*0.00*	
*Wald chi^2 -Test**	-	9.74	-	25.81	-	12.34
		0.045		*0.00*		*0.015*

*Note: P>|t| resp. P>F reported in italics, Wald chi²-Test of common exclusion
restriction of ltype and ltype² for outcome and selection Equation.
ltype = Länder with 1, 2, 3 or 4 additional to 13 public holidays.
Source: German Time Budget Survey 2001/02, own computation.

Using the quadratic specification (Table 2a) and the OLS results, the marginal association between having two or one additional holidays and Social Time on normal non-holiday weekdays would be + 4.42 minutes per day (= 12.97 – 2.85*(4-1)) or about nine extra social engagements per year, and the linear and quadratic are both individually and jointly statistically significant at normal (1%) levels[17]. The coefficient estimates imply the quadratic function is maximized at +2.8 additional public holidays. Using the dummy variable specification, as in Table 2b, the difference is 7.8 minutes per day, again about twice as large as in the quad-

---

[17] In Table 2a and 2b, the statistical insignificance of the inverse Mills ratio provides good reason to doubt the Heckit specification but the implied point estimate of marginal addition to Social Time is+ 2.84 minutes per day (= 8.96 – 2.04(4-1), or about 5.6 additional social engagements per year).

ratic specification – and again statistically indistinguishable from an increase to three additional public holidays.

Table 2b
Time use on non-holiday weekdays – Germany 2001-02,
estimates with single Länder type dummies

Control variables	Entertainment		Meetings		Social Time	
	OLS	HECK	OLS	HECK	OLS	HECK
ltype1	0.068	0.551	-1.040	-30.552	6.900	9.121
	0.972	*0.985*	*0.155*	*0.113*	*0.138*	*0.081*
ltype2	4.205	47.924	-.841	-34.314	14.664	11.074
	0.006	*0.067*	*0.145*	*0.014*	*0.000*	*0.198*
ltype3	3.911	49.230	.918	3.208	12.491	10.845
	0.023	*0.076*	*0.158*	*0.896*	*0.003*	*0.098*
ltype4	1.962	31.604	.964	-16.825	5.480	3.525
	0.307	*0.215*	*0.185*	*0.632*	*0.237*	*0.499*
Mills' lambda		245,07		47,13		-25,44
		0.29		*0.70*		*0.86*
Test of common exclusion restriction ltype1, ltype2, ltype3, ltype4:						
F-Test (2; 9,732)	2.99		4.05		4.705	
	0.018		*0.003*		*0.001*	
Wald chi^2 -Test*		15.64		36.46		20.14
		0.048		*0.000*		*0.010*

*Note: P>|t| resp. P>F reported in italics, Wald chi^2-Test of common exclusion
restriction of ltype1, ltype2, ltype3, ltype4 for outcome and selection Equation.
ltypex = Länder with x = 1, 2, 3 or 4 additional to 13 public holidays.
Source: German Time Budget Survey 2001/02, own computation.

We would caution that because only one Länder (Bavaria) has four additional public holidays, we cannot distinguish the marginal effect of a fourth public holiday from a "Bavaria effect". Nevertheless, although the two specifications outlined in Tables 2a and 2b disagree in the absolute magnitude of the effect, they both conclude that the impact of public holidays on entertainment or social time on Non-Holiday Weekdays is maximized at something between two and three additional public holidays (i.e. 15 or 16 in total).

Tables 3a and 3b present comparable estimates for Non-Holiday Saturdays. Compared to our results for Non-Holiday workdays, these are not quite as robust. Although sample selectivity continues to be rejected and the OLS results therefore preferred, in the quadratic specification, "Länder -type" is strongly statistically significant[18], while in the dummy variable specification it is generally not.

---

[18]   And the coefficient estimates continue to imply the quadratic function is maximized between two and three additional holidays.

Table 3a
Time use on non-holiday saturdays – Germany 2001- 02

Variable (rhs)	Entertainment		Meetings		Social Time	
	OLS	HECK	OLS	HECK	OLS	HECK
Personal demographics						
Age	-8.65	-22.71	0.14	-8.29	-7.96	-8.83
	0.00	*0.14*	*0.86*	*0.70*	*0.17*	*0.17*
Age^2	0.10	0.26	-0.00	0.09	0.08	0.10
	0.00	*0.15*	*0.96*	*0.74*	*0.26*	*0.19*
Woman	-2.29	1.15	-0.96	-45.88	-8.60	-19.63
	0.54	*0.94*	*0.41*	*0.09*	*0.29*	*0.08*
Education						
Intermediate	0.27	6.42	-0.13	0.83	-8.01	-2.67
	0.95	*0.65*	*0.92*	*0.97*	*0.40*	*0.80*
Upper/special upper	1.12	-7.67	4.03	5.01	-0.59	3.22
	0.82	*0.62*	*0.01*	*0.86*	*0.96*	*0.79*
University	2.67	-2.63	-3.13	-17.68	-22.27	-28.99
	0.65	*0.88*	*0.09*	*0.59*	*0.08*	*0.03*
Health	-2.18	-8.20	-0.72	-14.38	-14.82	-11.12
	0.39	*0.44*	*0.37*	*0.44*	*0.01*	*0.22*
Occupation						
Freelancer	-8.48	95.99	-5.11	–	-40.82	-37.49
	0.58	*0.11*	*0.29*		*0.23*	*0.34*
Entrepreneur	-15.06	-5.52	-1.42	-70.11	12.71	14.50
	0.28	*0.93*	*0.75*	*0.47*	*0.67*	*0.67*
Employee	-8.92	21.54	-1.16	-49.08	2.97	-11.53
	0.32	*0.55*	*0.68*	*0.43*	*0.88*	*0.59*
Work timing and fragmentation						
Core/fragmented	-8.29	-71.09	0.07	-45.87	-18.14	-16.01
	0.46	*0.08*	*0.98*	*0.61*	*0.45*	*0.55*
Non-core/not fragmented	2.27	-15.75	7.94	38.87	-23.03	-22.90
	0.85	*0.71*	*0.04*	*0.55*	*0.39*	*0.42*
Non core/fragmented	-22.32	-138.10	-2.02	–	-45.14	-65.98
	0.21	*0.27*	*0.72*		*0.25*	*0.11*
Cohabitants	1.10	-2.01	1.48	13.25	-8.12	-7.34
	0.48	*0.66*	*0.00*	*0.09*	*0.02*	*0.05*
Young kid	-17.70	-17.34	-1.00	1.41	-16.29	-16.64
	0.00	*0.34*	*0.55*	*0.97*	*0.16*	*0.18*
Equivalent income (10^{-3})	0.00	-0.00	-0.00	0.00	0.01	0.00
	0.95	*0.64*	*0.63*	*0.68*	*0.01*	*0.21*
Temperature	1.38	5.27	0.16	1.07	2.25	1.97
	0.00	*0.06*	*0.04*	*0.65*	*0.00*	*0.02*
Sun hours	-1.99	-8.48	0.55	7.25	0.51	1.33
	0.03	*0.09*	*0.06*	*0.28*	*0.80*	*0.57*
Rainfall	0.15	1.54	-0.12	2.48	3.48	3.21
	0.77	*0.45*	*0.46*	*0.60*	*0.00*	*0.01*

Table 3a cont.
Time use on non-holiday saturdays – Germany 2001- 02

Variable (rhs)	Entertainment		Meetings		Social Time	
	OLS	HECK	OLS	HECK	OLS	HECK
Workday	-0.01	-0.13	-0.00	0.22	-0.15	-0.14
	0.79	*0.24*	*0.57*	*0.21*	*0.00*	*0.04*
ltype	6.29	29.27	-2.88	-33.02	19.56	27.40
	0.15	*0.13*	*0.04*	*0.37*	*0.04*	*0.01*
ltype^2	-1.50	-5.86	0.97	1.90	-5.67	-7.08
	0.17	*0.23*	*0.00*	*0.87*	*0.02*	*0.01*
Constant	225.75	372.10	-6.17	743.80	402.73	459.71
	0.00	*0.06*	*0.72*	*0.32*	*0.00*	*0.00*
Mills' lambda		190.93		-199.01		-72.61
		0.16		*0.30*		*0.65*
n	*2,575*	*492*	*2,575*	*104*	*2,575*	*2,102*
n censored		*2,421*		*2,861*		*508*
adj. R^2 (%)	2.5		0.84		4.3	
Wald Chi^2 p-value		*99.01*		*39.5*		*120.8*
		0,000		*0,000*		*0,000*
Test of common exclusion restriction ltype, ltype^2:						
F-Test (2; 2,552)	1.04	-	5.83	-	3.13	-
	0.355		*0.003*		*0.044*	
Wald chi^2 -Test*	-	4.85	-	19.11	-	9.25
		0.303		*0.000*		*0.055*

*Note: P>|t| resp. P>F reported in italics, Wald chi^2-Test of common exclusion
restriction of ltype and ltype^2 for outcome and selection Equation.
ltype = Länder with 1, 2, 3 or 4 additional to 13 public holidays.
Source: German Time Budget Survey 2001/02, own computation.

