electronic International Journal of Time Use Research

contents

Incentive contracts and time use

Tor Eriksson and Jaime Ortega

Dr. Pol. Tor Viking Eriksson,
Department of Economics and Business
Frichshuset Hermodsvej 22
8230 Åbyhøj
e-mail: tor@asb.dk

Jaime Ortega, Ph.D. Economics.
Universidad Carlos III de Madrid
Calle Madrid 126
28903 Getafe (Madrid)
e-mail: jaime.ortega@uc3m.es

Abstract

Empirical studies on incentive contracts have primarily been concerned with the effects on employees' productivity and earnings. The productivity increases associated with such contracts may, however, come at the expense of quality of life at or outside work. In this paper we study the effect on the employees' non-work activities, testing whether incentive contracts lead to a change in the allocation of time across work and non-work activities. In doing so, we distinguish between two effects, a substitution effect and a discretion effect. On the one hand, the introduction of explicit incentives raises the marginal payoff to work, hence employees are expected to work more and spend less time on non-work activities (substitution effect). On the other hand, employees with an incentive contract tend to have more discretion to choose their work hours. Therefore, they may choose to do the same job in less time and have more spare time for non-work activities (discretion effect). Using data from the European Working Conditions Survey, we show that performance pay has a negative effect on non-work activities and a positive effect on work hours. The substitution effect is negative for men's leisure activities and for women's charitable and political activities.

JEL-Codes: J22, J33, M52

Keywords: Incentive contracts, performance pay, time use, work and non-work activities, work-family balance

1   Introduction

Research on the impact of incentive contracts has mainly been concerned with its effects on earnings of employees and performance of firms (Booth and Frank 1999; Lazear 2000; Parent 1999; Freeman and Kleiner 2005; Shearer 2004). Considerably less is known about other consequences, such as worker turnover, job satisfaction (Money and Graham 1999; Heywood and Wei 2006) and competition among employees (Drago and Garvey 1998). Increased use of incentive pay schemes is frequently accompanied by changes in the design of jobs and work organizations. In particular, paying for performance typically means increasing the discretion of employees with respect to choice of work hours and methods (Ortega 2009)[1]. There is a small economic literature (and a large number of works in psychology and sociology) on how increased demands of work life affect job satisfaction (see Greene 2006 for a discussion and analysis) or the work-family life balance (Berg, Kalleberg and Appelbaum 2003) and related time stress (Hamermesh and Lee 2007). Investigations of how changes in compensation schemes spill over to other parts of individuals' lives have, however, been thin on the ground.

Our intention in this paper is to contribute to fill one of these gaps. We focus on how incentive contracts affect employees' private lives in terms of time available for housework (cooking, cleaning), taking care of children, elderly or disabled relatives, and sports, cultural and other leisure activities. In other words, in our study we examine the extent to which performance-related pay schemes contribute to the much discussed worsening of the "work/life balance" as it is called Europe ("time squeeze" is the term used in North America; see OECD 2004). The term "time squeeze" is associated with the stress caused by an imbalance between work and family requirements, and this paper we do not have any measures of stress. However, we are able to measure time spent in and out of work and therefore can estimate whether incentive contracts are associated with less time available for non-work activities. Our empirical analysis is based on the European Working Conditions Survey from year 2000, which provides us with a fairly rich data set on working conditions and individuals' activities outside work in 27 European countries.

Household work and family care are the non-market activities that have been studied most in the time use literature. A considerable portion of this research has been concerned with the consequences of time spent on household work and taking care of family on (especially women's) wages. Consequently a large literature has documented a negative relationship between household work and women's wages (see e.g., Hersch and Stratton 1997, and Stratton 2001) and a corresponding positive relation for men. As shown by Bonke et al. (2005), the negative effect for women is mainly due to inflexibility of household work and this is further strengthened by inflexible work time schedules. Thus the question we address in this paper is different

---

[1]   Moreover, Lemieux, MacLeod and Parent (2009) have shown that the increased use of performance pay accounts for a sizable fraction of the increase in U.S. wage inequality in the seventies and eighties.

since we are interested in how monetary incentives influence household work and family care. On the other hand, most research on leisure has focused on how the greater access to leisure affects leisure consumption (Gershuny 2005). An important feature of leisure is that its consumption is complementary among spouses (and other family members); see Hills and Juster 1985, and Jenkins and Osberg 2005. Hence, a reduction in time available for leisure may have a negative externality on the employee's family members. Although the data that we use do not allow us to measure time allocation within the household, we find different effects of performance pay for employees who live alone and other employees. Finally, note that in our study we do not, unlike most previous studies, see e.g., Anttila, Oinas and Nätti (2009), make use of data on individuals' perceptions of time stress. As pointed out by Hamermesh and Lee (2007), due to binding time constraint and increased abundance of goods, more and more people will be harried. Thus, perceptions of time stress will largely reflect differences in income levels.

Some limitations of our study with respect to the existing time use literature are the absence of data on hours of sleep and dual earner households and the fact that the variables on non-work activities are not continuous. However, the data have some advantages over time use surveys, particularly the information about the use of monetary incentives, which makes it possible to link the time use literature with the performance pay literature.

Our empirical study is guided by a model of the Holmström and Milgrom's (1991) multi-task variety. The aim of the model is to show that the effect of performance pay on non-work activities can be decomposed into a "substitution effect" (employees spend less time on private activities because better work performance leads to a higher bonus) and a "discretion effect" – with a performance pay contract employees are given more discretion over work hours and can choose to spend more or less time on private activities. Moreover, the model shows that substitution effects are different for activities where the individual cannot be replaced (e.g. sports activities) and those where he can be easily substituted for (e.g. housework). Specifically, the substitution effect is such that employees will always spend less time on the latter but might spend more or less time on the former.

In the empirical sections we use two difference approaches. First we estimate the total effect of performance pay on non-work activities for men and women. We find a positive effect of performance pay on men's hours worked, and the effect on non-work activities, when significant, is generally positive. Second, we use a differences approach which enables us to estimate the substitution effect. This alternative approach takes advantage of an interesting feature of the data – the information about employees' discretion over work schedules. Using this approach, we find that women with a performance pay contract reduce the amount of time spent on charitable and political activities, whereas men reduce the amount of time spent on leisure. Estimates of the substitution effect also indicate that men with a performance pay contract work more hours, whereas women only work more significantly more hours when they live alone.

The rest of the paper is structured as follows. In Section 2 the theoretical framework and the hypotheses to be tested are presented and derived. Section 3 contains the data description. In the following two sections we report results from analyses using two different estimation approaches. Section 6 concludes.

2 Theory

To guide the empirical analysis we propose the following version of Holmström and Milgrom's (1991) multi-task agency model. Suppose a risk-neutral firm employs a risk-averse individual whose work effort is not observable. The employee makes three choices outside work: in particular, she chooses the amount of housework and family-related work, the amount of leisure, and the amount of housework services purchased in the market. Such services are assumed to be a perfect substitute for the employee's own housework[2]. The model also takes into account that time imposes a limit on the amount of work and non-work activities that the employee can carry out.

As in Lazear (1986), we consider two different contractual arrangements. In the first one, the employee is paid according to an explicit incentive contract and has discretion to choose the amount of work effort she wants to exert, and under the second arrangement she is paid a straight salary. Because in the latter case she would not have any incentive to work, the firm must supervise her in order to ensure that she works for a minimum amount of time or supplies a minimum level of work effort. Two other contractual arrangements are of course possible but will not be optimal in this simple model: if there is a performance pay contract but the employee does not have discretion, she will be inefficiently exposed to risk. Given that she is being monitored, the contract can be improved by paying her a fixed salary. The other suboptimal contract is the one where the employee is paid a fixed salary and has discretion to choose effort, for in that case she will choose a level of effort equal to zero.

We consider a multi-task agency model with one principal (the firm) and one agent (the employee). Besides work effort (e), the employee chooses the amount of housework (h) and leisure (L). Total time available is normalized to one ($e + h + L = 1$). The employee can also hire an amount x of housework services at a unit price of p. Her utility function has a constant absolute risk aversion coefficient[3] equal to r and is given by

(1) $$U = -\exp\left\{-r\left[c + B(h+x) + F(L) - g(e,h)\right]\right\},$$

---

[2] Thus, the term "housework" refers to house-related activities for which there exists a market substitute (e.g. cooking and cleaning) whereas for "leisure" such market substitutes do not exist (we do not pay someone to watch a movie for us). There are of course activities for which only an imperfect market substitute exists (e.g. taking care of children).

[3] Holmström and Milgrom (1987) show that if the agent's coefficient of absolute risk aversion is constant, then the optimal contract will be linear. We therefore assume this utility function to make sure that the linear contracting assumption is consistent with optimality.

where c is consumption, $B(.)$ are the private benefits derived from housework, $F(.)$ is the net utility of leisure, and $g(.,.)$ is the cost of effort. Housework services are assumed to be a perfect substitute for the employee's own housework effort: $B = B(h + x)$, with $B' > 0$ and $B'' < 0$. Moreover, leisure is assumed to increase utility $F' > 0$ at a decreasing rate $F'' < 0$. As far as the cost function is concerned, all first and second partial derivatives are assumed to be positive, which in particular implies that e and h are substitutes in the utility function (complements in the cost function). In addition, the cost function is assumed to be quadratic: $g(e,h) = e2/2 + \gamma h2/2 + \kappa eh$, where $\gamma, \kappa > 0$. The employee's budget constraint is given by $c + px = w$, where for simplicity the price of consumption is normalized to one. The firm is risk neutral, with profits given by $y - w$, where y denotes value added and w employee compensation. Specifically, we assume that $y = e + \varepsilon$, where $\varepsilon \sim N(0, \sigma^2)$.

There are two contractual arrangements. Under a performance pay system, the employee is paid $w = \beta + \alpha y$ (where β and α are positive parameters) and has discretion to choose effort (e). Under a salary system, she receives $w = \beta$, and firm supervision ensures that she supplies a minimum level of work effort, $\underline{e}$.[4] We use e^{pp}, h^{pp}, L^{pp} and x^{pp} to denote the optimal choices under the performance pay system, and e^{s}, h^{s}, L^{s} and x^{s} to denote the optimal choices under the salary system.

Let $A = (h, L)$, and suppose $A^{s}(0)$ denotes the level of non-work activities when the employee is paid a fixed salary and is not supervised (i.e. when $\underline{e} = 0$). Then the total effect of moving from a salary system to a performance pay system can be decomposed as:

(2) $A^{pp} - A^{s}(\underline{e}) = [A^{pp} - A^{s}(0)] + [A^{s}(0) - A^{s}(\underline{e})]$,

where the "substitution effect" (the effect of introducing performance pay when employees already have discretion) is given by $[A^{pp} - A^{s}(0)]$, and the "discretion effect" (the effect of giving discretion when employees are paid on a salary basis) is given by $[A^{s}(0) - A^{s}(\underline{e})]$.

Proposition: Suppose the firm moves from a salary system to a performance pay system. If work effort increases $e^{pp} > \underline{e}$, then:

1. The total effect on housework is negative $h^{pp} < h^{s}$, the substitution effect is negative, and the discretion effect is positive.

2. The total effect on leisure is negative $L^{pp} < L^{s}$, the substitution effect is negative, and the discretion effect is positive if and only if $\kappa < \gamma$.

Proof: See Appendix.

The economic intuition for these results can be summarized as follows. Due to the multi-task nature of the problem, in equilibrium the marginal benefit of housework must be equal to the marginal benefit of leisure. When moving from a salary system to an incentive pay system,

---

[4]   Thus $\underline{e}$ is positively related to the extent of monitoring, and negatively related to the employee's discretion. The more the employee is supervised, the higher e and the lower her discretion. In particular, if there is no supervision, $\underline{e} = 0$, which means that the employee is free to choose her preferred effort level.

the employee increases work effort, which raises the marginal benefit of leisure. Hence, to go back to equilibrium, the marginal benefit of housework must increase and/or the marginal benefit of leisure must diminish. A reduction in housework will always achieve both goals: it will reduce the marginal benefit of leisure, and it will of course increase the marginal benefit of housework. As far as leisure is concerned, the effect of performance pay will depend on the increase in work effort relative to the reduction of housework, because leisure is any amount of time that is not spent on work or housework. This will in turn be determined by the degree of substitutability between work and housework: if work and housework are only weak substitutes, a small reduction of housework will suffice to increase the marginal benefit of housework back to an equilibrium level. In that case, since the reduction of housework is relatively small compared to the increase in work effort, leisure will diminish. In contrast, if work and housework are strong substitutes, a large reduction of housework will be needed to increase the marginal benefit of housework back to an equilibrium level. In that case leisure will actually increase, because the reduction in housework is relatively large compared to the increase in work effort.

Furthermore, since the two contractual arrangements differ both in how employees are paid and in how much discretion they have, the effect of moving from a salary system to a performance pay system can be expressed as the sum of two effects, a "discretion effect" and a "substitution effect." The discretion effect is the effect of introducing discretion when employees are being paid a straight salary, and the substitution effect is the effect of introducing performance pay when employees already have discretion. The model shows that the substitution effect is always negative for housework, whereas for leisure it is only negative when there is little substitutability between work and housework. The logic is similar to the one outlined above: if employees already have discretion, the introduction of incentive pay will increase work effort and, if housework stays constant, leisure will diminish and the marginal benefit of leisure will increase above the marginal benefit of housework. A reduction in housework will increase the marginal benefit of housework and (since there will be more time for leisure) will reduce the marginal benefit of leisure. The substitution effect on leisure will be positive or negative depending on the size of the reduction in housework relative to the increase in work effort (which hinges on the degree of substitutability between the two).

3   Data description

The third European Working Conditions Survey (EWCS) was carried out in 2000 for fifteen European Union member states and in 2001 for twelve "candidate states".[5] The data are a cross-section of more than 24,000 employees representing all industries and occupational

---

[5]   In 2000, the European Union member states were Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Portugal, Spain, Sweden, and United Kingdom. The candidate countries were Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, and Slovenia.

groups, and provide information on incentive contracts, discretion, work hours and time spent on non-work activities.[6]

An individual is defined to receive performance pay if she receives any of the following payments: piece rate or productivity payments, payments based on the overall performance of the company she works in (profit sharing), payments based on group performance, and income from shares of the company she is working for. As can be seen from Table 1, piece rates and profit sharing are clearly the most prevalent incentive schemes, and 16.4 per cent of the employees receive at least one form of performance-related pay.

Table 1
Descriptive statistics for performance pay

	Mean	Std. dev.	n
1. Piece rate or productivity payment	.105	.306	27,083
2. Group performance pay	.024	.154	27,083
3. Profit sharing	.056	.230	27,083
4. Stock ownership	.009	.094	27,083
5. Performance pay	.164	.402	27,083

Note. All variables are dichotomous. Performance pay is a dichotomous variable
equal to one if the respondent receives at least one type of performance pay.
Souce: European Working Conditions Survey 2000/01, own calculations.

As for non-work activities the questionnaire asks the respondents on a scale from 0 (never) to 5 (every day for at least one hour) about the frequency of their involvement in several types of activities: voluntary or charitable activities, political/trade union activities, caring for and educating their children, cooking, housework, caring for elderly/disabled relatives, taking a training or education course, sporting activities, cultural activities and other leisure activities. In our empirical analysis, reported below, we will not consider educational activities because for some respondents these may involve training for their jobs. As can be seen from Table 2, participation in political/trade union activities is rare as is involvement in charitable activities and taking care of disabled or elderly relatives. Not surprisingly, the most prevalent non-work activities are housework, child care, cooking and "other leisure", followed by sports and cultural activities.

Since theory suggests distinguishing between private activities for which the market provides a close substitute and those for which no market substitute really exists, we use the information available to construct four different indexes (see Table 3).[7]

---

[6]   The third EWCS is more informative than the other EWCS available cross sections (first, second and fourth EWCS): the first and second Surveys (1990 and 1995, respectively) do not include information on non-work activities, and the questions included in the fourth EWCS (2005) are less precise than the ones included in the third EWCS. More precisely, in the fourth EWCS activities are grouped so that information is more aggregated than in the third EWCS.

[7]   Although we use these indexes for our main results and discussion, we also report results by individual activities (see Section 4 below).

Table 2
Descriptive statistics for non-work activities, by sex

	Men				Women			
	Mean	Std. dv.	Median	n	Mean	Std. dv.	Median	n
1. Cooking	2.384	1.852	3	13,573	4.279	1.259	5	13,119
2. Housework	2.587	1.779	3	13,598	4.369	1.074	5	13,172
3. Children care	2.321	2.248	3	11,618	2.899	2.340	5	11,427
4. Disabled/elderly	.513	1.209	0	12,213	.815	1.509	0	11,724
5. Charity	.533	1.035	0	13,363	.537	.988	0	12,766
6. Political	.227	.711	0	13,306	.146	.550	0	12,723
7. Sport	1.607	1.619	2	13,445	1.350	1.589	0	12,795
8. Cultural	1.063	1.256	1	13,456	1.134	1.218	1	12,861
9. Leisure	2.590	1.565	3	13,543	2.394	1.577	3	12,932

Note. For each out-of work activity there are six possible responses: "never" (0); "once or twice per year" (1); "once or twice per month" (2); "once or twice a week" (3); "every day or every second day for less than one hour" (4); "every day for at least one hour" (5).
Souce: European Working Conditions Survey 2000/01, own calculations.

Table 3
Descriptive statistics for the indexes of work and non-work activities, by sex

	Description	Men			Women		
		Mean	Std. dev.	n	Mean	Std. dev.	n
Housework	Annual number of hours spent on cooking and housework	382.079	493.540	13,507	1057.643	516.978	13,091
Familycare	Annual number of hours spent on taking care of children and disabled or elderly relatives	283.348	352.864	10,751	432.648	398.368	10,549
Charipol	Annual number of hours spent on charitable and political activities	23.413	109.757	13,189	16.948	85.903	12,606
Leisure	Annual number of hours spent on sports, cultural, and other leisure activities	267.505	371.349	13,194	228.242	339.507	12,562
Work	Annual number of hours worked	2,143.329	534.556	13,666	1,867.887	617.851	13,131

Souce: European Working Conditions Survey 2000/01, own calculations.

The first one, HOUSEWORK, is defined as the sum of the variables referring to cooking and housework. Both are activities for which the market can provide very close substitutes. The second index is called FAMILYCARE and measures time spent taking care of children or elderly / disabled relatives. These are activities for which the market provides imperfect substitutes. The third and fourth indexes capture non-work activities for which the market cannot provide a substitute: CHARIPOL (charitable and political activities) and LEISURE (sports, cultural and other leisure activities). The reason for using two different indices for these activities is that in the former case it could be argued that some market substitution would be possible (i.e., donating money to charitable organizations or political associations), whereas in the latter case it would be much more difficult. Since the response options for non-work activities do not increase linearly, we use a non-linear scale reflecting how many times per year the employee participates in each kind of activity to compute the annual number of hours spent on each activity.[8] Table 3 shows summary statistics for the four indexes: HOUSEWORK, FAMILYCARE, CHARIPOL and LEISURE. Women devote more time to housework and taking care of their children and elderly or disabled relatives than men. On average, men dedicate one hour per day to housework, whereas women dedicate an average of nearly three hours per day. Time devoted to take care of children and other relatives is 0.8 and 1.2 hours per day for men and women respectively. On the other hand, men dedicate more time to leisure and charitable and political activities.

To measure work hours, we construct a variable from answers in the questionnaire concerning the number of weekly hours usually worked in main job. In addition, for those who have another regular job beside their main job, we add the usual weekly hours in this secondary job. The average number of hours per week is 41.1 for men and 35.8 for women. In the regressions we use the annual number of hours so that the measurement of work hours is consistent with that of non-work activities.

To make sure that our results were not conditioned by our measurement approach, we have also used other criteria to transform the survey responses to numbers of hours. First, note that for non-work activities, the two highest response options are defined in terms of the frequency and the amount of time devoted, whereas the remaining options are only defined in terms of the frequency. This means that the values for the two highest options could be defined slightly differently, or those two response categories could be merged (in that way, the resulting measure would only convey information on frequency, i.e. no information on duration). Second, we could use time shares (instead of frequency or number of hours) for work and non-work activities. This would take into account that all individuals must face the same time constraint and would correct for the fact that survey respondents tend to over-report time spent (Juster and Stafford 1991). However, it could be criticized on the grounds that all non-work activities are not mutually exclusive. For example, cooking and taking care of a ten-year-old

---

8   Specifically, the response "never" is quantified as zero; "once or twice per year" is quantified as 1.5; "once or twice per month" as 18 (i.e., 1.5×12); "once or twice a week" as 72 (i.e., 1.5×12×4); "every day or every second day for less than one hour" as 273.75 (i.e., 0.75×365); and "every day for at least one hour" as 730 (i.e., 2×365)

child can be done simultaneously, and so can reading and taking care of an elderly relative. In Section 4 we report the results obtained with different measurement approaches.

The EWCS includes a number of questions concerning discretion. The information we use emanates from a question on whether the employee can or cannot influence her working hours. In addition, we use a number of control variables summarized in Table 4 below, as well as establishment size, industry, country, net earnings and occupation dummies.[9] Not surprisingly, men are more often employed on permanent contracts and the main income earner in the household. Furthermore, men have somewhat more discretion regarding work hours than women.

Table 4
Descriptive statistics of discretion and main control variables

	Men			Women		
	Mean	Std. dev.	n	Mean	Std. dev.	n
Discretion over work hours	.348	.476	13,661	.327	.469	13,088
Household size	2.111	1.343	13,819	2.078	1.297	13,254
Small children	.710	.958	13,821	.720	.920	13,256
Main income earner	.780	.414	13,723	.416	.493	13,132
Married	.593	.491	13,781	.562	.496	13,193
Part-time contract	.066	.248	13,821	.249	.432	13,256
Permanent contract	.823	.381	13,665	.797	.402	13,085
Age	38.447	11.249	13,821	38.061	10.930	13,256

Note. All variables are dichotomous except the two hours worked variables (measured in number of hours), household size (number of individuals living in the household), age (measured in years), and small children (measured in a 0 to 4 scale: 0 = none, 1=one, 2=two, 3= three, 4=four or more).
Souce: European Working Conditions Survey 2000/01, own calculations.

The data show that discretion over work hours is positively correlated with incentive pay, but the correlation is small (3.4 percent). Of the total sample 56 percent had neither discretion nor incentive pay. Another relatively large category is those with discretion but no performance contract; their share is 27.6 per cent. Finally, 10.3 per cent are on performance pay contracts but lack discretion with respect to work hours, and the remaining 6.1 per cent have discretion as well as performance pay. Note that, on the one hand, the group of employees with no dis-

---

[9] Establishment size is measured according to the number of employees and is defined in eight intervals (1, 2-4, 5-9, 10-49, 50-99, 100-249, 250-499, and 500 and over). Industries and occupations are defined at one-digit level according to the European General Nomenclature of Industrial Activities (NACE Rev. 1) and the International Standard Classification of Occupations (ISCO-88) respectively. As far as net earnings are concerned, the EWCS provides information about the income interval to which the individual belongs. Twelve different intervals are defined according to the income distribution of each country (each interval corresponds to a different quantile).

cretion and no incentive pay is larger than the group of employees with discretion and no incentive pay, and is also larger than the group with performance pay and without discretion. On the other hand, employees with discretion and performance pay are outnumbered by employees with discretion and no incentive pay and by those without discretion and with incentive pay. Although one may like to interpret these descriptive statistics as evidence favorable or unfavorable to the theory, some caution is needed. The multi-task theoretical framework focuses on how measurement problems and incentives influence the optimal contracting choices, assuming that the only cost of discretion is the principal's loss of control. However, in practice, firm's ability to give discretion is limited by the characteristics of the production process, i.e. by "technology." For example, if a given number of employees must work simultaneously in a production site with the same set of industrial robots, the firm cannot give full discretion over work hours. This type of coordination problems and fixed proportions technology are not captured by the model. A more accurate reading of the model is that, controlling for "technological" differences, one should observe a positive correlation between incentive contracts and discretion. Evidence from other research based on this and other data is consistent with this.[10]

In the following sections we use two different empirical strategies to estimate the effect of incentive contracts on non-work activities.

4 Estimates of the determinants of non-work activities

To begin with, we report estimates from linear regressions in which the left-hand-side variable is time spent on different activities. We estimate the models for men and women separately, using systems of seemingly unrelated regression equations. The key right-hand-side variable is the dichotomous variable for performance-related pay. Given the nature of the data, we cannot rule out the possibility that performance pay is endogenous, but to attenuate this potential problem we include a very comprehensive set of controls: the employee's age, age squared, marital status, whether she is the main income earner in the household, size of the household, number of children below age 15 who live with her, a dummy for whether she is employed on a permanent/fixed-term, a dummy for part-time work, net earnings, occupation and country of residence, and the size and industrial affiliation of the establishment in which she works.

The estimation results are given in Tables 5a and 5b for men and women, respectively. (To save space, the country, establishment size, industry, net earnings, and occupation dummy estimates are not shown in the tables.)

---

[10] Studies made with various datasets have shown a significant relationship between discretion and performance pay. Evidence from the EWCS can be found in Ortega (2009), and evidence from other datasets, in Osterman (1994b); MacLeod and Parent (1999); and Nagar (2002).