Table 3b
Time use on non-holiday saturdays – Germany 2001-02,
estimates with single Ländertype dummies

Control variables	Entertainment		Meetings		Social Time	
	OLS	HECK	OLS	HECK	OLS	HECK
ltype1	11.537	54.267	-.332	-101.891	11.546	6.525
	0.079	0.027	0.872	0.076	0.418	0.676
ltype2	3.352	27.321	-1.322	-85.402	14.866	30.000
	0.522	0.163	0.421	0.085	0.191	0.031
ltype3	11.505	50.417	-.427	-58.962	9.681	9.718
	0.50	0.037	0.816	0.224	0.447	0.485
ltype4	-.435	25.729	5.177	-123.895	-14.995	-4.467
	.947	0.336	0.012	0.239	0.292	0.812
Mills' lambda		160.04		-161.05		-57.26
		0.211		0.363		0.714
Test of common exclusion restriction ltype1, ltype2, ltype3, ltype4:						
F-Test (2; 2,547)	1.80		3.27		1.61	
	0.126		0.011		0.170	
Wald chi^2 -Test*	-	10.59	-	28.30	-	15.77
		0.226		0.000		0.046

*Note: P>|t| resp. P>F reported in italics, Wald chi^2-Test of common exclusion restriction of
ltype1, ltype2, ltype3 and ltype4 for outcome and selection Equation.
ltypex = Länder with x = 1, 2, 3 or 4 additional to 13 public holidays.
Source: German Time Budget Survey 2001/02, own computation.

Tables 4a and 4b examine time use on Non-Holiday Sundays. Länder type does not predict at all time spent in entertainment and meetings on Sundays, but for Social Time, the impact is strongly statistically significant in both quadratic and dummy variable specifications. In the dummy variable specification, there are continually increasing marginal effects of more public holidays – and the effect is large, amounting to an additional half hour of social time use in going from one to two additional public holidays. In the quadratic specification, the marginal association of an additional public holiday with Social Time on normal Sundays is significantly estimated at + 18.37 minutes, and the statistical insignificance of the quadratic term indicates there is no evidence for diminishing returns to additional extra public holidays. (If the insignificance of the quadratic term is disregarded, the coefficient estimates imply maximization of Social Time at 8.8 additional holidays.)

Table 4a
Time use on non-holiday sundays – Germany 2001-02

Variable (rhs)	Entertainment		Meetings		Social Time	
	OLS	HECK	OLS	HECK	OLS	HECK
Personal demographics						
Age	-2.97	-3.85	-0.31	-12.09	-17.71	-45.76
	0.24	*0.61*	*0.69*	*0.13*	*0.00*	*0.66*
Age^2	0.03	0.03	0.01	0.13	0.21	0.54
	0.29	*0.73*	*0.51*	*0.12*	*0.00*	*0.67*
Woman	-7.70	-9.88	0.26	-9.67	1.36	33.88
	0.02	*0.45*	*0.81*	*0.12*	*0.84*	*0.81*
Education						
Intermediate	2.88	18.64	-3.08	1.51	-4.88	-2.93
	0.47	*0.10*	*0.02*	*0.79*	*0.54*	*0.93*
Upper/special upper	5.95	14.58	-0.33	-1.42	17.32	12.82
	0.19	*0.25*	*0.82*	*0.83*	*0.06*	*0.75*
University	-4.27	-17.53	-1.32	1.46	-28.85	-24.35
	0.43	*0.23*	*0.44*	*0.86*	*0.01*	*0.61*
Health	-8.18	-18.67	0.24	3.36	-13.42	-40.34
	0.00	*0.06*	*0.75*	*0.42*	*0.00*	*0.69*
Occupation						
Freelancer	9.49	7.28	5.58	93.19	20.45	-0.10
	0.54	*0.85*	*0.25*	*0.00*	*0.51*	*1.00*
Entrepreneur	-5.87	-18.02	-2.38	46.92	1.92	22.46
	0.65	*0.65*	*0.56*	*0.09*	*0.94*	*0.85*
Employee	9.97	31.07	3.82	75.80	16.38	2.68
	0.32	*0.26*	*0.23*	*0.00*	*0.41*	*0.98*
Work timing and fragmentation						
Core/fragmented	-0.16	-8.98	-4.40	-90.49	-15.50	0.82
	0.99	*0.81*	*0.25*	*0.00*	*0.53*	*0.99*
Non-core/not fragmented	7.24	13.05	-2.97	-77.28	-2.87	-0.30
	0.55	*0.71*	*0.44*	*0.00*	*0.91*	*1.00*
Non-core/fragmented	-3.40	20.54	10.19	-9.38	40.23	26.86
	0.82	*0.67*	*0.03*	*0.65*	*0.17*	*0.83*
Cohabitants	0.88	7.24	2.19	2.25	-2.18	0.38
	0.56	*0.07*	*0.00*	*0.26*	*0.47*	*0.98*
Young kid	-3.34	-26.98	-3.06	-12.47	-10.14	-23.40
	0.48	*0.03*	*0.04*	*0.10*	*0.28*	*0.57*
Equivalent income (10^{-3})	-0.00	-0.00	-0.00	-0.00	0.00	0.01
	0.50	*0.79*	*0.00*	*0.11*	*0.21*	*0.63*
Temperature	1.07	2.96	-0.06	-0.17	0.79	2.31
	0.00	*0.03*	*0.41*	*0.69*	*0.08*	*0.64*

Table 4a cont.
Time use on non-holiday sundays – Germany 2001-02

Variable (rhs)	Entertainment		Meetings		Social Time	
	OLS	HECK	OLS	HECK	OLS	HECK
Sun hours	-3.28	-6.72	-0.02	0.06	-1.32	-5.35
	0.00	*0.04*	*0.95*	*0.97*	*0.44*	*0.75*
Rainfall	-0.63	-2.45	-0.08	-0.40	-0.18	1.38
	0.25	*0.17*	*0.66*	*0.74*	*0.87*	*0.87*
Workday	-0.06	-0.22	-0.01	-0.19	-0.17	-0.21
	0.01	*0.01*	*0.03*	*0.03*	*0.00*	*0.34*
ltype	4.19	6.96	-2.34	6.54	18.37	35.56
	0.29	*0.58*	*0.06*	*0.62*	*0.02*	*0.63*
ltype^2	-0.97	-2.76	0.99	-3.43	-1.04	-0.37
	0.33	*0.36*	*0.00*	*0.52*	*0.61*	*0.97*
Constant	126.35	173.80	10.23	460.54	532.98	848.67
	0.01	*0.25*	*0.52*	*0.19*	*0.00*	*0.48*
Mills' lambda		84.81		-59.79		837.43
		0.30		*0.54*		*0.77*
n	*2,409*	*524*	*2,409*	*266*	*2,409*	*1,990*
n censored		*2,235*		*2,519*		*479*
adj. R^2 (%)	*2.6*		*2.8*		*3.3*	
Wald Chi^2 p-value		*20.76*		*80.39*		*24.02*
		0,000		*0,000*		*0,844*
Test of common exclusion restriction ltype, ltype^2:						
F-Test (2; 2,386)	0.552	-	9.896	-	14.113	-
	0.576		*0.000*		*0.000*	
Wald chi^2 -Test*	-	2.38	-	27.81	-	7.02
		0.666		*0.000*		*0.135*

*Note: P>|t| resp. P>F reported in italics, Wald chi^2-Test of common exclusion restriction
of ltype and ltype^2 for outcome and selection Equation.
ltype = Länder with 1, 2, 3 or 4 additional to 13 public holidays.
Source: German Time Budget Survey 2001/02, own computation.

In assessing whether the number of public holidays is associated with individuals' time use on other days, it is important to control for potentially confounding variables – such as age, gender and education – which might plausibly influence time use. Tables 2a to 4a indicate that their impact is not strong or consistent (e.g. age has no statistically significant impact on Entertainment, Meetings or Social Time on weekdays and is only correlated with Entertainment time on Saturdays and Social Time on Sundays, and education is generally statistically insignificant.) On the other hand, health status clearly matters. Bad Health (as subjectively evaluated) makes it more difficult for individuals to engage in social activities – the consistently negative and significant association indicated in Tables 2a to 4a is plausible.