Table 5a
Seemingly unrelated regressions –
Annual number of hours spent by men on non-work activities

	Housework	Familycare	Charipol	Leisure
Performance pay	-19.538	12.989	1.209	1.117
	(13.147)	(8.815)	(3.311)	(10.704)
Household size	-99.066***	35.304***	.857	-3.722
	(5.598)	(3.753)	(1.410)	(4.558)
Small children	80.812***	98.062***	2.416	-14.940**
	(7.386)	(4.953)	(1.860)	(6.014)
Main income earner	-49.122***	38.210***	2.429	-41.720***
	(14.048)	(9.419)	(3.538)	(11.438)
Married	-123.600***	102.126***	-.356	-30.044***
	(13.129)	(8.803)	(3.306)	(10.690)
Part-time contract	.217	-12.286	16.660***	25.713
	(21.257)	(14.253)	(5.353)	(17.308)
Permanent contract	-18.226	9.666	-5.428	11.757
	(13.965)	(9.364)	(3.517)	(11.370)
Age	32.835***	30.783***	-.640	-14.671***
	(3.478)	(2.332)	(.876)	(2.832)
Age squared	-.374***	-.401***	.014	.139***
	(.043)	(.029)	(.011)	(.035)
n	7,878	7,878	7,878	7,878
R-squared	.239	.338	.031	.107

Note. Standard errors are shown in parentheses. Levels of significance: (***) 1 percent; (**) 5 percent; (*) 10 percent. All regressions include 26 country dummies, 8 occupation dummies, 11 industry dummies, 11 net income dummies, 7 establishment size dummies, and a constant. All other variables are shown in the table. Souce: European Working Conditions Survey 2000/01, own calculations.

We can see that incentive contracts do not have significant coefficients for men, whereas for women they are only associated with more time spent on leisure. Moreover, the magnitude of this estimate is small: about twenty-five minutes per week, equivalent to an 8-percent reduction in leisure for the average employee in the sample. On the other hand, most control variables are highly significant. Some estimates have the same sign for both men and women: household size (controlling for the number of children) has a negative relationship with housework and a positive relationship with family care; the number of small children (controlling for household size) has a positive relation with both housework and family care; being married is positively related with family care and negatively related with leisure; and age is positively related with both housework and family care and negatively related with leisure. Other estimates vary according to sex: thus, the relation between being married and housework is negative for men and positive for women. We also find that for women working part-time is positively associated with housework, family care, and leisure, whereas for men the only positive association is with charitable and political activities. Having a permanent contract also seems to be more relevant for women's than for men's non-work activities: for women, being on a permanent contract has a positive relationship with housework and nega-

tive relationship with charitable and political activities, whereas for men the permanent nature of the contract is insignificant in all cases.

Table 5b
Seemingly unrelated regressions –
Annual number of hours spent by women on non-work activities

	Housework	Familycare	Charipol	Leisure
Performance pay	-11.884	6.905	2.788	21.741*
	(15.697)	(11.276)	(3.230)	(11.480)
Household size	-47.092***	49.764***	2.958**	-10.535**
	(5.654)	(4.061)	(1.163)	(4.135)
Small children	121.213***	143.366***	-2.795*	-21.453***
	(7.234)	(5.197)	(1.488)	(5.291)
Main income earner	2.508	67.198***	3.843	-5.716
	(12.166)	(8.740)	(2.503)	(8.898)
Married	176.991***	78.563***	.644	-21.785**
	(12.626)	(9.070)	(2.298)	(9.234)
Part-time contract	77.355***	29.399***	.802	39.503***
	(13.742)	(9.872)	(2.827)	(10.050)
Permanent contract	24.638*	10.490	-5.351**	-2.969
	(13.012)	(9.347)	(2.677)	(9.516)
Age	54.233***	51.058***	.963	-5.889**
	(3.481)	(2.500)	(.716)	(2.546)
Age squared	-.573***	-.641***	-.008	.051
	(.044)	(.031)	(.009)	(.032)
n	7,811	7,811	7,811	7,811
R-squared	.249	.377	.022	.117

Note. Standard errors are shown in parentheses. Levels of significance: (***) 1 percent; (**) 5 percent; (*) 10 percent. All regressions include 26 country dummies, 8 occupation dummies, 11 industry dummies, 11 net income dummies, 7 establishment size dummies, and a constant. All other variables are shown in the table. Souce: European Working Conditions Survey 2000/01, own calculations.

Table 6 shows the results of similar seemingly unrelated regressions estimated for the four types of non-work activities included in Table 5 and the number of hours worked. Results for non-work activities are similar to those reported in Table 5. In particular, for men performance pay is not significant in any of non-work regressions, and for women it is only significant in the regression for leisure.

As far as the relation between performance pay and work hours is concerned, we only find a significant result for men, but the effect is rather small: the estimate implies that employees with incentive pay spend about an hour more at work per week (equivalent to a 2-percent increase for the average male employee in the sample).

For women no significant relation between performance pay and hours worked is found. As far as the control variables are concerned, the signs and significance of the estimates for non-work activities are the same as in Table 5, and the main results for work hours are that for men age has a positive coefficient, and for women being married and having small children have both negative coefficients.

Table 6a
Seemingly unrelated regressions –
Annual number of hours spent by men on non-work and work activities

	Housework	Familycare	Charipol	Leisure	Work
Performance pay	-19.270 (13.246)	13.948 (8.887)	1.248 (3.341)	4.976 (10.792)	26.773* (14.691)
Household size	-98.871*** (5.623)	35.337*** (3.773)	.800 (1.418)	-3.209 (4.581)	7.821 (6.236)
Small children	80.147*** (7.415)	98.228*** (4.975)	2.337 (1.870)	-15.448** (6.042)	-6.284 (8.224)
Main income earner	-52.322*** (14.131)	38.047*** (9.481)	2.291 (3.564)	-39.360*** (11.513)	18.465 (15.673)
Married	-122.917*** (13.178)	102.678*** (8.842)	.163 (3.324)	-31.099*** (10.737)	-18.929 (14.616)
Part-time con-tract	2.352 (21.448)	-12.388 (14.390)	17.282*** (5.410)	25.527 (17.474)	-471.981*** (23.788)
Permanent con-tract	-17.167 (14.044)	7.960 (9.423)	-5.706 (3.543)	11.092 (11.442)	17.720 (15.576)
Age	32.934*** (3.496)	30.898*** (2.346)	-.645 (.882)	-14.719*** (2.848)	12.007*** (3.878)
Age squared	-.376*** (.043)	-.402*** (.029)	.014 (.011)	.141*** (.035)	-.172*** (.048)
n	7,813	7,813	7,813	7,813	7,813
R-squared	.239	.338	.031	.106	.177

Note. Standard errors are shown in parentheses. Levels of significance: (***) 1 percent; (**) 5 percent; (*) 10 percent. All regressions include 26 country dummies, 8 occupation dummies, 11 industry dummies, 11 net income dummies, 7 establishment size dummies, and a constant. All other variables are shown in the table. Souce: European Working Conditions Survey 2000/01, own calculations.

We also estimate the regressions in Table 6 with a control for educational level. (To save space, the table is omitted.) Unfortunately, this variable is only available for the twelve "candidate states" and measures educational achievement with some error since the survey reports the age at which the respondent stopped full-time education, but does not provide information about the educational level achieved. In these regressions, controlling for years of education does not make a difference as far as the estimated relationship between performance pay and the allocation of time is concerned. Both with and without the control, the relationship is only significant for men's housework (we find a positive relationship) and for women's hours of work (we find a negative relationship).

As a matter of fact, years of education are only significant in two regressions (men's leisure and women's family care).[11] Note, however, that all these regressions include controls for net earnings, occupation, and age, which are correlated with educational level. Because there are potential problems involved in the measurement of the non-work activities (as explained in Section 3 above), we also estimate the system of equations with different measurement criteria for the left-hand-side variables.

---

[11] In both cases, the coefficient for years of education is positive.

Table 6b
Seemingly unrelated regressions –
Annual number of hours spent by women on non-work and work activities

	Housework	Familycare	Charipol	Leisure	Work
Performance pay	-12.967 (15.794)	7.259 (11.329)	2.845 (3.207)	21.560* (11.507)	25.564 (17.083)
Household size	-47.985*** (5.666)	50.124*** (4.064)	3.123*** (1.151)	-10.348** (4.128)	6.926 (6.128)
Small children	121.040*** (7.256)	143.773*** (5.205)	-2.739* (1.473)	-21.902*** (5.286)	-16.680** (7.848)
Main income earner	-.157 (12.206)	66.493*** (8.756)	3.686 (2.479)	-5.396 (8.893)	38.151*** (13.202)
Married	177.426*** (12.663)	79.171*** (9.083)	1.240 (2.572)	-20.556** (9.226)	-29.118** (13.697)
Part-time contract	78.476*** (13.784)	29.699*** (9.887)	-.515 (2.799)	37.192*** (10.042)	-639.170*** (14.909)
Permanent contract	24.471* (13.061)	9.413 (9.369)	-5.873** (2.652)	-5.581 (9.516)	-20.194 (14.127)
Age	54.372*** (3.495)	50.827*** (2.507)	.815 (.710)	-5.728** (2.547)	5.506 (3.781)
Age squared	-.576*** (.039)	-.638*** (.032)	-.006 (.009)	.049 (.032)	-.090* (.048)
n	7,751	7,751	7,751	7,751	7,751
R-squared	.249	.379	.022	.118	.416

Note. Standard errors are shown in parentheses. Levels of significance: (***) 1 percent; (**) 5 percent; (*) 10 percent. All regressions include 26 country dummies, 8 occupation dummies, 11 industry dummies, 11 net income dummies, 7 establishment size dummies, and a constant. All other variables are shown in the table. Souce: European Working Conditions Survey 2000/01, own calculations.

First, we use time shares as dependent variables, i.e. we divide the (annual) number of hours spent on each non-work activity by the sum of the (annual) number of hours spent on all work and non-work activities.[12] The signs and significance of the coefficients are essentially the same as in Table 5. Second, we use ordered probits for individual activities. The main advantage of this approach is that it tackles the limited dependent variable and censoring problems. In particular, it does not require assigning numerical values to the top two response options (see discussion above). Its main problem is that some information is lost. Since respondents report the frequencies with which they perform various activities, their responses are not purely ordinal, as assumed in an ordered probit. Table 7 shows ordered probit results by activities. For men, incentive pay has a positive effect on childcare, political activities, and cultural activities whereas in Table 5 none of the performance pay estimates was significant. For women, performance pay has a negative effect on housework and a positive effect on time spent taking care of disabled and elderly relatives. This is different from the results reported in Table 5, where we only find a positive relationship between performance pay and leisure.

---

[12]   See Section 3 for details about how hours spent on non-work and work activities have been computed.

Table 7a
Ordered probits by individual activities, men

	Cooking	Housework	Childcare	Disabled & Eld. care	Charity	Political	Sport	Culture	Leisure
Performance pay	-.036	.036	.072 **	.033	.020	.174 ***	-.026	.096 ***	.044
	(.029)	(.029)	(.036)	(.040)	(.034)	(.043)	(.030)	(.030)	(.028)
Household size	-.291 ***	-.234 ***	.370 ***	.129 ***	.023	.028	.012	-.054 ***	-.003
	(.012)	(.012)	(.011)	(.017)	(.014)	(.018)	(.013)	(.013)	(.012)
Small children	.211 ***	.210 ***	.499 ***	-.129 ***	.012	-.006	-.058 ***	-.033 *	-.066 ***
	(.017)	(.017)	(.020)	(.022)	(.019)	(.024)	(.017)	(.018)	(.016)
Main income earner	-.065 **	.055 *	.138 ***	.096 **	.001	.034	-.083 ***	-.101 ***	-.101 ***
	(.031)	(.031)	(.015)	(.043)	(.036)	(.048)	(.032)	(.032)	(.030)
Married	-.259 ***	-.207 ***	.183 ***	-.083 **	.051	-.019	-.030	-.076 **	-.090 ***
	(.029)	(.029)	(.039)	(.040)	(.035)	(.044)	(.030)	(.030)	(.028)
Part-time contract	.108 **	-.006	-.006	.107 *	.134 **	-.075	.134 ***	.215 ***	-.040
	(.047)	(.047)	(.061)	(.063)	(.054)	(.076)	(.048)	(.048)	(.045)
Permanent contract	-.011	-.013	.003	.040	.013	.053	.060 *	.048	.095 ***
	(.031)	(.031)	(.040)	(.044)	(.037)	(.049)	(.032)	(.032)	(.030)
Age	.103 ***	.083 ***	.187 ***	.078 ***	.016 **	.039	-.049 ***	-.018 **	-.023 ***
	(.008)	(.008)	(.011)	(.011)	(.009)	(.012)	(.008)	(.008)	(.007)
Age squared	-.001 ***	-.001 ***	-.002 ***	-.001 ***	-.0001	-.0003 **	.0003 ***	.0001	.0002 *
	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)
n	10,270	10,274	8,784	9,267	10,141	10,102	10,143	10,161	10,211
Pseudo R-squared	.097	.110	.214	.055	.045	.055	.071	.058	.050

Note. Standard errors are shown in parentheses. Levels of significance: (***) 1 percent; (**) 5 percent; (*) 10 percent. All regressions include 26 country dummies, 8 occupation dummies, 11 industry dummies, 11 net income dummies, 7 establishment size dummies, and a constant. All other variables are shown in the table.
Souce: European Working Conditions Survey 2000/01, own calculations.

Table 7b
Ordered probits by individual activities, women

	Cooking	Housework	Childcare	Disabled & Eld. care	Charity	Political	Sport	Culture	Leisure
Performance pay	-.026	-.097**	-.017	.074*	.073*	.051	.051	.036	.020
	(.039)	(.039)	(.046)	(.043)	(.041)	(.059)	(.037)	(.036)	(.034)
Household size	-.164***	-.087***	.148***	.066***	.037**	.033	-.033**	-.057***	-.041***
	(.014)	(.014)	(.016)	(.011)	(.014)	(.021)	(.014)	(.013)	(.012)
Small children	.314***	.317***	.840***	-.122***	-.026	-.109***	-.067***	-.034**	-.092***
	(.019)	(.020)	(.023)	(.020)	(.019)	(.028)	(.018)	(.017)	(.016)
Main income earner	-.035	.055*	.184***	.120***	.031	.041	-.086***	-.091***	-.128***
	(.031)	(.031)	(.036)	(.015)	(.032)	(.045)	(.030)	(.028)	(.027)
Married	.472***	.425***	.413***	-.030	.027	-.036	-.102***	-.108***	-.105***
	(.032)	(.032)	(.037)	(.035)	(.033)	(.047)	(.030)	(.029)	(.027)
Part-time contract	.142***	.243***	.164***	.091**	.131***	.037	.121***	.093***	.098***
	(.035)	(.036)	(.042)	(.039)	(.035)	(.052)	(.033)	(.032)	(.030)
Permanent contract	.046	.092***	.036	-.011	-.031	.007	-.018	.002	.057**
	(.033)	(.033)	(.039)	(.037)	(.034)	(.051)	(.032)	(.030)	(.028)
Age	.127***	.114***	.225***	.058	.031***	.038***	-.024***	-.012	-.016**
	(.008)	(.008)	(.010)	(.010)	(.009)	(.013)	(.008)	(.008)	(.007)
Age squared	-.001***	-.001***	-.003***	-.0005***	-.0003***	-.0004**	.0001	-.00001	.0001
	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0002)	(.0001)	(.0001)	(.0001)
n	10,042	10,080	8,760	9,026	9,809	9,776	9,801	9,855	9,897
Pseudo R-squared	.144	.113	.257	.042	.042	.070	.102	.070	.059

Note. Standard errors are shown in parentheses. Levels of significance: (***) 1 percent; (**) 5 percent; (*) 10 percent. All regressions include 26 country dummies, 8 occupation dummies, 11 industry dummies, 11 net income dummies, 7 establishment size dummies, and a constant. All other variables are shown in the table.
Souce: European Working Conditions Survey 2000/01, own calculations.

Third, we estimate the seemingly unrelated equations using the number of times that each activity is performed as dependent variables (results are not shown but are available upon request).[13] For men, we find that performance pay has a negative relation with cooking and a positive relation with childcare and political and cultural activities. For women, none of the estimates of performance pay are significant.

All in all, the results from different specifications suggest that in most cases time spent on non-work activities is not significantly related with performance pay, but whenever the relationship is significant, it is usually positive. Thus, for men we have found a positive relation of incentive contracts with time spent in child care, political activities and cultural activities; and for women we have found evidence of a positive relation of incentive contracts with leisure and time spent taking care of disabled and elderly relatives. The only negative relations we find are for men's cooking and women's housework. In addition, we find a positive relation between incentive contracts and work hours for men and no significant relation for women.

5   Estimates from a differences approach

We now turn to a different estimation approach, which takes advantage of information on whether employees have discretion to choose their work hours. The EWCS includes several questions on job discretion and one in particular about whether employees "can influence their working hours" (possible answers are yes/no). As shown in Table 4, about 35 percent of employees report having some influence over their work hours. Thus we observe the amount of work and non-work activities performed by four different types of employees: those with a performance pay contract and discretion over work hours, those with a performance pay contract and no discretion over work hours, and those with a salary contract with or without discretion over work hours.

Our estimation approach is based on the hypothesis that the effect of incentive contracts on time use should be larger when employees can influence their working hours. Equivalently, we hypothesize that the effect on time use of being able to influence working hours should be greater for employees who have an incentive contract. Some evidence consistent with this hypothesis is shown in Table 8. In Columns 1 and 2 we estimate OLS regressions with hours worked as left-hand-side variable and performance pay and controls in the right-hand side.[14] In the first column the regression is estimated for the subsample of employees who do not have discretion, and in the second column we estimate it for those who have discretion.

---

[13]   Given that the two highest response options are defined in terms of the frequency and time spent, whereas the remaining options only refer to the frequency, we collapse the two highest response options into one. Thus, the possible values of each dependent variable are 0 ("Never"), 1.5 ("Once or twice a year"), 18 ("Once or twice per month", i.e. 1.5*12), 72 ("Once or twice a week", i.e. 18*4), and 365 ("Everyday").

[14]   The other explanatory variables in Table 8 are the same as in Tables 5-7 and to save space their coefficients are not reported.

Table 8

Estimates of the effect of performance pay (columns 1 and 2)
and the effect of discretion over work hours (columns 3 and 4) on the annual
number of work hours (ordinary least squares estimates)

	(1) Employees without discretion coefficient of performance pay	(2) Employees with discretion coefficient of performance pay	(3) Employees without performance pay coefficient of discretion	(4) Employees with performance pay coefficient of discretion
Men	-5.793 (16.349)	59.059 *** (21.629)	59.107 *** (12.270)	9.058 *** (25.022)
Women	36.075 * (18.587)	23.787 (26.100)	-15.138 (11.430)	.801 (32.534)

Note. Standard errors are shown in parentheses. Levels of significance: (***) 1 percent; (**) 5 percent; (*) 10 percent. Columns 1 and 2: Coefficient of performance pay from an OLS regression in which the left-hand-side variable is the annual number of work hours and the right-hand-side variables are: performance pay, household size, small children, main income earner, married, part-time contract, permanent contract, age, age squared, 26 country dummies, 8 occupation dummies, 11 industry dummies, 11 net income dummies, 7 establishment size dummies, and a constant. Columns 3 and 4: Coefficient of discretion over work hours from an OLS regression in which the left-hand-side variable is the annual number of work hours and the right-hand-side variables are: discretion over work hours, household size, small children, main income earner, married, part-time contract, permanent contract, age, age squared, 26 country dummies, 8 occupation dummies, 11 industry dummies, 11 net income dummies, 7 establishment size dummies, and a constant.
Souce: European Working Conditions Survey 2000/01, own calculations.

We expect the coefficient in the second column to be larger than in the first column. In Columns 3 and 4 we estimate OLS regressions with the same left-hand-side variable (hours worked) and discretion and controls in the right-hand side, distinguishing between employees without (Column 3) and with (Column 4) performance pay. For men, the results are indeed consistent with our hypothesis: it can be seen that incentive pay has a larger effect on work hours when the employee has discretion, and discretion has a larger effect on work hours for employees who have an incentive contract. However, for women we find that the coefficient of discretion (in Columns 3 and 4) is insignificant no matter whether employees have performance pay, and the coefficient of performance pay is positive when employees do not have discretion (Column 1) and statistically insignificant otherwise.

Our estimation strategy proceeds as follows. First, we divide the data into four categories: employees without discretion, employees with discretion, employees without an incentive contract, and employees with an incentive contract. Second, we estimate the effect of incentive pay on work and non-work activities for each of the first two categories of employees, and the effect of discretion on work and non-work activities for the other two categories. Third, we compute the difference between the coefficients for incentive pay in the first two categories and, similarly, we compute the difference between the coefficients for discretion in the two remaining categories. We expect the coefficient of incentive pay to be larger for employees who have discretion than for employees who do not have discretion, and the discretion coefficient to be larger for those who have an incentive contract than for those who earn a straight salary. Since we want to test for the statistical significance of these differences, instead of estimating these

four regressions separately and for different subsamples, we separately estimate the following two equations on the whole sample:

(3) $A_i = a_1 + \beta_1 I_i + \theta_1 X_i + \gamma_1 D_i + \delta_1 D_i I_i + \lambda_1 D_i X_i + e_{1i}$

(4) $A_i = a_2 + \beta_2 D_i + \theta_2 X_i + \gamma_2 I_i + \delta_2 D_i I_i + \lambda_2 I_i X_i + e_{2i}$

where I and D are the dichotomous variables for incentive pay and discretion, respectively, and X are the same control variables used in the previous section, namely: household size, small children, main income earner, married, part-time contract, permanent contract, age, age squared, twenty-six country dummies, eight occupation dummies, eleven industry dummies, eleven net income dummies, and seven establishment size dummies. The coefficient δ_1 captures the change in the incentive pay coefficient when employees are given discretion, i.e. the effect of moving from $I = 0$ to $I = 1$ when $D = 1$; whereas δ_2 captures the change in the discretion coefficient when employees are given performance pay, i.e. the effect of moving from $D = 0$ to $D = 1$ when $I = 1$. In terms of the model, δ_1 provides an estimate of $\left\{ \left[A^{pp}(0) - A^{s}(0) \right] - \left[A^{pp}(\underline{e}) - A^{s}(\underline{e}) \right] \right\}$ and δ_2 gives an estimate of $\left\{ \left[A^{pp}(0) - A^{pp}(\underline{e}) \right] - \left[A^{s}(0) - A^{s}(\underline{e}) \right] \right\}$.

Moreover, suppose in the model that performance pay can only lead to a change in time spent on non-work activities if the employee can actually influence her working hours. In that case, if the employee does not have discretion time spent on non-work activities will be the same no matter whether she has an incentive contract or not. Hence in the model $A^{pp}(\underline{e}) = A^{s}(\underline{e})$ and the two differences can be further simplified to

(5)
$$
\begin{aligned}
&\left[A^{pp}(0) - A^{s}(0) \right] - \left[A^{pp}(\underline{e}) - A^{s}(e) \right] = \\
&= \left\{ \left[A^{pp}(0) - A^{pp}(\underline{e}) \right] - \left[A^{s}(0) - A^{s}(\underline{e}) \right] \right\} = A^{pp}(0) - A^{s}(0)
\end{aligned}
$$

where $\left[A^{pp}(0) - A^{s}(0) \right]$ is the substitution effect defined in Section 2, i.e. the effect of performance pay on time use conditional on the employee being able to influence her working hours. In other words, we can interpret the coefficients δ_1 and δ_2 in equations (3) and (4) as two alternative measures of the substitution effect.[15]

Results from this estimation approach are reported in Tables 9-14. As in the previous section, we estimate separate regressions for men and women, using systems of seemingly unrelated regression equations.[16] In Table 9 we can see a negative relation between performance pay and men's leisure, and also between performance pay and women's charitable and political activities. These coefficients suggest very large effects: for men's leisure, the size is equivalent to

---

[15]   Since equations (3) and (4) are estimated separately, we cannot test whether our estimates of δ1 and δ2 are significantly different from each other.

[16]   We do not use ordered probit or censored regression methods because we want to be able to obtain estimates of the "substitution effect", as defined in the text. Moreover, notice that almost all the right-hand-side variables that we use are dichotomous or discrete (as a matter of fact, age and age squared are the only continuous variables). In such cases the linearity assumption implied by OLS is not as restrictive as in the cases in which the right-hand-side variables are mostly continuous.

about an hour per week, which amounts to a 22-percent reduction for the average man in the sample; and for women's charitable and political activities the size is equivalent to eighteen minutes per week, or a 90-percent reduction for the average woman in the sample.

Table 9

Estimates of substitution effect of performance pay on the annual number of hours spent on different activities (seemingly unrelated regressions)

	Men		Woman	
	(1)	(2)	(3)	(4)
Housework	-28.045	-7.826	-45.576	-2.312
	(26.937)	(27.573)	(33.834)	(33.849)
Familycare	3.874	6.623	-3.266	20.420
	(18.103)	(18.572)	(24.254)	(24.283)
Charipol	-6.724	-5.122	-15.277**	-9.466
	(6.827)	(6.893)	(6.936)	(6.948)
Leisure	-58.343***	-59.407***	-10.816	-29.719
	(21.951)	(22.572)	(24.781)	(24.842)

Note. Standard errors are shown in parentheses. Levels of significance: (***) 1 percent; (**) 5 percent; (*) 10 percent. Columns 1 and 3: OLS estimates of $\delta 1$ (equation 14). Columns 2 and 4: OLS estimates of $\delta 2$ (equation 15). Both $\delta 1$ and $\delta 2$ are estimates of the substitution effect of performance pay on the number of hours per year dedicated to different activities. Specifically, $\delta 1$ is the effect of performance pay on the amount of time spent on different activities for employees who have discretion to choose their work hours; whereas $\delta 2$ is the effect of discretion over work hours on the amount of time spent on different activities for employees who are on a performance pay contract. In Columns 1 and 3 the left-hand-side variables are the time variables and the right-hand side variables are: performance pay, household size, small children, main income earner, married, part-time contract, permanent contract, age, age squared, 26 country dummies, 8 occupation dummies, 11 industry dummies, 11 net income dummies, 7 establishment size dummies, and a constant; and interactions between all these variables and discretion over work hours. In this regression, $\delta 1$ is the coefficient of the interaction term discretion × performance pay. In Columns 2 and 4 the left-hand-side variables are the time variables and the right-hand side variables are: discretion over work hours, household size, small children, main income earner, married, part-time contract, permanent contract, age, age squared, 26 country dummies, 8 occupation dummies, 11 industry dummies, 11 net income dummies, 7 establishment size dummies, and a constant; and interactions between all these variables and performance pay. In this regression, $\delta 2$ is the coefficient of the interaction term discretion × performance pay.
Souce: European Working Conditions Survey 2000/01, own calculations.