Table 4b
Time use on non-holiday sundays – Germany 2001-02,
estimates with single Länder type dummies

Control variables	Entertainment		Meetings		Social Time	
	OLS	HECK	OLS	HECK	OLS	HECK
ltype1	-3.339	-29.016	-.916	-12.173	2.946	8.694
	0.577	0.124	0.629	0.258	0.807	0.902
ltype2	6.890	6.439	-.503	-7.715	36.013	70.563
	0.145	0.687	0.736	0.348	0.000	0.594
ltype3	-1.036	-17.574	1.705	-4.057	37.878	88.372
	0.845	0.302	0.310	0.728	0.000	0.663
ltype4	2.264	-20.258	6.946	-33.055	56.754	127.165
	0.720	0.311	0.000	0.371	0.000	0.644
Mills' lambda		92.43		-46.87		777.44
		0.272		0.601		0.771
Test of common exclusion restriction ltype1, ltype2, ltype3, ltype4:						
F-Test (2; 2,384)	1.352	-	4.990	-	7.929	-
	0.248		0.001		0.000	
Wald chi^2 -Test*	-	8.85	-	32.39	-	7.28
		0.356		0.000		0.507

*Note: P>|t| resp. P>F reported in italics, Wald chi^2-Test of common exclusion restriction of ltype1,
ltype2, ltype3 and ltype4 for outcome and selection Equation.
ltypex = Länder with x = 1, 2, 3 or 4 additional to 13 public holidays.
Source: German Time Budget Survey 2001/02, own computation.

As well, it is conceivable that differences between individuals in their social time are really driven by aspects of their work life. Although entrepreneurs or free lancers ("Freie Berufe") may have more flexibility in their working time, they may also face more demands on their time outside normal working hours, implying that scheduling a social life may be harder for them. In general, workers who put in more time on the job clearly have less time available to allocate to all non-work purposes, and workers whose jobs are scheduled outside the normal working day (7AM to 5PM weekdays) or whose working hours are fragmented in their timing can be expected to find it harder to arrange Social Time, to attend meetings or to go out with friends[19]. In this paper, we control for the impact of all these variables. Relative to workers who have a standard, non-fragmented workday, social time on normal weekdays is 7.79 minutes less for workers with fragmented but core working time and 27.04 minutes less for non-core continuous workers. For meetings and entertainment, however, these variables are statistically insignificant.

Income differences[20] are associated with statistically significant, but fairly modest, differences in total social time on weekdays - particularly with regard to time spent with others

---

[19] See Merz and Burgert 2004 for analysis of fragmented working hour arrangements in Germany and Merz, Böhm and Burgert 2005 for the impact of daily working hour arrangements on income and its distribution, and Hamermesh 1996, 1998, 2002 for the timing of the work time in general.

[20] In this paper, we use equivalent individual income, defined as total household net income divided by the square root of household size.

from outside the household in entertainment. The coefficient on "equincome" (equivalized income) reported in column 1 of Table 2a corresponds to (very roughly) 2.5 additional social engagements per year for somebody making an additional 12,000 Euro per year,[21] There is, a clear impact of the presence of young children in the household – as any parent could predict, they are associated with reduced time spent on other social interaction. The number of co-residents in the household also offers an easy alternative to going out of the household for social time on Saturdays and weekdays, and is statistically significant. Finally, to control for the impact on time use which weather conditions can have, we match the location of the interview to meteorological data (at the regional level). Our control for rainfall is usually insignificant, but the temperature and sun light hours are often statistically significant.

In summary, more public holidays are significantly and positively associated with more leisure time spent with others for entertainment and meetings and with more enhanced total social time, but the size of the effect varies. For Non-Holiday Weekdays, both the quadratic and dummy variable specifications concur in suggesting that a modest increase in entertainment, meeting and general social time would be maximized at something between two and three additional public holidays (i.e. 15 or 16 Public Holidays in total). For Non-Holiday Saturdays, the evidence is mixed, since the two specifications yield conflicting implications. However, for Non-Holiday Sundays, both specifications imply statistically significant and empirically large impacts on Social Time, with little evidence of diminishing returns. Other statistically significant socio-economic control variables include the individual's health situation, occupation (particularly self-employed status), the fragmentation of a work day, number of cohabitants and household equivalent income.

Public Holidays and the Typical Week

Tables 2 to 4 are based on the coding of self-reported time use diaries on three specific days, in which activities were reported at ten minute intervals. This time diary methodology cues respondents to walk through the sequence of events in a given day, and has significant advantages in ensuring the completeness and consistency of responses. The disadvantage is a high cost of administration, which mandates relatively few days observed per respondent and the possibility that a survey will miss low frequency events. The German Time Use study therefore also asked a series of summary retrospective questions on time use "in a typical week".

Tables 5a and 5b report the results of Ordinary Least Squares regressions for a typical week. In the first column, the length of the "typical work week" is regressed on Länder type and control variables. In the second column, the dependent variable is the active personal help given per week to other households (in minutes, for childcare, care, household work, do it yourself). Our model is clear in suggesting that if individuals have more social contacts, and hence their non-work time is more attractive, their desired work week will be less.

---

[21] If an additional 1,000 Euros of monthly income on average means an additional 1.17 minutes of entertainment on each of 240 working days per year, and each engagement lasts two hours.

Table 5a
Time use during a non-holiday "typical workweek" and for active personal help –
Germany 2001-02

Variable	Workweek	Active personal help**
Personal demographics		
Age	113.64	-16.78
	0.00	*0.04*
Age^2	-1.43	0.26
	0.00	*0.01*
Woman	-918.96	95.18
	0.00	*0.00*
Education		
Intermediate	56.79	-11.73
	0.00	*0.38*
Upper/special upper	-3.05	-14.69
	0.89	*0.34*
University	192.42	-57.35
	0.00	*0.00*
Health	-110.33	48.65
	0.00	*0.00*
Occupation		
Freelancer	279.96	93.25
	0.00	*0.02*
Entrepreneur	798.65	61.06
	0.00	*0.10*
Employee	102.94	48.45
	0.00	*0.04*
Work timing and fragmentation		
Core/fragmented	49.82	23.74
	0.07	*0.23*
Non-core/not fragmented	-125.40	-37.14
	0.01	*0.26*
Non-core/fragmented	38.22	79.00
	0.53	*0.07*
Cohabitants	-65.92	-51.19
	0.00	*0.00*

Table 5a cont.
Time use during a non-holiday "typical workweek" and for active personal help – Germany 2001-02

Variable	Workweek	Active personal help**
Young kid	-75.10	41.85
	0.00	*0.01*
Equivalent income (10^{-3})	0.16	-0.02
	0.00	*0.00*
Temperature	-0.80	3.04
	0.46	*0.00*
Sun hours	-12.49	-9.45
	0.00	*0.00*
Rainfall	-1.09	1.18
	0.60	*0.43*
Workday	1.41	-0.18
	0.00	*0.00*
ltype	64.73	41.28
	0.00	*0.00*
ltype^2	-17.52	-8.56
	0.00	*0.01*
Constant	-287.65	600.12
	0.22	*0.00*
adj. R^2 (%)	44.9	2.8
Test of common exclusion restriction ltype, ltype^2:		
F-Test (2; 14,718)	7.09	5.31
	0.001	*0.005*
Wald chi^2 -Test+*	35.38	47.73
	0.000	*0.000*

*Note: P>|t| resp. P>F reported in italics, Wald chi^2-Test of common exclusion restriction
of ltype and ltype^2 for outcome and selection Equation.
** active personal help given per week to other households (in minutes,
for childcare, care, household work, do it yourself).
+ HECK single coefficients not shown.
Source: German Time Budget Survey 2001/02, own computation.

Over most of the range of additional public holidays in Germany, that is the case – the coefficients in column 1 of Table 5a imply that moving from 2 to 3 additional holidays is associated with a decline of 23 minutes in the normal work week, and moving from 3 to 4 additional holidays per year is associated with a decline of 58 minutes.[22] Table 5b likewise shows longer workweeks in Länder with more public holidays – with the exception of Bavaria.

Although the model of Section 2 considers the demand for leisure (social and solo), and does not directly discuss the "Social Capital" which repeated social interaction produces, it is plausible that in localities with stronger social ties, individuals will spend more of their time helping other households (in childcare, care, household work, home repairs, etc.). The evidence from Table 5a is however mixed, since the quadratic specification and the OLS coefficients

---

[22]   [-22.87 = 64.73 –17.52* (9-4)] ; [-57.91 = 64.73-17.52*(16-9)].

estimated imply a maximum, across Länder type, at 2.41 additional public holidays. Table 5b implies that "active personal help" for other households is greatest when there are three additional public holidays, but the pattern of other results is difficult to interpret.

Table 5b
Time use during a non-holiday "typical workweek" and for active personal help – Germany 2001-02

Control variables	Workweek	Active personal help
ltype1	106.652	64.259
	0.000	*0.001*
ltype2	38.340	24.729
	0.080	*0.118*
ltype3	81.378	90.477
	0.001	*0.000*
ltype4	-27.769	10.143
	0.316	*0.612*
Mills	-670.05	971.96
lambda	*0.000*	*0.009*
adj. R^2 (%)	44.93	3.2
Test of common exclusion restriction ltype1, ltype2, ltype3, ltype4:		
F-Test (4; 14,716)	7.69	8.83
	0.000	*0.000*
Wald chi^2 –Test*+	49.07	65.44
	0.000	*0.000*

*Note: OLS estimates, P>|t| resp. P>F reported in italics, Wald chi^2-Test of common exclusion restriction of ltype1, ltype2, ltype3, ltype4 for outcome and selection Equation. ltypex = Länder with x = 1, 2, 3 or 4 additional to 13 public holidays. + HECK single coefficients not shown.
Source: German Time Budget Survey 2001/02, own computation.