Moreover, note that none of the estimates reported in Table 5 were significant. Since those estimates can be interpreted as the "total effect" of performance pay on different activities, the combined results of Tables 5 and 9 suggest that the negative substitution effect that we find for some non-work activities is being offset by a positive discretion effect. In Table 10 we have also estimated the same regressions using time shares instead of the measures of total time spent, and the signs and significance of the coefficients remain unchanged: for men, we find a negative substitution effect for leisure, and for women we find a negative substitution effect for charitable and political activities. We also find a negative effect for women's housework.

In Table 11, we add to the system of equations for non-work activities a regression with hours worked as left-hand-side variable. Estimates suggest a positive effect for men, and no significant effect for women.

Table 10

Estimates of substitution effect of performance pay on time shares of different activities (seemingly unrelated regressions)

	Men		Women	
	(1)	(2)	(3)	(4)
Housework share	-.009	-.007	-.016*	-.007
	(.007)	(.007)	(.009)	(.009)
Familycare share	.002	.003	.004	.009
	(.005)	(.005)	(.006)	(.006)
Charipol share	-.002	-.001	-.004**	-.002
	(.002)	(.002)	(.002)	(.002)
Leisure share	-0.17***	-.015***	.002	-.006
	(.006)	(.006)	(.006)	(.006)

Note. Standard errors are shown in parentheses. Levels of significance: (***) 1 percent; (**) 5 percent; (*) 10 percent. The meaning of Columns 1-4 is the same as the respective Columns of Table 9, except for the fact that the estimates come from regressions in which the left-hand-side variables are the fractions of time spent on different activities. The right-hand-side variables of these regressions are the same as in Table 9.
Souce: European Working Conditions Survey 2000/01, own calculations.

Table 11

Estimates of substitution effect of performance pay on the annual number of hours spent on different activities (seemingly unrelated regressions)

	Men		Woman	
	(1)	(2)	(3)	(4)
Housework	-34.157	-88.348	-49.983	-65.070
	(27.130)	(56.100)	(34.104)	(65.579)
Familycare	4.080	17.288	-2.665	-55.717
	(18.235)	(24.504)	(24.406)	(43.369)
Charipol	-7.103	-2.156	-14.511**	-16.360
	(6.884)	(12.855)	(6.898)	(11.740)
Leisure	-60.325***	-20.134	-6.103	-5.762
	(22.113)	(49.834)	(24.883)	(48.775)
Work	68.434**	30.635	-25.625	66.438
	(29.969)	(58.714)	(36.696)	(70.342)

Note. Standard errors are shown in parentheses. Levels of significance: (***) 1 percent; (**) 5 percent; (*) 10 percent. Same regressions as in Table 9, except for the fact that the annual number of hours worked is also used as a left-hand-side variable.
Souce: European Working Conditions Survey 2000/01, own calculations.

The effect on men's working hours is equivalent to 85 minutes per week, or a 3-percent increase in hours worked for the average man in the sample.

Next, we estimate the substitution effects separately for different sets of individuals: those who live or do not live alone (Table 12); those who are or are not the main income earner in the household (Table 13); and individuals with and without small children (Table 14). When we separate the sample according to whether the individual lives alone, we find that for men who

do not live alone performance pay is associated with a reduction in leisure of about 69 to 83 minutes per week (equivalent to a 26 to 31-percent reduction for the average male individual who does not live alone) and an increase in hours worked of about 83 minutes per week (equivalent to a 2-percent increase for the average employee). As far as women are concerned, for those who do not live alone we find a negative effect on charitable and political activities equivalent to 20 minutes per week (104 percent for the average female employee in the group). Moreover, our estimates show that the relation between performance pay and hours worked is positive for women who live alone and negative otherwise. For female employees who live alone, incentive pay is associated with a weekly increase in work hours of 157 minutes, which is equivalent to a 4-percent increase. However, for women who do not live alone we find a reduction in work hours of about 110 minutes per week, which amounts to a 2-percent reduction for the average employee in the relevant group.

Table 12

Estimates of substitution effect of performance pay on the annual number of hours spent on different activities (seemingly unrelated regressions)

| | Employees living alone | | | | Employees not living alone | | | |
| | Men | | Women | | Men | | Women | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Housework	-88.348	-28.525	-65.070	-23.625	-16.029	-3.332	-22.252	36.507
	(56.100)	(59.712)	(65.579)	(66.813)	(29.118)	(30.178)	(37.955)	(38.621)
Familycare	17.288	1.907	-55.717	-1.842	6.313	17.716	20.013	39.900
	(24.504)	(24.241)	(43.369)	(43.965)	(22.816)	(23.668)	(29.082)	(29.647)
Charipol	-2.156	-3.870	-16.360	-5.792	-7.369	-5.160	-17.158**	-12.416
	(12.855)	(13.711)	(11.740)	(12.025)	(8.174)	(8.441)	(8.594)	(8.748)
Leisure	-20.134	-63.801	-5.762	7.421	-72.456***	-60.196**	-11.387	-26.268
	(49.834)	(53.623)	(48.775)	(49.643)	(24.174)	(25.064)	(28.815)	(29.457)
Work	30.635	-64.938	66.438	125.579*	66.237*	37.735	-88.335**	-64.762
	(58.714)	(64.024)	(70.342)	(71.695)	(34.698)	(36.194)	(43.186)	(44.224)

Note. Standard errors are shown in parentheses. Levels of significance: (***) 1 percent; (**) 5 percent; (*) 10 percent. Regressions are the same as in Table 11, for different groups of employees.
Souce: European Working Conditions Survey 2000/01, own calculations.

Table 13 reports estimates according to whether the respondent is or is not the main income earner in the household. As far as men are concerned, the increase in hours worked and the reduction in leisure are only significant when the individual is the main income earner, and the estimates are approximately equivalent to a 2-percent increase and a 23-percent reduction, respectively. For men who are not the main income earners, there are no significant effects on hours worked or leisure, but there is a significant effect on housework, which is equivalent to a 31-percent reduction. For women, the only significant effect that we find is for charitable and political activities of women who are not the main income earner, and the effect is sizeable, as in previous regressions. Finally, Table 14 shows results for employees with and without children below age fifteen.

Table 13

Estimates of substitution effect of performance pay on the annual number of hours spent on different activities (seemingly unrelated regressions)

| | Employee is the main income earner in the household | | | | Employee is not the main income earner in the household | | | |
| | Men | | Women | | Men | | Women | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Housework	-22.324	-8.211	-50.635	-14.399	-125.156**	-27.298	-35.801	15.612
	(29.434)	(30.090)	(54.148)	(55.8409)	(62.368)	(68.554)	(44.122)	(44.936)
Familycare	12.814	11.744	-37.516	5.616	-22.291	5.460	28.895	38.150
	(20.432)	(20.942)	(38.813)	(40.0179)	(39.229)	(43.247)	(31.312)	(31.952)
Charipol	-5.211	-2.489	-4.298	6.146	-6.777	-20.937	-21.679**	-14.962*
	(7.853)	(8.014)	(11.406)	(11.813)	(14.010)	(15.425)	(8.688)	(8.839)
Leisure	-59.860**	-56.635**	-23.768	-58.479	-63.782	-82.241	13.936	13.160
	(23.575)	(24.2269)	(38.654)	(39.910)	(59.675)	(65.595)	(32.887)	(33.612)
Work	75.285**	26.324	8.786	79.446	53.072	33.207	-46.359	-38.194
	(32.083)	(33.083)	(59.556)	(61.308)	(79.917)	(88.100)	(46.607)	(47.992)

Note. Standard errors are shown in parentheses. Levels of significance: (***) 1 percent; (**) 5 percent; (*) 10 percent. Regressions are the same as in Table 11, for different groups of employees.
Souce: European Working Conditions Survey 2000/01, own calculations.

Table 14

Estimates of substitution effect of performance pay on the annual number of hours spent on different activities (seemingly unrelated regressions) – Employees living with and without children (below age 15)

| | Without children | | | | With children | | | |
| | Men | | Women | | Men | | Women | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Housework	-58.520	-21.535	-95.362*	-78.049	-67.540	-28.719	6.127	79.083
	(39.107)	(40.250)	(52.783)	(53.753)	(52.691)	(56.206)	(62.024)	(67.040)
Familycare	5.961	-2.267	-24.045	-2.110	-36.449	-18.777	-28.196	38.158
	(20.641)	(21.299)	(33.960)	(34.552)	(40.940)	(43.820)	(43.593)	(47.292)
Charipol	-11.560	-8.128	-25.246**	-28.453***	-10.518	5.477	10.830	-6.173
	(9.771)	(9.996)	(10.643)	(10.801)	(13.419)	(14.393)	(11.424)	(12.222)
Leisure	-61.226*	-73.128**	10.517	-13.875	-76.476*	-88.865*	7.298	-77.548*
	(32.822)	(33.990)	(39.272)	(40.012)	(44.416)	(46.964)	(43.594)	(46.871)
Work	48.995	(15.995)	19.535	66.786	92.136	98.567	-16.087	75.143
	(40.445)	(41.857)	(51.249)	(52.325)	(63.829)	(68.377)	(74.870)	(81.237)

Note. Standard errors are shown in parentheses. Levels of significance: (***) 1 percent; (**) 5 percent; (*) 10 percent. Regressions are the same as in Table 11, for different groups of employees.
Souce: European Working Conditions Survey 2000/01, own calculations.

The main difference we find between the two groups is that the reduction in women's charitable and political activities is only significant for women without small children.

6   Conclusions

While much research on incentive contracts has focused on their consequences for the performance of firms and how gains are shared with the employees, considerably less has been concerned with how increased use of performance pay affects the individuals' allocation of time in general and, in particular, time spent on non-work activities. On the one hand, performance pay can lead employees to spend more time at work so as to increase their performance and earn higher pay, which would lead to a reduction in time spent on non-work activities. Moreover, incentive contracts are often introduced as part of "empowerment" strategies, which imply that employees will not only have more incentives to spend more time at work, but will also have more freedom to do so. However, higher earnings obtained through longer work hours can be used to hire housework services in the market, thus leaving more time available for leisure even if more time is also spent at work. Therefore the overall effect of performance pay contracts on non-work activities is not necessarily clear.

The multi-task agency model that we propose shows that if performance pay and discretion are jointly introduced and work effort increases as a result, there will be an unambiguous reduction in housework and that, depending on the level of substitutability between work and housework, there might be a reduction or an increase in leisure. Specifically, leisure will diminish if substitutability is low, i.e. an increase in work effort does not have a large impact on the marginal cost of housework effort. We also use the model to show that the effect of introducing discretion and performance pay can be decomposed into a "substitution effect" (the effect of introducing performance pay when employees have discretion) and a "discretion effect" (the effect of introducing discretion when employees are paid a straight salary). We show that the substitution effect is always negative for housework and that it is negative for leisure if work-housework substitutability is low.

In our empirical analysis, we use information on performance pay, discretion, and hours worked and time spent on different non-work activities. Although the model only considers "housework" and "leisure", the information we take from the data is much more detailed and includes time spent in housework, taking care of children or relatives, charitable and political activities, and leisure. We conduct two empirical analyses. First of all, we estimate the total effect of performance pay on work and non-work activities. We find a positive relation between performance pay and men's working hours, equivalent to a 2-percent increase for the average employee; but no significant relation for women. As far as non-work activities are concerned, for most activities the relation with performance pay is not significant, but when it is significant, it is usually positive. For men we have found a positive relation of incentive contracts with time spent in child care, political activities and cultural activities; and for women we find a positive relation with leisure and time spent taking care of disabled and elderly relatives. The only negative relations we find are for men's cooking and women's housework.

The second empirical analysis exploits an interesting feature of the data – the information about discretion over work hours. We use a differences approach to estimate the substitution effect in

two ways: (a) the difference between the effect of performance pay on employees who have discretion over work hours and employees who do not have discretion; and (b) the difference between the effect of discretion on employees who have performance pay and employees who do not have performance pay. This approach relies on the idea that performance pay must have a larger effect on employee behavior when employees have more choice over work hours and, similarly, discretion must have a larger effect on behavior when employees have an incentive contract. The main findings are that for men, performance pay is associated with a small increase (3 percent) in hours worked and a relatively large reduction (22 percent) in leisure; whereas for women it is associated with a very large reduction (90 percent) in charitable and political activities. In summary, when the estimation approach takes into account that employee influence over working hours can vary, we find a negative relation between incentive pay and time spent on non-work activities.

The analysis also shows some variation in the substitution effect according to family characteristics. For male employees, the reduction in leisure and the increase in work hours are only significant when they do not live alone. In contrast, for female employees we find an increase in work hours for those who live alone and a reduction in work hours for those who do not live alone. We also find differences according to whether the employee has children or is the main income earner in the household. These results suggest that employees with different family environments adjust differently to incentive contracts.

Appendix

Part (a):

Under an incentive contract, the employee's certainty equivalent is

(A1) $\beta + ae - px + B(h+x) + F(1-e-h) - g(e,h) - (r/2)a^2\sigma^2$

and maximizing with respect to e, h and x yields the following first-order conditions:

(A2) $a - F'(1-e-h) - g_1(e,h) = 0$

(A3) $B'(h+x) - F'(1-e-h) - g_2(e,h) = 0$

(A4) $-p + B'(h+x) = 0$,

where g_1 and g_2 are the first partial derivatives of g with respect to the first and second arguments respectively. Combining (A3) and (A4), we obtain

(A5) $a = F'(1-e^{pp}-h^{pp}) + g_1(e^{pp},h^{pp})$

(A6) $p = F'(1-e^{pp}-h^{pp}) + g_2(e^{pp},h^{pp})$

On the other hand, under a salary system, $a = 0$ and the employee will choose the minimum work effort allowed ($\underline{e}$). Therefore:

(A7) $0 < F'(1-\underline{e}-h^s) + g_1(\underline{e},h^s)$

(A8) $p = F'(1-\underline{e}-h^s) + g_2(\underline{e},h^s)$.

Since $e^{pp} > \underline{e}$, equations (A6) and (A8) imply that $h^{pp} < h^s$ (a negative total effect). Moreover, (A8) implies that a reduction in e raises h^s, which implies $h^s < h^s(0)$ (a positive discretion effect). Since $h^{pp} < h^s$, this also implies $h^{pp} < h^s(0)$ (a negative substitution effect).

Part (b):

Since $L = 1-e-h$, the total effect is negative $L^{pp} < L^s$ if and only if

(A9) $e^{pp} - \underline{e} > h^s - h^{pp}$.

On the other hand, combining (A6) and (A8),

$F'(L^{pp}) - F'(L^s) = g_2(\underline{e}, h^s) - g_2(e^{pp},h^{pp}) = \gamma(h^s - h^{pp}) - \kappa(e^{pp} - \underline{e})$.

Therefore the total effect is negative if and only if

(A10) $\qquad \kappa(e^{pp} - \underline{e}) < \gamma \left(h^s - h^{pp} \right).$

Conditions (A9) and (A10) are jointly met if and only if $\kappa < \gamma$. Hence the total effect is negative in that parameter range. Using analogous reasoning, it follows that the discretion and substitution effects are respectively positive $L^s < L^s(0)$ and negative $L^{pp} < L^s(0)$ if and only if $\kappa < \gamma$.

References

Anttila, T., Oinas, T. and J. Nätti (2009), Predictors of time famine among Finnish employees – Work, family or leisure?, in: *electronic International Journal of Time Use Research,* Vol. 6, No. 1, 73-91.

Berg, P., Kalleberg, A. and E. Appelbaum (2003), Balancing work and family – The role of high-commitment environments, in: *Industrial Relations,* Vol. 42, No. 2, 168-188.

Bonke, J., Datta Gupta, N. and N. Smith (2005), The timing and flexibility of housework and men and women's wages, in: Hamermesh, D. and G. Pfann (eds.), *The economics of time use – Contributions to economic analysis,* Elsvier, Amsterdam.

Booth, A. and J. Frank (1999), Earnings, productivity, and performance-related pay, in: *Journal of Labor Economics,* Vol. 17, No. 3, 447-463.

Drago, R. and G. Garvey (1998), Incentives for helping on the job – Theory and evidence, in: *Journal of Labor Economics*, Vol. 16, No. 1, 1-25.

Freeman, R. and M. Kleiner (2005), The last american shoe manufacturers – Changing the method of pay to survive foreign competition, in: *Industrial Relations*, Vol. 44, No. 2, 307-330.

Gershuny, J. (2005), *Changing times – Work and leisure in postindustrial society*, Oxford University Press, Oxford.

Green, F. (2006), *Demanding work*, Princeton University Press, Princeton.

Hamermesh, D. and J. Lee (2007), Stressed out on four continents – Time crunch or yuppie kvetch?, in: *Review of Economics and Statistics*, Vol. 89, No. 2, 374-383.

Hersch, J. and L. Stratton (1997), Housework, fixed effects, and wages of married workers, in: *Journal of Human Resources,* Vol. 32, No. 2, 285-307.

Heywood, J. and X. Wei (2006), Performance pay and job satisfaction, in: *Journal of Industrial Relations*, Vol. 48, No. 4, 523-540.

Hill, M. and T. Juster (1985), Constraints and complementarities in time use, in: Juster, F.T. and F.P. Stafford (eds.), *Time, goods, and well-being. Ann arbor,* Institute for Social Research, University of Michigan, 439-470.

Holmström, B. and P. Milgrom (1987), Aggregation and linearity in the provision of intertemporal incentives, in: *Econometrica,* Vol. 55, No. 2, 303-328.

Holmström, B. and P. Milgrom (1991), Multitask principal-agent analyses – Incentive contracts, asset ownership and job design, in: *Journal of Law, Economics and Organization*, Vol. 7, No. 0, 24-52.

Jenkins, S. and L. Osberg (2005), Nobody to play with? The implications of leisure coordination, in: Hamermesh, D. and G. Pfann (eds.), *The economics of time use. Contributions to economic analysis*, Elsvier, Amsterdam, 113-145.

Juster, F.T. and F.P. Stafford (1991), The allocation of time – Empirical findings, behavioral models and problems of measurement, in: *Journal of Economic Literature*, Vol. 29, No. 2, 471-522.

Lazear, E. (1986), Salaries and piece rates, in: *Journal of Business*, Vol. 59, No. 3, 405-431.

Lazear, E. (2000), Performance pay and productivity, in: *American Economic Association*, Vol. 90, No. 5, 1346-1361.

Lemieux, T., MacLeod, B. and D. Parent (2009), Performance pay and wage inequality, in: *Quarterly Journal of Economics,* Vol. 124, No. 1, 1-49.

MacLeod, B. and D. Parent (1999), Job characteristics and the form of compensation, in: *Research in Labor Economics,* Vol. 18, No. 1, 177-242.

Money, B. and J. Graham (1999), Salesperson performance, pay, and job satisfaction – Test of a model using data collected in the United States and Japan, in: *Journal of International Business Studies*, Vol. 30, No. 1, 149-172.

Nagar, V. (2002), Delegation and incentive compensation, in: *The Accounting Review*, Vol. 77, No. 2, 379-395.

OECD (2004), Employment outlook 2004, OECD, Paris.

Ortega, J. (2009), Employee discretion and performance pay, in: *The Accounting Review*, Vol. 84, No. 2, 589-612.

Osterman, P. (1994), Supervision, discretion and work organization, in: *American Economic Review Papers and Proceedings,* Vol. 84, No. 2, 380-384.

Parent, D. (1999), Methods of pay and earnings – A longitudinal analysis, in: *Industrial and Labor Relations Review,* Vol. 53, No. 1, 71-86.

Shearer, B. (2004), Piece rates, fixed wages and incentives – Evidence from a field experiment, in: *Review of Economic Studies,* Vol. 71, No. 2, 513-534.

Stratton, L. (2001), Why does more housework lower women's wages? – Testing hypotheses involving job effort and hours flexibility, in: *Social Science Quarterly,* Vol. 82, No. 1, 67-76.

An examination of the characteristics and time use of those who have unfilled spare time

Jennifer Baxter

Dr. Jennifer Baxter
Australian Institute of Family Studies
Level 20
485 La Trobe St
Melbourne Vic 3000, Australia
e-mail: jennifer.baxter@aifs.gov.au

Abstract

While the often-heard complaint about time today is that of having too much to do and too little time, there are those who experience the opposite: they have difficulty filling the spare time that they have. This spare time can for some include times perceived to be empty of satisfying activity, and instead be associated with feelings of dissatisfaction, with frustration and boredom, and with time being spent in unproductive or even unhealthy pursuits. This paper uses the Australian Bureau of Statistics 1997 and 2006 Time Use Surveys to examine the characteristics and time use patterns associated with reporting to frequently have spare time that is difficult to fill. These analyses take a life cycle perspective to determine which men and women are at greatest risk of having this experience of time. These findings indicate that while a minority of people experience unfilled spare time, it is more common among the youngest men and women, especially those living with their parents, as well as men living alone, men and women with limited commitments to paid work or to caring, and those with a health problem and with a non-English-language background. Examining the reasons given for having unfilled spare time, lack of money is the main reason given, however other reasons also apply, and reasons differ for particular groups of people. Ill health, transport, having no friends or family nearby and lack of community facilities are some of those reasons. These data were also related to the patterns of time use to better understand the implications of having unfilled spare time for individuals' wellbeing.

JEL-Codes: D91, J15, J22

Keywords: Leisure time, spare time, time use, diaries, life cycle

1   Introduction

While the often-heard complaint about time today is that of having too much to do and too little time, there are those who experience the opposite. That is, some people have an excess of free time that they are unable to fill. Several decades ago, Parker (1975) referred to this as one of the problems of leisure, that is, the inability for some people to utilise their leisure time, for example because of lack of mobility, facilities or money, or because of having an excess of enforced leisure time. When this occurs, free time can include time that is empty of satisfying activity, and instead may be associated with feelings of dissatisfaction, with frustration and boredom, and with time being spent in unproductive or even unhealthy pursuits (Bloomfield, 2004; Bloomfield and Kennedy, 2004). Such unfilled spare time has been referred to elsewhere as "unoccupied free time" (Bloomfield, 2004) or "empty" time (Parker, 1975).

This paper is concerned with exploring this experience of having unfilled spare time. A life cycle perspective is used to examine who is most likely to experience unfilled spare time in Australia, whether there has been any change across two time periods (1997 and 2006) in the frequency of having unfilled spare time, to look at why people feel they have this experience, and to also look at associated time use patterns. The Australian Bureau of Statistics (ABS) Time Use Surveys contain questions that allow this subject to be analysed. These data are particularly valuable for these analyses, being large population-based surveys with the same items collected (of different respondents) in 1997 and 2006.

While considerable research has explored the experience of time from the opposite perspective–being rushed and time poor–little is known about this perspective, especially from a whole of population view. Certainly there has been recognition and study of this issue for particular groups, such as the unemployed and the elderly, but this paper compares across these and other groups to explore how this experience of having unfilled spare time varies across the life cycle and according to a range of demographic characteristics. It builds upon earlier work with these data by Bloomfield (2004) and Warburton and Crosier (2001).

Perceptions of time, such as are captured in questions about being rushed, or about having spare time that cannot be filled, are likely to be based on real elements of a person's life – whether in terms of caring responsibilities, work responsibilities or other aspects (Sayer and Treas, 2005; Zuzanek, 1998). These subjective assessments of time are useful, as they are likely to be key factor in understanding how individuals' time use might affect their wellbeing. For example, feeling time pressured is related to poorer wellbeing in terms mental health or depression (Roxburgh, 2004; Zuzanek, 1998). At the other end of the scale, a sense of hav-

ing spare time that is difficult to fill may be an indicator of boredom,[1] and proneness to boredom is associated with poorer mental health as measured on a range of constructs, including feelings of loneliness and hopelessness (e.g., Farmer and Sundberg, 1986). Zuzanek (1998) found that poorer mental health was evident among those at the two extremes–those with high and those with low levels of time pressure.

Poorer wellbeing at the individual level, that may be evident among those with unfilled spare time, is of relevance to broader contexts, including the families and communities within which these people live. If barriers to using unfilled spare time can be addressed, this may allow these individuals to be more engaged in family or community life, perhaps helping to address the time pressure experienced by the majority of the population.

2 Background

Today we commonly hear about the busy lives of men and women who are trying to meet the many demands of family, work and of other obligations or interests. This is true in Australia (e.g., Craig and Mullan, 2009; Gunthorpe and Lyons, 2004) the focus of this study, as well in other developed countries (e.g., Linder, 1970; Mattingly and Sayer, 2006; Robinson and Godbey, 1997; Sayer and Treas, 2005), and indeed has been recognised as an issue for several decades now. Deservedly, such studies point attention to those at greatest risk of such experiences, especially those faced with the pressures of long work hours and of caring for children (e.g., Bittman and Pixley, 1997; Gunthorpe and Lyons, 2004; Mattingly and Sayer, 2006; Robinson and Godbey, 1997; Sayer and Treas, 2005; Zuzanek, 1998).

What studies of time pressure tend not to do is discuss the implications for those at the other end of the scale: those who have difficulties filling the time that they have. Certain groups most likely to have this experience of time have been explored elsewhere. Such groups include those who may have more "enforced leisure", meaning that they have leisure time imposed on them through circumstance rather than through choice. This includes unemployed people (e.g., Feather and Bond, 1983; Fryer and Mckenna, 1987; Waters and Moore, 2002; Winefield, Tiggemann and Winefield, 1992), youth and students (e.g., Caldwell et. al, 1999; Gordon and Caltabiano, 1996; Iso-Ahola and Crowley, 1991; Møller, 1992; Robertson, 1999; Shaw et al., 1996; Winefield, Tiggemann and Winefield, 1992); those with a disability or chronic physical or mental health condition (e.g., Leufstadius and Eklund, 2008; Pentland and McColl, 1999) and elderly or retired people (e.g., Gauthier and Smeeding, 2003; Grossin, 1986; Hugman, 1999). Patterns of time use and links to wellbeing have been explored within these groups, with a common finding across the fields of research being that meaningful occupation of time is important to wellbeing. Winefield, Tiggemann and Winefield (1992), for example, found that among unemployed young people, those who engaged in purposeful

---

[1]   For example, the "boredom proneness scale" presented by Farmer and Sunderg (1986) includes the item "I often find myself with time on my hands and nothing to do".

activities in their spare time, rather than aimless ones such as watching television, had better pscyhological wellbeing.