5   Public policy implications – A conclusion

Many labour market outcomes (e.g. the unemployment rate) are influenced in complex and interdependent ways by a variety of socio-economic trends and policy variables. By contrast, the number of public holidays per year is an issue which is clearly amenable to straightforward legislative decision. Around the world, different legislatures have made somewhat different choices – Appendix B presents a summary table of the number of national public holidays in the European Union and other countries. Within the majority of countries, the number of public holidays also varies at the sub-national level, and most countries have something in the range of 10 to 15 public holidays each year. The fact that Germany is at the higher end of this range is useful for the analysis of possible public policy change, since German data may indicate what countries with fewer holidays (e.g. Canada or the USA) might expect, were they to increase the number of their public holidays.

However, the variation in public holidays across countries also suggests the question: what is the optimal number of public holidays?

This paper has argued that there may be an increase in utility for those whose social life is easier to arrange because they live in a locality with a greater number of public holidays. It has also estimated the association between time use patterns and the number of public holidays across German Länder and it has emphasized the increased utility derived from leisure *on normal workdays and weekends* associated with more holidays. In doing so, this paper seeks to draw attention to a previously unrecognized benefit – but one should also not lose sight of the historic reasons for, and benefits of, public holidays.

The public holidays that now exist in different countries have a wide range of specific historic origins, but there is also a general theme of the common enjoyment of festivals, which have combined time away from work with unifying social rituals – ceremonies, parades and family gatherings that bring people together in an event with common symbolic meaning. Enjoying oneself in this way adds to the utility of participants[23] on the day which implies that for many people the utility of the leisure consumed on holidays includes some additional direct utility value to the common enjoyment of that time, as well as building social cohesion and social capital. The benefits of greater social capital and social cohesion in outcomes such as faster economic growth, better health and lower social costs have been emphasized in a growing literature – see, for example, Putnam (2000); Knack & Keefer (1997); or Osberg (2004).

This paper cannot test, with cross-sectional data, the hypothesis that causality is reversed – i.e. that people in different Länder have different tastes for sociability and more sociable people will vote for more public holidays. Stigler and Becker (1977) have articulated the long tradition in economics that one should not try to explain away awkward empirical findings with an appeal to unobservable differences in preferences because such a proposition cannot be tested empirically. Nevertheless, we cannot reject this hypothesis.

In addition, even if public holidays could be shown to causally determine sociability in our data, the implications of increasing the number of holidays over the range from 13 to 17 days clearly cannot be extrapolated indefinitely. At some point (unobserved in current cross-sectional data, but presumably very considerably less than 365 days) an increase in the number of public holidays will overwhelm the ability of individuals to adjust their hours of work on other margins and will become a binding constraint on aggregate leisure consumption for a significant number of people, and not just a co-ordination device for leisure time. "Out of sample prediction" is, in general, something to be approached cautiously. This paper is concerned with the possible impacts of additional public holidays over the 13 to 17 day range. Our results indicate that there may be a maximum impact, for Non-Holiday Workdays, somewhere between 15 and 16 public holidays, but over the range of observation available to us, there is no evidence of diminishing returns for Social Time on Non-Holiday Sundays.

---

[23] If, for example, public holidays are often celebrated with parades, but people have the option of not attending, a revealed preference approach would argue that the opportunity for common celebration must increase the utility of parade participants and parade watchers, while non-attendees enjoy, at minimum, more easily co-ordinated leisure time.

Nevertheless, we cannot make a general statement about the impacts of additional public holidays at any level of holidays.

When firms pay both for hours actually worked and for public holidays and vacations, the wage per hour actually worked includes, as a form of "fringe benefit" the worker's entitlement to paid holidays and vacations. If workers can see through the packaging of their total hourly compensation into [wages + fringes], it is reasonable to think that firms can too. A legislated public holiday may change the proportions, but there are at least three margins of adjustment for any given employer – normal working hours (which imply non-paid leisure time on work days), paid vacation days and nominal wages – to enable firms and workers to co-ordinate a mutually desired equilibrium of wages (per hour actually worked) and actual labour hours.

Even if workers are, in general, not meaningfully constrained in their total annual working hours by public holidays, firms may protest that they might be constrained in their usage of the capital stock. Any resulting costs associated with lower capital utilization must be counted as a cost of public holidays. However, firms which operate during "normal working hours, Monday to Friday" are not now actually attempting to utilize their capital stock in the evening or overnight or on weekends (e.g. universities typically do not try to use lecture halls at 4 AM). For such establishments, the margins of adjustment in capital usage are plausibly quite similar to the margins of aggregate labour supply adjustment by workers, and would presumably be largely determined by such adjustments, since an important reason why these firms now use their capital stock only during standard working hours is because it is then that workers are available at standard pay rates.

As well, the legislation establishing worker entitlement to a paid public holiday does not generally prevent firms from paying a wage premium to obtain labour, if it is profitable to do so. Firms would clearly prefer not to have to pay such a wage premium, but since it is a worker-firm transfer, the social cost is the loss in consumer surplus of any change in behaviour it induces – which is likely to be small. A firm which now finds it profitable to operate 24 hours a day, 7 days a week and to pay the wage premium necessary to attract workers on weekends and holidays, rather than bear the costs of downtime, will have to pay a holiday premium to their workers' wages for a working day which is now paid at normal pay rates. For such "24/7" (*"24 hours per day, 7 days per week"*) employers[24], the marginal private cost of an additional public holiday is easily calculated as the additional holiday pay premium required in the annual wage bill. However, since this premium is a firm-worker transfer, it is not a social cost. The social cost is any loss in consumer and producer surplus from any change in aggregate investment which might be caused in such 24/7 firms. Since establishments which choose to bear the costs of utilizing capital for fewer days in the year could have chosen the option of paying the necessary holiday pay premium for the additional day of holidays, the upper bound for their private loss is the increase in annual wage bill which the firm could

---

[24] Examples would include plants which face a large fixed cost to start up or to shut down (e.g. nuclear or thermal electricity generation plants, oil refineries or blast furnaces) or services (like police, fire and hospitals) which must be offered on holidays.

have chosen to pay. If, for example, working on a public holidays was paid at double time, an additional day of holidays would imply an increase in a "24/7" firm's annual wage bill of about 1/380th [25]. To find the impact on capital stock (of the subset of firms which operate 24/7), one would have to multiply 1/380th by the elasticity of investment with respect to wages – the answer is likely to be small.

In summary, this paper argues that, over their current range in developed countries, public holidays facilitate the co-ordination of leisure time but do not constrain the annual amount of leisure. We contend that better co-ordination of leisure has benefits because it increases the utility of leisure both on holidays and (by enabling people to maintain social contacts more easily) on normal weekdays and weekends. German Time Use data from 2001-02 show that over the range of public holidays (13 to 17) observed in Germany, public holidays are positively associated with social life on normal weekdays and weekends. We argue that these benefits are additional to the direct utility gains of the holidays, and that there may be a case for more public holidays in those countries (like the USA or Canada) which now have fewer public holidays than Germany.

---

[25] If there were previously 15 public holidays, which increased to 16, the firm would previously pay for 15 days at double time and 350 at normal rates (total days paid = 380). Hence, an additional day of holidays would imply an increase in the firms annual wage bill of about 1/380th.