The overall aim of this study is to explore the experience of having unfilled spare time from a broad perspective, similar to those studies conducted on the experience of being rushed or pressed for time (e.g., Gunthorpe and Lyons, 2004). This allows identification and comparison of the risk factors associated with this experience. The first research question is how does the experience of having unfilled spare time vary across the life cycle and for different demographic groups.

One aim throughout this research is to examine gender differences in the experience of having unfilled spare time. This is important given the gender differences in patterns of time use, especially in relation to paid work and caring (Craig and Mullan, 2010; Robinson and Godbey, 1997; Zuzanek, 1998). Indeed, it is often estimated that compared to women, men have more free time (e.g. Bittman and Wajcman, 2000; Sayer, 2005), experience less time pressure (Mattingly and Bianchi, 2003; Mattingly and Sayer, 2006), have more unfilled spare time (Bloomfield, 2004) and in some cultures are more prone to boredom in free time than women (Sundberg *et al.*, 1991; Vodanovich and Watt, 1999).

Other variables examined in this study were selected to capture life cycle differences, and to enable identification of some of these groups with a greater likelihood of having unfilled spare time (e.g, the unemployed). The variable choice was guided by previous literature on having unfilled spare time (Bloomfield, 2004), on proneness to boredom (Barnett and Klitzing, 2006; Harris, 2000) and on time pressure (with an expectation that these variables might work in the opposite direction in predicting having unfilled spare time) (e.g., Bittman and Pixley, 1997; Gunthorpe and Lyons, 2004; Jacobs and Gerson, 2004; Robinson and Godbey, 1997; Zuzanek, 1998.)

The analyses include measures of age, family/household structure, having caring responsibilities (for someone due to their ill health, disability or old age), having a disability or long-term health condition, and the main language spoken at home being a language other than English. The analyses also include labour force status and paid work hours, since working longer hours is expected to reduce the opportunity to have unfilled spare time. Unemployed men and women are identified separately from those not in the labour force. The analyses also test whether, independent of labour force status, there is an association between low income and having unfilled spare time.

These characteristics are included in multivariate analyses to identify those groups of greatest risk of having unfilled spare time. Since men and women have very different time allocations, they are analysed separately to determine whether having spare time that is hard to fill is predicted by different characteristics for men and women. From what we know about predictors of time pressure, such factors are likely to have differential effects in predicting men's and women's experiences of time (Mattingly and Sayer, 2006).

Another aim of this study is to examine whether the percentage experiencing unfilled spare time has changed across the two survey periods available, in 1997 and 2006. We examine this initially in aggregate for all males and females. However, aggregate differences may be apparent simply due to a compositional change in the population, for example if it shifts to have a higher representation of those more at risk of having unfilled spare time. To determine whether changes are apparent, putting aside compositional factors, survey year was included as one of the variables in the multivariate analyses. The interest in whether there is a difference across years is driven by the perception that life may have become more rushed over time, perhaps meaning a decline in the reporting of having unfilled spare time. However, it is not even clear that life has become more rushed for everyone. Some studies, comparing over different time periods, report heightening of time pressure (Craig, 2009, for mothers and fathers; Mattingly and Bianchi, 2003; Robinson and Godbey, 1997), although within these studies time pressure is shown to vary across different demographic groups. Others find increased reports of feeling time pressured for women, but not for men (e.g Mattingly and Sayer, 2006). Zuzanek (1998) found that in Canada between 1992 and 1998 the greatest increases in time pressure were reported for middle aged, parents and employed persons. In these Canadian data, compared to other life cycle stages, time pressure was least often experienced by retired and housekeeping persons aged 65 years or more.

Relating the above characteristics of individuals to their likelihood of having unfilled spare time provides some insights into the possible reasons for this experience of time. To add to this, this paper also makes use of respondents' reports on why they are unable to fill in their spare time. This is the next research question addressed by this paper–what are the main reasons for having unfilled spare time, and how do these reasons vary according to life cycle and demographic variables. This analysis examines, for example, who is more likely to report being constrained by money or by their own health. Other reasons, including problems with access to transport and community facilities are also explored.

To some extent it is expected that those who have more difficulty filling their spare time will be those who have a greater amount of spare time. But perhaps this is not always true–some people with large amounts of spare time may quite easily make use of that time, for example, filling that time with satisfying recreational or social activities. The next question explored, then, is whether those characteristics that predict having unfilled spare time also predict having a greater amount of spare time. In these analyses, the measure of spare time is equal to time spent on leisure, recreation or social activities. This is equal to the amount of time not spent on paid or unpaid work or personal care and is therefore equal to the measure of free time used in other studies (e.g. Bittman and Wajcman, 2000).

Insights into how having unfilled spare time is experienced by individuals may be gained by examining the time use patterns of those who report having unfilled spare time compared to those who do not. The next question explored here is whether time use patterns are different for those who report that they have unfilled spare time compared to those who do not. Specifically, do those with unfilled spare time fill in that time by undertaking activities that might

contribute to poor wellbeing? At one extreme this may involve a higher incidence of deviant behaviours, such as crime, or gambling, or an excess of time spent drinking or smoking. This is the idea that "the devil finds work for idle hands". Evidence suggests, however, a much more complex relationship between time use and delinquency (Jacob and Lefgren, 2003). There is perhaps some link between boredom–which may be more likely for those with un-filled spare time– and substance abuse and addictive behaviours (Gordon and Caltabiano, 1996; Iso-Ahola and Crowley, 1991; Iso-Ahola and Weissinger, 1990, 1997). The scenario likely to affect more people is that having unfilled spare time leads to more time being spent in pursuits such as watching television as a means of passing the time of day (Bloomfield, 2004). We consider these different possibilities here.

In summary, this paper explores the experience of having unfilled spare time. Differences across time are examined, as are differences for men and women, and across life cycle stages and other demographic characteristics. These analyses include looking at the overall incidence of having unfilled spare time, at the reasons for having unfilled spare time, and the actual amount of spare time. Time use patterns according to individuals' reports of how often they have unfilled spare time are also examined.

The next section of this paper describes the data and methods used. The results of the empiri-cal analyses follow, and the paper concludes with a discussion of the findings.

3   Data and methods

These analyses use the Australian 1997 and 2006 Time Use Surveys (TUS) (Australian Bureau of Statistics, 1997, 2006). Households were selected for this survey using an area-based survey design. All persons aged 15 years and over from selected households were in-cluded in the survey, such that the sample is representative of Australians aged 15 years and over living in private dwellings. As such, the sample excluded individuals living in non-private dwellings, and so does not include those living in care facilities for reasons of old age or ill health.

The main component of the TUS is the time use diary that was completed 85% of respondents in 1997 and 83% in 2006. The diary covers two consecutive 24-hour periods, for which re-spondents identify their activities, with respondents able to provide detail down to 5-minute intervals. Across the duration of these two days, respondents record their main activities, and for each of those activities, also record supplementary information on such things as what else they are doing at the same time (secondary activities), who they were with and where they were. The diary also includes a range of questions, including the main one used in these anal-yses, about the experience of having unfilled spare time (described below). Individuals' and families' characteristics are collected by personal interview.

Within the diary a question was asked "How often do you feel that you have spare time that you don't know what to do with?" with response categories of "always", "often", "some-

times", "rarely" and "never". This is referred to here as the frequency of having spare time that cannot be filled, or alternatively, as the frequency of having unfilled spare time. Those who said they sometimes, often or always had spare time they could not fill were asked "What are all the reasons you have spare time that you don't know what to do with?" with respondents shown a card listing possible reasons. In 1997 there were six possible reasons, including "other", while two new reasons were added in 2006 (see Table 1). These items form the central focus of this paper.

In 2006, the final sample used in the analyses of having unfilled spare time comprised 3,004 males and 3,428 females, and in 1997 the sample comprised 3,269 males and 3,587 females. This represented the majority of survey respondents–some were excluded because they did not provide a response to the key data item on experience of having too much spare time (383 from 1997 and 479 from 2006). These excluded cases were retained in the analyses of time use data, described below.

The data collected in the time use diaries were also used in this paper. Time use was aggregated based on main activity into broad categories to derive estimates of daily amounts of time spent undertaking each of these sets of activities. The main one used is the one referred to here generally as "spare time", which includes time spent in recreation, leisure and social activities. As defined, this is the amount of time that is not committed to paid or unpaid work or study, or to personal care or sleep. Note that "recreation" includes activities described as "doing nothing" or "bored". The other broad categories of time use are (1) paid work and study; (2) household and childcare tasks: (3) other care and voluntary work; (4) personal care; (5) sleep. "Spare time" is also analysed in more detail by examining activities at a finer level of disaggregation.

3.1   Methods

Descriptive analyses were used to overview the responses regarding having unfilled spare time. In these analyses, data were weighted using the person-level sample weights, which take account of respondents' probability of selection into the sample and non-response.

The frequency of experiencing unfilled spare time was then dichotomised to identify those who often or always had unfilled spare time, rather than less frequent unfilled spare time. Multivariate analyses were used to explore associations between the likelihood of men and women often experiencing having unfilled spare time and different life cycle and demographic characteristics. Logistic regression was used for these analyses and results are presented as odds ratios. As the TUS data are collected from all adults within a household, the non-independence of household-level data was taken into account by calculating robust standard errors, treating the household as a cluster. The variables included in the analyses are described below.

This model was initially estimated for all respondents together. Separate models were then estimated for males and females, to explore whether there were gender differences in the pre-

dictors of having unfilled spare time. The differences in the resulting coefficients for males and females were formally tested by fitting an additional model in which gender was interacted with each of the variables. A significant interaction term indicates that the predictor for males differs to that for females. The results of this full model have not been presented, but the presence of significant differences for males versus females is indicated and discussed in the results section.

Similar analyses were undertaken to examine the reasons for having unfilled spare time. Logistic regression was used to analyse the likelihood of selecting each one of the possible reasons for unfilled spare time, incorporating the same variables described above as possible explanatory factors. These analyses were conducted just for those who at least sometimes had spare time they could not fill. For these analyses, for simplicity, males and females were combined.

The amount of spare time (as defined, including leisure, recreation and social activities) was then analysed using multivariate analyses. Each person reported their time use for two consecutive days, providing two sets of data on daily time use patterns. These data were analysed using the same set of variables used in the analyses of unfilled spare time, with an additional indicator of whether the data related to a weekday or weekend. The estimation technique treated the time use data as continuous, using Ordinary Least Squares, with robust standard errors calculated to acknowledge the non-independence of the two days of time use data per person. Similar analyses of other time use categories were also undertaken, although not the main focus of this paper.

Associations between the reporting of having unfilled spare time and time use patterns were then explored using descriptive methods. For these analyses, person-day level sample weights were used. These weights are derived from the person-level weights to also take account of the distribution of days of week covered by the time use diaries. Statistical tests were used to identify whether apparent differences in time use were statistically significant. Analyses of variance tests (and post-hoc Scheffe tests) were used for these purposes and were based on unweighted data. These analyses are undertaken only with the 2006 data.

3.2   Life cycle and demographic variables

The first of the life cycle variables included in the analyses was age. These data were available in 5-yearly age groups, but for the sake of parsimony, they were grouped initially into categories of 15 to 24, 25 to 35 years, 35 to 54 years, 55 to 74 years and 75 years and over. The youngest of these age groups is particularly diverse, with some young people still living at home with their parents and still in study, some still living at home but not as students, and other no longer living with parent/s. These different categories of 15 to 24 year olds were identified, to better understand which youth might be at risk of having unfilled spare time.

The family or household structure was then included, differentiating into those living in a family with children aged under 15 years, those living in a family but without children aged

under 15 years, those living as non-family members, such as group households, and then lone person households.

Other important variables are labour force status and hours of employment. In these analyses those who are not employed are identified as either unemployed or not in the labour force. Employed persons are categories according to their usual hours of employment, with categories of less than 35 hours, 35 to 49 hours, 50 hours or more. [2]

An indicator of whether the person's main language spoken at home was English or another language was included. Non-English speaking Australians are almost all overseas-born, some being recent arrivals to Australia, but others being long-term residents.

Persons who provide care to others for reasons of their age or ill health are identified, as are persons who themselves have a long term health condition or disability. In 2006 this health/disability indicator was more inclusive, as the 1997 item referred to disability but not long-term health conditions. Note that a significant proportion report to have a long term health condition or disability (about one-third of the population). Future analyses of these data could differentiate according to whether the disability or health condition resulted in limitations in undertaking personal activities. This would be best done with one year's data, as differences across years in the data items make it difficult to create an indicator that can be used in the pooled dataset.