Appendix A

Public Holiday (Feiertag)		Date 2001		Date 2002	Bundesweit	Baden-Württemberg	Bayern	Berlin	Brandenburg	Bremen	Hamburg	Hessen	Mecklenburg-Vorpommern	Niedersachsen	Nordrhein-Westfahlen	Rheinland-Pfalz	Saarland	Sachsen	Sachsen-Anhalt	Schleswig-Holstein	Thüringen
Neujahr	Mo	01/01/2001	Di	01/01/2002	x																
Heilige Drei Könige	Sa	06/01/2001	So	06/01/2002		x	x												x		
Karfreitag	Fr	13/04/2001	Fr	29/03/2002	x																
Ostersonntag	So	15/04/2001	So	31/03/2002	x																
Ostermontag	Mo	16/04/2001	Mo	01/04/2002	x																
Tag der Arbeit	Di	01/05/2001	Mi	01/05/2002	x																
Christi Himmelfahrt	Do	24/05/2001	Do	09/05/2002	x																
Pfingstsonntag	So	03/06/2001	So	19/05/2002	x																
Pfingstmontag	Mo	04/06/2001	Mo	20/05/2002	x																
Fronleichnam	Do	14/06/2001	Do	30/05/2002		x	x					x			x	x	x	x			x
Mariä Himmelfahrt	Mi	15/08/2001	Do	15/08/2002			x										x				
Tag der deutschen Einheit	Mi	03/10/2001	Do	03/10/2002	x																
Reformationstag	Mi	31/10/2001	Do	31/10/2002					x				x					x	x		x
Allerheiligen	Do	01/11/2001	Fr	01/11/2002		x	x								x	x	x				
Buß- und Bettag	Mi	21/11/2001	Mi	20/11/2002														x			
Heiligabend	Mo	24/12/2001	Di	24/12/2002	x																
1. Weihnachtsfeiertag	Di	25/12/2001	Mi	25/12/2002	x																
2. Weihnachtsfeiertag	Mi	26/12/2001	Do	26/12/2002	x																
Silvester	Mo	31/12/2001	Di	31/12/2002	x																

Appendix B

Country - EU	Total No. of National Public Holidays	Footnote
Sweden	15,5	yes
Portugal	15	yes
Cyprus	15	
Luxembourg	14	yes
Spain	14	yes
Italy	13	yes
France	13	yes
Germany	13	yes
Slovakia	13	
Slovenia	13	
Greece	13	yes
Denmark	12,5	
Belgium	12	
Latvia	12	
Hungary	11	
Poland	11	
Czech Republic	11	
Netherlands	11	
United Kingdom	9	yes
Country - Non-EU	**Total No. of National Public Holidays**	**Footnote**
Israel	23	
Brazil	18	yes
Chile	17	yes
Mexico	15	
Norway	14	
Taiwan	14	
Philippines	14	yes
Japan	14	yes
Ukraine	13	
Bulgaria	13	
Canada	12	yes
New Zealand	11	
Russia	11	
Switzerland	10	yes
USA	10	yes
Australia	10	yes
Singapore	8	
Thailand	8	yes
Egypt	7	

Holidays only for certain regions or banks excluded from total number of national holidays.
Source: 1.) www.tyzo.com, 2.) www.holidayfestival.com.

Appendix C

Age	Age
Age^2	Age squared
Woman	Woman=1, man=0
Elementary	Education: elementary (Hauptschule, 9 school years)
Intermediate	Education: intermediate (Realschule, 10 school years)
Supper	Education: special upper (specuppe, Gymnasium 13 school years) or upper (upper Fachgymnasium 13 school years)
Universi	Education: university
Health	Health info (1=very poor, …, 5=very good)
Notempl	Not employed, not active (category=0)
Freelancer	Freelancer status1=1 (and working, category not 0)
Entrepre	Entrepreneur status1=2 (and working, category not 0)
Employee	Employee status1=3 (and working, category not 0)
Work timing and fragmentation	Core = working hours 7AM to 5PM weekdays not fragmented = no break in working > 60 minutes core/not fragmented = reference category
Core/frag	Core/fragmented =1; else = 0
Nocor/nofrag	Non-core/not fragmented =1; else = 0
Nocor/frag	Non-core/fragmented =1; else = 0
Cohabits	Number cohabitants (persons in household -1)
Young kid	Household with kids aged <= 6 =1; else = 0
Eqincome	Equivalent individual net income ((household income/square root number household members))
Temper	Temperature (daily max of respective state) on survey day
Sun hours	Sunhours on survey day in the living region
Rainfall	Rainfall on survey day in the living region
Workday	Daily working hours at all jobs + daily commuting time for work,

Ltype =0	all Länder with only the 13 national public holidays
=1	Länder with one additional public holiday
=2	Länder with two additional public holidays
=3	Länder with three additional public holidays
=4	Länder with four additional public holidays

Appendix D

Definition of *Dependent Variables*

(code numbers by the German Federeal Statistical Office, Zeitbudgeterhebung 2001/02)
conditioning on: done with other acquaintances ('Bekannte')

entertain = 52

52 ENTERTAINMENT AND CULTURE
520 Unspecified entertainment and culture
521 Cinema
522 Theatre and concerts
523 Art exhibitions and museums
524 Libraries
525 Sports events
526 Going on a trip/ excursion, visiting a zoo, parks and centres or a circus, sightseeing, etc.
527 Going out (to a pub, cafe, discotheque, but without eating)
529 Other specified entertainment and culture

meetings = 44

44 PARTICIPATION IN MEETINGS
440 Unspecified participatory activities
441 Political and social meetings
442 Religious activities and ceremonies
443 Praying, meditation, mental relaxation
449 Other specified participatory activities

02 EATING AND DRINKING
020 Unspecified activities
021 Eating meals

23 FREE TIME STUDY AND QUALIFICATION (NOT FOR EMPLOYMENT, SCHOOL/UNIVERSITY)
230 Unspecified activities related to free time study and qualification
231 Attending classes and lessons because of personal interests (seminars, courses, lectures, workshops and conferences) (for example language course for the next holiday, maternity courses)
232 Attending informational events/ meetings, fairs etc. (for example exhibitions or fairs because of personal interests)
233 Learning in self-organised groups (for example with friends, colleagues, fellow students, parents/ children)
234 Learning on one's own, especially by using technical or instructional literature (books or journals), papers from classes or lectures or from correspondence schools, or by using other kinds of printings

41 ORGANISATIONAL WORK
410 Unspecified organisational work
411 Work for an organisation
412 Volunteer work through an organisation
419 Other specified organisational work

42 INFORMAL HELP TO OTHER HOUSEHOLDS
420 Unspecified informal help
421 Childcare as help
422 Gardening as help
423 Household upkeep as help
424 Shopping and services as help
425 Looking after the dwelling or apartment of neighbours, friends or relative as help
426 Administrative and insurance services as help
427 Mental help and assistance in solving a problem
428 Physical help and care
429 Construction and repair as help
430 Repair and maintenance of cars and other vehicles as help
431 Pet care as help
432 Food management as help
433 Transport and removals as help
434 Financial help
439 Other specified informal help

44 PARTICIPATION IN MEETINGS
440 Unspecified participatory activities
441 Political and social meetings
442 Religious activities and ceremonies
443 Praying, meditation, mental relaxation
449 Other specified participatory activities

51 SOCIAL CONTACTS
510 Unspecified social life
511 Socialising
512 Visiting and receiving visitors
513 Private feasts
514 Telephone conversation
519 Other specified social life

52 ENTERTAINMENT AND CULTURE
520 Unspecified entertainment and culture
521 Cinema
522 Theatre and concerts
523 Art exhibitions and museums
524 Libraries
525 Sports events
526 Going on a trip/ excursion, visiting a zoo, parks and centres or a circus, sightseeing, etc.
527 Going out (to a pub, cafe, discotheque, but without eating)

6 SPORTS AND OUTDOOR ACTIVITIES
600 Unspecified sports and outdoor activities

61 PHYSICAL EXERCISE
610 Unspecified physical exercise
611 Walking
612[a] Hiking
613 Jogging and fast walking
614 Biking
615 Skiing, skating, ice hockey, sledge
616 Ball games (as a team sport)
617[c] Tennis, badminton, table tennis, etc.
618 Gymnastics
619 Fitness, Aerobic
620[d] Physical relaxation exercises
621 Swimming, water gymnastics
622[e] Rowing, sailing, windsurfing, canoe
623[b] In-line skating, skateboarding

624 martial arts (judo, karate, aikido, boxing)
625[f] Bowling, ninepins, playing boule/ petanque
626[f] Dancing
627[f] Shooting (at a shooting gallery or range, not hunting)
628[f] Athletic sports
629[f] Riding
639 Other specified sports activities

64 HUNTING; FISHING AND COLLECTING
640 Unspecified productive exercise
641 Hunting and fishing
642[g] Picking berries, mushrooms and herbs
649[g] Other specified productive exercise

7 HOBBIES AND GAMES
700 Unspecified hobbies and games

71 ARTS
710 Unspecified arts
711 Visual arts
712 Performing arts/ music
713 Literary arts
719 Other specified arts

72 TECHNICAL AND OTHER HOBBIES
720 Unspecified hobbies
721 Collecting, etc.
722 Making miniatures/ doing handicrafts
723 (Video-) filming/ photographing
724 Experiments (e.g. chemical, electronical)
725 Correspondence
729 Other specified hobbies

73 GAMES
730 Unspecified games
731 Parlour games and play
732 Solo games and play
733 Computer games
734 Gambling
739 Other specified games

94 TRAVEL RELATED TO VOLUNTEER WORK/INFORMAL HELP (SECTION 4)
941 Volunteer work in or for organisations
942 Travel related to informal help
944 Travel related to participatory activities
949 Other specified and unspecified travel connected with volunteer work and informal help to other households

95 TRAVEL RELATED TO SOCIAL LIFE AND EN-TERTAINMENT (SECTION 5)
951 Travel related to social contacts
952 Travel related to entertainment and culture, except visiting sports events
953 Travel related to visiting sport events
959 Other specified and unspecified travel connected with social life and entertainment

[1] In case of total anonymised data: code = 631.

[1] In case of total anonymised data: code = 632.

[1] In case of total anonymised data: code = 633.

SOCIAL TIME =
021+233+234+41+42+44+51+52+61+64+71 +72+73+94+95

References

Angist, J.D. and J.-St. Pischke (2009), *Mostly harmless econometrics – An empiricists companion*, Princeton University Press, Princeton.

Ashenfelter, O. and D. Card (1999), *Handbook of labor economics – 3A and 3B*, Elsevier/North-Holland, Amsterdam.

Ashenfelter, O. and R. Layard (1986), *Handbook of labor economics – 1 and 2*, Elsevier/North-Holland, Amsterdam.

Becker, G.S. (1991), *A treatise on the family*, Harvard University Press, Cambridge MA.

Corneo, G. (2005), Work and television, in: *European Journal of Political Economics*, Vol. 21, No. 1, 99-113.

Ehling, M. (1999), The German time use survey – Methods and results, in: Merz, J. und M. Ehling (eds.), *Time use – Research, data and policy*, FFB-Schriftenreihe Band 10, Nomos Verlagsgesellschaft, Baden-Baden, 89-105.

Ehling, M. (2004), Zeitbudgeterhebungen 1991/92 und 2001/02 – Kontinuität und Wandel, in: *Statistisches Bundesamt, 2004, Alltag in Deutschland – Analysen zur Zeitverwendung*, Wiesbaden, 10-22.

Ehrenberg, R. and R. Smith (2003), *Modern labor economics – Theory and public policy*, Addison-Wesley, Boston.

Ermisch, J.F. (2003), *The economics of the family*, Princeton University Press, Princeton NJ.

Gershuny, J. (2002), *Changing times – Work and leisure in postindustrial society*, Oxford University Press, Oxford.

Gratton, C. and P. Taylor (2000), *The economics of sport and leisure*, Spon Press, London.

Hallberg, D. (2003), Synchronous leisure, jointness, and household labor supply, in: *Labour Economics*, Vol. 10, 185–202.

Hamermesh, D. (1996), The timing of work time – Evidence from the US and Germany, in: *Konjunkturpolitik*, Applied Economics Quarterly, Vol. 42, 1–22.

Hamermesh, D. (1998), When we work, in: *American Economic Review*, Vol. 88, No. 2, 321-325.

Hamermesh, D. (2002), Timing, togetherness and time windfalls, in: *Journal of Population Economics*, Vol. 15, 321-325.

Harvey, A. (1999), Time use research The roots to the future, in: Merz, J. und M. Ehling (eds.), *Time use – Research, data and policy*, FFB-Schriftenreihe Band 10, Nomos Verlagsgesellschaft, Baden-Baden, 123-149.

Heckman, J., Lalonde, R.J. and J.A. Smith (1999), The economics and econometrics of active labor market programs, in: Ashenfelter, O. and D. Card (eds.), *Handbook of labor economics*, Vol. 3a, Elsevier Science B.V., Amsterdam, 1865-2097.

Heckman, J.J. (1979), *Sample selection bias as a specification error*, Econometrica, 153-161.

Jacobsen, J.P. and P. Kooreman (2005), Timing constraints and the allocation of time – The effects of changing shopping hours regulations in The Netherlands, in: *European Economic Review*, Vol. 49, No. 1, 9-27.

Jenkins, S. and L. Osberg (2005), Nobody to play with? – The implications of leisure co-ordination, in: Hamermesh, D.S. and G.A. Pfann (eds.), *The economics of time use*, Elsevier B.V., Amsterdam, 113-145.

Killingsworth, M. (1983), *Labor supply*, Cambridge University Press, Cambridge.

Knack, S. and P. Keefer (1997), Does social capital have an economic payoff? – A cross-country investigation, in: *The Quarterly Journal of Economics*, Vol. 112, 1251–1288.

Knight, F.H. (1933), *The economic organization*, University of Chicago, Chicago IL.

Merz, J. (2002a), Time use research and time use data – Actual topics and new frontiers, in: Ehling, M. and J. Merz (eds.), *New technologies in survey research – Applications for time use studies (Neue Technologien in der Umfrageforschung – Anwendungen bei der Erhebung von Zeitverwendung)*, FFB-Schriftenreihe, Nomos Verlagsgesellschaft, Baden-Baden, 3-19.

Merz, J. (2002b), Time and economic well-being – A panel analysis of desired vs. actual working hour, in: *The Review of Income and Wealth*, Vol. 48, No. 3, 317-346.

Merz, J. and D. Burgert (2005), Wer arbeitet wann? – Arbeitszeitarrangements von Selbständigen und abhängig Beschäftigten – Eine mikroökonometrische Analyse deutscher Zeitbudgetdaten, in: Merz, J. and J. Wagner (eds.), *Perspektiven der Mittelstandsforschung – Ökonomische Analysen zu Selbständigkeit, Freien Berufen und KMU*, CREPS-Schriftenreihe, Vol. 1, Lit-Verlag, Münster, 303-330.

Merz, J. and M. Ehling (1999), Time use – Research, data and policy, in: *FFB-Schriftenreihe Band 10*, Nomos Verlagsgesellschaft, Baden-Baden.

Merz, J., Böhm, P. and D. Burgert (2005), *Timing, fragmentation of work and income inequality – An earnings treatment effects approach*, FFB-Discussionpaper No.48, Department of Economics and Social Sciences, University of Lüneburg, Lüneburg.

OECD (2001), *The well-being of nations – The role of human and social capital*, Organization for Economic Co-operation and Development, Paris.

Osberg, L. (2003a), Understanding growth and inequality trends – The role of labour supply in the U.S.A. and Germany, in: *Canadian Public Policy*, Vol. 29, No. 1, 163–183.

Osberg, L. (2003b), *The economic implications of social cohesion*, University of Toronto Press, Toronto.

Putnam, R.D. (1993), *Making democracy work – Civic traditions in modern Italy*, Princeton University Press, Princeton NJ.

Putnam, R.D. (2000), *Bowling alone – The collapse and revival of the American community*, Simon and Schuster Publishers, New York.

Skuterud, M. (2005), The impact of sunday shopping on employment and hours of work in the retail industry – Evidence from Canada, in: *European Economic Review*, Vol. 49, No. 8, 1953-1978.

Stigler, G.J. and G.S. Becker (1977), De gustibus non est disputandum, in: *The American Economic Review*, Vol. 67, No. 2, 76-90.

Sullivan, O. (1996), Time co-ordination, the domestic division of labour and affective relations – Time use and the enjoyment of activities with couples, in: *Sociology*, Vol. 30, 79–100.

Uhlaner, C.J. (1989), Relational goods and participation – Incorporating sociability into a theory of rational action, in: *Public Choice*, Vol. 62, 253–285.

van Velzen, S. (2001), *Supplements to the economics of household behaviour*, Tinbergen Institute Research Series No. 242, University of Amsterdam, Amsterdam.

Weiss, Y. (1996), Synchronisation of work schedules, in: *International Economic Review*, Vol. 37, 157–179.

time-pieces

news on time use research in the
electronic **International Journal of Time Use Research**

New developments in time technology – projects, data, computing and services

---

AMERICAN TIME USE SURVEY DATA EXTRACT BUILDER (ATUS-X)

Sarah Flood
University of Minnesota

Katharine Abraham
University of Maryland

The American Time Use Survey (ATUS) is an ongoing time diary survey funded by the United States Bureau of Labor Statistics and fielded by the United States Census Bureau. Data collection began with some 20,000 interviews in 2003 and 14,000 responses have been collected each subsequent year. ATUS respondents are a nationally representative sample of persons aged 15 and older drawn from households who have concluded their participation in the Current Population Survey (CPS), the monthly labor force survey in the United States. For each activity during the day covered by the ATUS interview, respondents are asked what they were doing, where they were, and who was with them.

Background information about the ATUS respondents and their households is collected as part of the ATUS interview. The ATUS public use files also include information collected during the household's final CPS interview. The survey is designed to permit the addition of modules on specific topics, such as the Eating and Health Module sponsored from 2006 through 2008 by the Economic Research Service of the United States Department of Agriculture.

The ATUS Data Extract Builder (ATUS-X) is a new web-based data dissemination system developed collaboratively by the University of Maryland Population Research Center and the University of Minnesota Population Center. The ATUS public use data are contained in multiple data files, some referring to the person, some to the household, and others to the individual activity. The ATUS-X eliminates the need to write programs to manipulate these separate files

to produce a file that is suitable for analysis. It also simplifies the creation of time use variables broken out along multiple dimensions (e.g., time spent watching television at home in the company of one's spouse).

The version of the ATUS-X system released in June 2009, available at *www.atusdata.org*, allows researchers to:

- Select study populations for data extracts;
- Create measures of time in user-defined activity aggregations, broken out as desired by time of day, by location, by whether the respondent was engaged in caring for children during the activity or (for 2006) was engaged in eating or drinking during the activity, and by the presence or absence of specified others, and;
- Request either a rectangular or a hierarchical data extract.

Data for survey years 2003 through 2007, together with data from the 2006 Eating and Health Module, are available now and new data will be added as they are released. Customized downloadable datasets come with SAS, SPSS, and Stata command files, which include variable and value labels for ease of use. ATUS-X also provides researchers with accessible and comprehensive online documentation.

Enhancements to ATUS-X will be added in annual releases planned for summer 2010 and 2011. Among other new features, data users will be able to build extracts that combine ATUS data with sample members' responses to earlier waves of the main CPS questionnaire or, if they participated, with their responses to various CPS supplements, which have covered topics including worker displacement, work schedules, volunteer activity, smoking habits, and others. For more information, visit www.atusdata.org or contact us via email at atusdata@umn.edu.

A NEW DANISH TIME USE AND CONSUMPTION SURVEY 2008/09

Jens Bonke
Rockwool Foundation Research Unit

The Rockwool Foundations Research Unit carried out a new Danish time use and consumption survey in 2008/09. This survey has to be seen as a continuation of the Danish Time Use Survey 2001 with additional information of the household's consumption behaviour. Hence the aim was to establish a time use panel for Denmark and to show the concurrent distribution of time and money within Danish households.

In order to carry out the study, a sample of 6,000 adults (ages 18-74) was drawn from administrative registers held at Statistics Denmark. Some of these people had also participated in the Danish Time Use Survey of 2001, of whom some again had participated in the Danish Time Use Survey of 1987. New respondents were included to compensate for attrition and to keep the

same age range, and also to provide a greater number of interviews in 2008/09 than in the previous time-use surveys.

The respondents received a letter offering them the choice of a telephone interview lasting 10-15 minutes or completion of a questionnaire on the web (an access code was provided for this). Respondents were also asked to complete two forms for daily time use – one for a weekday and one for a weekend day – together with an accounts booklet. If respondents in the 18-74 age group had a spouse or cohabiting partner and/or children aged 12-17, these people were also asked to complete the forms for time use. In the case of children aged 7-11, parents were asked to assist in completing a form which included time use information. Finally, a booklet for information about the previous month's spending on goods and services and about regular costs and durable goods bought within the previous year was to be filled out for all household members.

A pre-coding system was used for both time use (the day was divided into 10-minute intervals) and types of consumption, and this enabled the respondents and/or the interviewer to make electronic searches on keywords, etc.

The interviews were conducted at regular intervals over twelve months, covering the period March 2008 to March 2009. By linking the information obtained with register information from Statistics Denmark, it will be possible to study time use, consumption, income, family situation, attachment to the labour market, use of primary and secondary health system, etc. for around 10,000 people living in Denmark (inclusive of immigrants living in Denmark for more than seven years or with Danish citizenship).

A Study Paper "The impact of incentives and interview methods on response quantity and quality in diary- and booklet-based surveys" available on www.rff.dk investigates the impact on response quantity and quality of a diary- and booklet-based survey of using different interview methods and lottery prizes, which were drawn for participants every month. The amount of these prizes was varied during the survey period, and for some respondents the prizes were doubled if they had used only the CAPI method. Also the impact on response quality of using different survey methods and lottery prizes is estimated in the Study Paper (e-mail: jb@rff.dk).

COMPUTER AIDED TIME USE SURVEYS (CATUS)

Henning Stolze
Jens Koch-Bodes
Wege & Gehege – web applications, serverbased computing and databases

Time-use surveys ask for detailed diaries and large quantities of data. To journalize all their activities, however, is demanding a lot of effort from the participants. Thus a researcher has to balance between surveying sufficient detailed information and cutting the effort for the partici-

pant to a reasonable level to ensure acceptance and motivation. Computer aided surveying methods can help to reduce the complexity of surveying data and hence increase its quality. These systems are widely spread among interview-based surveys (CATI, CAPI etc.), though despite the advantages of these systems in stationary interviews, they are rarely used in surveying time-use journals since requirements towards hardware as well as software are high:

- The devices should be ...
  - mobile, small and light-weighted, though robust
  - capable of operating during a whole journal-day without the requirement of re-charging
  - affordable in a large number of units

- The software should be ...
  - self-explaining and quick to operate
  - programmable to gather all the data needed for further analysis
  - error tolerant concerning internal operations and external influences

The market for embedded devices offers nearly no solutions for surveying time-use data and although there are some very few products which are technically capable of capturing time-use data, they do not meet the requirements stated above.

For an internal survey-project in the production facilities of a large company, we developed a new approach in deploying computer-aided time-use surveying. We designed an Internet-based system consisting of two major components. On the one side a server system provides the software, both frontend and backend, including a database system to store the gathered data. On the other side standard Personal Data Assistants (PDAs) can access the serverbased software via a WLAN/ UMTS-connection through a web browser. The layout of the software is user-friendly and can be operated via the PDAs' touchscreen. This setup meets the requirements for a successful survey, increases the data quality and has some additional advantages due to the centralist configuration of the web based solution: You can access the survey layout, programmatic details and the gathered data at any time throughout the project without having physical access to the devices themselves. Furthermore, as this software is located on a server rather than on a handheld devices with limited performance, it is possible to implement complex features within the survey software like learning algorithms which offer the user different activity lists depending on the time of the day, the day of the week or the previously recorded activities. Besides the complexity of the software, it's possible to benefit from the functional range of modern PDAs as well, e.g. to record geo-positioning data through the devices GPS-module or use bar-code scanners on products consumed.

Although this pilot project operates on a business level, this system can increase data quality and quantity in time-use surveys in economic and social sciences as well.

The following will give you a brief overview of our system:

1. First you can set up a surveying project in an administration tool. With this software you can manage master files containing information about participants, activities and additional statistical units. It allows you to generate a project which is transferred to the survey software itself.

2. The PDAs are connecting to to this second piece of software to receive user-specific parameters like activity-lists as well as to send the surveyed data back to the server. In case of loosing the WLAN- or UMTS/GSM- connection, the software switches to a local operating mode buffering the data until the connection is restored. Since the actually transferred amount of data is rather small, the costs for data transfers are rather insignificant in a packet-based plan.

3. In our pilot project the surveyed data is transferred to a server-based statistical software which hosts several time-use data specific analytic functions on a user friendly interface. Of course, any other statistical software can be used instead.

In the pilot project our system journalized more than 6,000 activities over a period of 10 days on 5 PDAs simultaneously. The system worked reliably and the employees were very comfortable with using the PDAs thus generating a data basis of very high quality. If you are interested in further details of our system or our experiences, you are welcome to contact us at info@wegeundgehege.de.

TURC (TIME USE RESEARCH CELL) AT CFDA (CENTRE FOR DEVELOPMENT ALTERNATIVES) INDIA

Indira Hirway
Center for Development Alternatives

The Centre For Development Alternatives is a well-known academic research centre located at Ahmedabad, India. Its mission is to work for promoting human centered development by exploring and communicating alternatives through research, dialogues, seminars and publications and by undertaking policy advocacy as well as supporting efforts of like-minded institutes. Its major objectives are to conduct research on subjects relating to multifarious aspects of development; to discuss and disseminate research finding in seminars and workshops; to generate informed debates and discussions on relevant policies, activities and issues at regional, national and international levels; to publish outcomes of research and dialogues in forms of books, reports, research papers, working papers etc; to undertake training and capacity building programmes and to promote educational activities in the fields development and to collaborate and network with likeminded institutions and organizations at regional, national and international levels to further activities of CFDA.

The present Chairman of CFDA is Dr. R. Radhakrishna, an eminent economist who is also Chairman of the National Statistical Commission, the apex body in the Department of Statistics, Government of India. The other members of the Board of CFDA are also eminent social scientists in India.

The major areas of work of CFDA are poverty and its multiple dimensions, labour and employment, human development, gender development, environment and development including environmental accounting, urban development, NGOs and grass-root organizations, development alternatives, and time use studies. CFDA has so far undertaken more than 50 studies sponsored by organizations like the Planning Commission (Govt of India), several ministries of Government of India and Government of Gujarat, Asian Development Bank, UNDP (New York, Manila and India offices), UNIFEM (Bangkok and India offices), India Canada Environment Facility, WHO, UN-ESCAP (Bangkok), International Labour Organization, and many others. The faculty of CFDA has published more than 10 books and published more than 50 research papers in reputed Indian and international journals.

CFDA is in a process of setting up a Time Use Research Cell (TURC) at CFDA under International Working Group on Gender and Macroeconomics (IWG-GEM). The main objective of this TURC is to promote mainstreaming of time use surveys in developing countries to enable them to generate quality time use statistics on a regular basis and to tap the full potential of the data to understand and address the major development related concerns of these economies.

The specific objectives of TURC are:

(1) To understand the constraints and problems of developing countries with respect to conducting and mainstreaming time use surveys in their national data systems, and to work for facilitating the mainstreaming.

(2) To contribute towards harmonization of concepts, methods and analysis of time use data (particularly classification of time use activities) at the global level by focusing on the issues related to developing countries.

(3) To undertake capacity building in conducting time use surveys in developing countries by developing suitable courses and curriculum, and by organizing general and tailor-made programmes for capacity building of researchers, officials, civil society organizations and others.

(4) To conduct research and to encourage research using time use statistics in a country or in a group of countries to understand the different socioeconomic problems and constraints in these countries, and to illustrate the multiple uses of the data in understanding the critical areas of concerns in the developing economies.

(5) To organize research in the conceptual and methodological aspects of conducting time use surveys in these countries to strengthen the methodologies of time use surveys in these countries and to contribute towards harmonizing the methodologies at the global level.

(6) To network with other organizations and networks with similar objectives and activities at the global level.

The main activities of TURC will be research, developing depository of TUS statistics in developing countries, capacity building among concerned government officials and others, organizing workshops, seminars and conferences on important subjects and issues, publication and networking with national and international organizations and policy advocacy. TURC will welcome national and international experts and scholars to participate in its various activities.

An advisory committee, consisting of the experts from the different parts of the world, has been set up to guide the activities of TURC. This committee includes Dr. Radhakrishna (Chair person), Dr. Nilufer Cagatay, Dr Duncan Ironmonger, Dr Jacques Charmes, Dr. Solita Collas-Monsod, Dr. Valeria Equivel, Dr. Jayati Ghosh, Dr. Rania Antonopoulos, Dr Kimberly Fisher and Dr Indira Hirway (Convener).

TURC has already initiated its activities. It will start full swing from 2010, after the first meeting of the advisory committee.

RESEARCH NETWORK ON TIME USE (RNTU)

Joachim Merz
Research Institute on Professions (FFB), Leuphana University Lüneburg

The new international *Research Network on Time Use (RNTU)* will support researchers and other persons who are interested in time use considering surveys, methods and results of analyses and explanation of macro- and micro-behaviour as well as policy matters.

We offer an *information system about time use research* which is accessible via the Internet by any interested person. Based on the former RNTU pilot version the new RNTU in addition consists of an in-depth *Time Use Bibliography*, a reconstructed *Time Use Research Safe*, a *Time Use Information Pool* and a *Time Use Event Calendar*.

The RNTU Time Use Bibliography is a worldwide unique database of time use literature which Prof. Andrew Harvey and his research colleagues collected for many years at their TURP project at the St. Mary's University of Halifax, Canada (www.stmarys.ca/partners/turp). This time use library has now been released to RNTU and will be expanded periodically.

The RNTU Time Use Research Safe provides information about researchers, their subjects, their data bases, methods, results, references, available literature, advice and suggestions. The relational data base system behind allows a targeted search for all kinds of specific research information.

The RNTU Time Use Information Pool offers helpful links to time use related journals, institutions and databases and their access.

The RNTU Time Use Event Calendar informs about time use connected conferences, workshops, summer schools and related events.

The RNTU Time Use Forum gives users the chance to post or exchange topic-specific information, either by contacting or by getting in touch with others. It shall improve the ways of communication and thereby creates a global network of in time use interested people. The RNTU Time Use Forum is realized as a group at the social network *www.xing.com*. Via a teaser on each RNTU page you are able to register and enter XING and find the RNTU group under *Research Network on Time Use*.

Development and Hosting: New RNTU is developed and further hosted by the Research Institute on Professions (Forschungsinstitut Freie Berufe, FFB, www.leuphana.de/ffb) of the Leuphana University Lueneburg, Germany, its director Univ.-Prof. Dr. Joachim Merz and his colleagues; Kristina Kaske evolved the new server based software. The former RNTU FFB pilot project, realised by Henning Stolze, was encouraged and supported by the Federal Ministry of Education, Sciences, Research and Technology of Germany (Bundesministerium für Bildung, Wissenschaft, Forschung und Technologie (www.bmbf.de)), and by the Federal Statistical Office of Germany (www.destatis.de).

Comments and above all: your input and feedback are encouraged to further improve the Research Network on Time Use (email: info@rntu.org, internet: www.rntu.org).

Book notes
by Kimberly Fisher

Amico, A.
The international statistics of time use: structure and characteristic of multinational time use study data file (2008)

Publisher: Ricerca Sociale e Metodologia Sociologica, La Sapienza University
Languages Available: English

This PhD thesis examines comparative time use research, with a particular interest in comparing time use patterns in Italy with patterns in other countries. The thesis also considers the degree to which time use data collected in different ways can be compared.

Boulin, J.-Y.
Villes et politiques temporelles Paris (2008)

Publisher: La Documentation Française
Website:
http://www.ladocumentationfrancaise.fr/
Languages Available: French

This book looks at inequalities in the use of time between women and men, between young and old, and between other social groups in urban areas in France. The book covers the range of activities, from employment and education, transport, domestic work, leisure and social time.

Esquivel, V.
Uso del tiempo en la ciudad de Buenos Aires (2009)

Publisher: Buenos Aires: Universidad Nacional de General Sarmiento
Website:
http://www.ungs.edu.ar/publicaciones/resumen/res_lu33.html
Languages Available: Spanish

This book assesses the methodology of the official time use study conducted in the city of Buenos Aires in 2005. The book then demonstrates that paid labour comprises only a modest proportion of total labour in Argentina. The book demonstrates the value of understanding the total economy for gender policy.

Folbre, N.
Valuing children: rethinking the economics of the family (2008)

Publisher: Harvard University Press
Website: http://www.hup.harvard.edu/catalog/FOLOUR.html?show=reviews
Languages Available: English

This book demonstrates the many inadequacies of applying cost-benefit and other

neoclassical economics approaches to valuing children and child care activities. Families, states and employers all have an interest in policies relating to children, yet different actors have different perceptions of who bares the cost of children. The author examines time and financial investments in children and associated outcomes to build an argument for moral obligations to children.

Gabb, J.
Researching intimacy in families (2008)

Publisher: Palgrave Macmillan
Website: http://www.palgrave.com
Languages Available: English

This book makes use of mixed methods, including diaries, to examine intimate interactions between parents, and between parents and children in families. The book explores both the nature of private family relations and the efficacy of different methods for researching family life.

Hilbrecht, M.
Parents, employment, gender and well-being: a time use study (2009)

Publisher: Faculty of Applied Health Sciences, University of Waterloo
Website:
http://uwspace.uwaterloo.ca/handle/10012/6
Languages Available: English

This PhD thesis looks at quality of life, time pressure and well-being among Canadian parents with children in school (ages 5-17). The thesis considers changes in expecta-

tions of parenting roles, as well as changes in working patterns and schedules, time use patterns, and a range of measures of well-being for mothers and fathers. The thesis compares gendered experiences as well as the experiences of single parents and parents in couples.

OECD
Society at a glance 2009: OECD social indicators (2009)

Publisher: OECD
*Website:*http://www.oecd.org/document/24/0,3343,en_2649_34637_2671576_1_1_1_1,00.html
Languages Available: English

This volume includes a number of indicators comparing social conditions in OECD countries. The most relevant section for time use researchers is "Chapter 2: Special Focus on Measuring Leisure in OECD Countries". This chapter begins with discussion of working time and working hours, then continues to look at measures of leisure, with a discussion and use of time diary surveys. The web site also includes links to some raw data used in the creation of tables in this report.

Roe, R.A., Waller, M.J. and S.R. Clegg
Time in organizational research (2008)

Publisher: Routledge
Website: http://www.routledgebusiness.com/books/Time-in-Organizational-Research-isbn9780415460453
Languages Available: English

This book aims to fill a gap in organisational research by adding time to organisation theories which previously excluded this dimension. The book then reviews research into how managers use time. The next two parts looks at how understanding how individuals and groups use of time improve the understanding of the functioning of organisations.

Van Dongen, W.
Towards a democratic division of labour in Europe? The combination model as a new integrated approach to work and family life (2008)

Publisher: Policy Press
Languages Available: English

This book considers how European societies can reconcile promoting individual freedom, equality between the genders, social solidarity and efficiency, and also examines how to measure progress in these concepts. The book presents a combination model for examining the gendered division of labour (both paid and unpaid).

Zimbardo, P. and J. Boyd
The time paradox: the new psychology of time than will change your life (2008)

Publisher: Free Press, a Division of Simon & Schuster Inc.
Languages Available: English

This popular psychology book examines seven ways in which people experience time. The authors argue that people can better manage their time and the progression of their lives by understanding how to work with their personal time zone.