To explore whether having low income mattered, there was some difficulty in reconciling the available information from the two studies, as income was provided in different formats each year. In 1997, personal income was provided in ranges. From this information, those persons with the lowest incomes were said to be those whose own income was below $200 per week, which represented 29% of respondents. In 2006, personal income was instead provided as deciles, classifying people according to where their income fell in the income distribution of all respondents. This information was used to identify a low income group covering a similar proportion to the low income group from 1997. This was best identified as those with income in the bottom 30% of the income distribution, which represented 28% of the sample. Some respondents did not provide income data. These respondents are included in the analyses, and flagged as having missing income data. There was missing income data for 13% and 6% of the sample in 1997 and 2006 respectively.

The distributions of the above variables, for males and females, in 1997 and 2006, are shown in Appendix Table A1.

---

[2] The 1997 data in the highest category are actually 49 hours and over, rather than 50 hours and over.

4   Results

4.1   The frequency of having unfilled spare time

Table 1 shows that the majority of males and females, in 1997 and 2006, reported that they rarely or never had spare time they could not fill. Around one quarter sometimes had unfilled spare time, with fewer than 10 per cent saying they often or always had unfilled free time. While the proportions are quite small, across the population this amounts to a significant number of people always or often having unfilled spare time (estimated at 812,000 people in 1997 and 974,000 in 2006).

Table 1
**How often men and women aged 15 years and over have unfilled spare time –
1997 and 2006**

	1997		2006	
	Male	Female	Male	Female
		%		
Always	1.6	0.8	1.7	1.2
Often	5.5	4.3	6.2	4.1
Sometimes	25.3	21.7	27.7	25.3
Rarely	45.9	44.9	45.3	45.2
Never	21.7	28.3	19.1	24.2
Total	100.0	100.0	100.0	100.0
Always or often	7.1	5.1	7.9	5.2
		n		
Sample size	3,269	3,587	3,004	3,428

Note: The question was "How often do you feel that you have spare time that you don't know what to do with?" Within 1997 and within 2006, the male distribution is different to the female distribution. Also, the percentage reporting to always or often have unfilled spare time is significantly higher for males than females in each year. For males and for females the distributions differ across years, but if just looking at the percentage always or often, these percentages are not statistically different by year. Source: Australian Bureau of Statistics, 1997, 2006, own calculations.

Males were significantly more likely to report always or often having unfilled time than females in each year, although the percentages are small for both sexes.

Between 1997 and 2006, the distribution of responses to this question changed little, especially when considering the proportion reporting to often or always having unfilled spare time. This proportion did not change significantly for males or for females.

In 2006 there was somewhat less reporting of "never" having unfilled spare time compared to 1997, compensated by more reporting of "sometimes" having unfilled spare time. This is likely to be related to changes at the other end of the spectrum – the increased tendency for males and females to report being rushed or pressed for time (33% of males and 39% of females were always or often rushed or pressed for time in 1997, compared to 46% and 49% respectively in 2006).

4.2   Who has unfilled spare time?

Table 2 shows the results of the multivariate analyses of always or often experiencing unfilled spare time, combining data from 1997 and 2006.

In the model shown in the first column, males and females are combined and a separate variable measures differences between the sexes. This shows that men were more likely to frequently (i.e. always or often) experience unfilled spare time than were women, after taking into account the other differences between men's and women's characteristics that were included in the models.

Separate models were also estimated for males and females, shown in the next two columns, as various relationships were found to differ for males and females. The final column indicates if the male and female coefficient was significantly different. These results are discussed if the male and female coefficients differed; otherwise we refer to the findings for the model based on males and females combined.

In analysing the likelihood of having unfilled spare time, strong age differences were apparent, with the youngest men and women being the most likely to have unfilled spare time, especially those who were not students but living with parents. For the young people aged 15 to 24 who no longer lived with their parents, there was a greater chance of women having unfilled spare time, relative to women aged 35 to 54 years, but this difference was not apparent for men. Men and women aged 55 to 74 were the least likely of all age groups to report have unfilled spare time.

Relationship within the household was important in explaining the likelihood of having unfilled spare time. For both men and women, the reference group was being a family member with no dependent children aged under 15 years. Compared to these family members, those with dependent children were the least likely to have unfilled spare time, although when examined by gender, this difference was much greater and only significant for women. Men and women living as non-family members were not statistically different from family members without children in their likelihood of having unfilled spare time. This was true also of women who lived alone. For men, those living alone were more likely to experience unfilled spare time compared to other men.

Another personal characteristic linked to greater incidence of unfilled spare time is having a long-term health condition or disability. Also, those who mainly spoke a language other than English were more likely to say they had unfilled spare time, compared to those mainly speaking English. Having other caring responsibilities somewhat reduced the likelihood of having unfilled spare time, although when examined by gender, this difference was only statistically significant for women.

A very clear result was that not-employed men and women were more likely to experience unfilled spare time than others, whether or not they were unemployed or not in the labour force. Differences among those in paid employment also existed, such that those working the longest hours were least likely to experience unfilled spare time.

Table 2
Multivariate analyses of frequently having unfilled spare time in 1997 and 2006

	Odds ratios from logistic regression			
	All males and females	Males	Females	Male-female different?
Year of survey=2006 (Reference=1997)	1.12	1.13	1.10	
Background characteristics				
Male	1.76***			
Age=15-24 with parents, dependent student	1.90***	1.61*	2.28***	
Age=15-24 with parents, not student	4.21***	3.30***	6.73***	
Age=15-24 not with parents	2.29***	1.37	3.61***	yes
25-34	1.45**	1.27	1.89**	
35-54 (reference)				
55-74	0.71***	0.73*	0.67*	
75 or older	1.01	1.02	1.01	
Family with no children (reference)				
Family with children	0.63***	0.79	0.45***	yes
Non–family household	1.27	1.23	1.35	
Lives alone	1.68***	2.03***	1.31	yes
Has a disability or long term health condition	1.87***	1.65***	2.11***	
Main language spoken not English	1.75***	1.91***	1.48*	
Constraints or commitments				
Is carer to someone	0.65*	0.72	0.59**	
Not in the labour force	4.35***	4.38***	5.16***	
Unemployed	5.55***	4.35***	7.70***	
1 to 34 hours	2.52***	2.71***	2.60*	
35 to 50 hours	1.71**	2.02***	1.21	
50 hours or more (reference)	ref	ref	ref	
Low personal income	1.15	1.24	1.05	
Constant	0.01***	0.02***	0.01***	
Sample size (persons)	13,275	6,263	7,012	
McFadden's adjusted R-squared	0.093	0.085	0.108	

Note: The analyses estimate the log odds of often or always having unfilled spare time versus sometimes, rarely or never having unfilled spare time. The standard errors were adjusted to allow for clustering of observations within households. Omitted categories for single dummy variables are not shown. The model also included an indicator for having missing income data. The final column is based on a model including males and females in which all variables were also interacted by gender. This column indicates those variables for which there was a significant interaction with gender, which indicates the coefficient for males is different to that for females.
*** $p<0.001$, ** $p<0.01$, * $p<0.05$.
Source: Australian Bureau of Statistics, 1997, 2006, own calculations.

There was no independent effect on reporting to have unfilled spare time of having a low personal income. To summarise these results, in relation to our research question of which life

cycle and demographic characteristics were associated with having unfilled spare time, this research found that those who were most likely to have unfilled spare time were the youngest men and women, especially those living at home, in addition to men living alone, those with limited commitments to paid work or to caring, those with a health or disability, or an English language limitation.

Overall, there were no statistically significant differences between 1997 and 2006, consistent with the findings of Table 1. There were gender differences, such that men were more likely than women to report having unfilled spare time.

4.3 Reasons for having unfilled spare time

Identifying the groups of people who are most likely to have unfilled spare time gives some indication for the possible reasons these people have this experience. This can also be explored with these data by examining the reasons people give for having unfilled spare time. This question was asked of anyone who said they sometimes, often or always had unfilled spare time spare time. Respondents could choose more than one reason. As above, the 1997 and 2006 data are examined. The 2006 survey included two response categories that were not included in 1997, as shown in Table 3.

Table 3
Reasons given for sometimes having unfilled spare time by those who at least sometimes had spare time they could not fill – 1997 or 2006

	Males		Females	
	1997	2006	1997	2006
		%		
Lack of money	53	46	57	49
Being sick/injured/disability	12	16	10	18
No family or friends nearby	10	15	17	21
No interests or hobbies	13	14	12	18
Unpredictable working hours	n.a.	16	n.a.	13
Transport difficulties	n.a.	10	n.a.	15
Lack of community facilities or services	8	7	7	6
Other reasons	15	5	14	7
		n		
Sample size	1,048	1,061	0,938	1,039

Note: Response categories "unpredictable working hours" and "transport difficulties" were introduced in 2006.
Respondents could select more than one reason.
Source: Australian Bureau of Statistics, 1997, 2006, own calculations.

This may have resulted in the different distributions across the surveys, and because of this, we do not attempt to interpret how responses changed across the survey years.

The most often-given reason for having unfilled spare time was lack of money. Being sick, injured or having a disability, having no family or friends living nearby, having no interests or hobbies and working unpredictable working hours were also contributing factors. Transport difficulties and lack of family or friends nearby were more often cited by females than males.

Smaller proportions reported lack of community facilities or services and other reasons as being contributing reasons for too much spare time.

Multivariate analyses were used to determine whether particular reasons for unfilled spare time were given by different groups of people. Results are shown in Table 4. The 1997 and 2006 data for males and females were combined for each model predicting the likelihood of a given response. (Transport difficulties and unpredictable working hours were also included, just for 2006 data.) The "other reasons" category has not been included. Some differences by year were apparent, but it is not possible to discern whether this reflects an actual change in the propensity for these factors to affect people's spare time use, or whether it is due to the changes in the response categories.

These analyses show that men and women were equally likely to say they had unfilled spare time because of lack of money, being sick, injured or having a disability, having no interests and hobbies, having no community facilities nearby, and working unpredictable hours. However, males were less likely than females to attribute unfilled spare time to having no family or friends nearby and to transport difficulties.

The oldest people were the least likely to say they had unfilled spare time because of lack of money and were also somewhat less likely than others to say that lack of community facilities was a problem.

For the younger people, transport problems were a contributing factor (for dependent students and others, including those no longer living with parents). Lack of money was another contributing factor for those aged 15-24 no longer living at home. Also, for dependent students, having no community facilities was considered a factor in their having unfilled spare time.

The young dependent students and young people who no longer lived at home were the least likely of all ages to attribute their unfilled spare to sickness, injury or disability. Young people who lived at home but were not students were the least likely to attribute having unfilled spare time to having no family or friends nearby.

Not surprisingly, those with health problems or a disability were much more likely than others to attribute their unfilled spare time to barriers caused by sickness, injury or disability. Those with an illness or disability were also somewhat more likely than others to say transport difficulties was a factor, but were less likely than others to say lack of community facilities was a factor in their having unfilled spare time.

Compared to English-speakers, those whose main language was not English were somewhat more likely to say transport problems contributed to their having unfilled spare time. These people were less likely to attribute their unfilled spare time to financial reasons and unpredictable working hours.

Based on the relationship in household variable, those most likely to attribute having unfilled spare time to having no family or friends nearby were those living alone.

Table 4
Multivariate analyses of reasons for having unfilled spare time in 1997 and 2006

	Odds ratios for separate models estimated for each of the possible reasons for having unfilled spare time						
	Lack of money	Sick, injured, disability	No family or friends nearby	No interests or hobbies	No community facilities	Transport	Unpredictable work hours
Year of survey = 2006	0.83*	1.46***	1.58***	1.26*	1.04	n.a.	n.a.
Background characteristics							
Male	0.93	1.14	0.63***	0.83*	1.19	0.66	1.05
Age = 15-24 with parents, dependent student	0.84	0.29***	1.01	0.94	2.24***	2.89***	0.73
Age = 15-24 with parents, not students	1.11	1.45	0.44**	1.22	1.36	2.83***	1.57
Age = 15-24 not with parents	1.37*	0.53*	1.14	1.08	1.43	2.07*	1.14
25-34	1.06	0.72	1.11	0.86	1.13	1.34	1.15
35-54 (reference)							
55-74	0.73**	0.84	0.76	0.94	0.62	0.65	1.02
75 or older	0.21***	0.91	0.72	1.06	0.36*	0.62	0.53
Family with no children (reference)							
Family with children	1.24*	0.93	0.87	0.92	0.76	0.58*	0.77
Non–family household	1.39	1.15	1.41	0.86	0.93	1.60	0.99
Lives alone	1.02	0.95	1.70***	0.83	0.83	1.41	0.89
Has a disability or long term health condition	1.13	9.55***	0.94	1.20	0.66*	1.50	0.91
Main language spoken not English	0.58***	1.42	1.26	1.24	0.89	2.03	0.53
Constraints or commitments							
Is carer to someone	1.05	0.94	0.82	0.95	1.24	0.72	1.13
Unemployed	3.15***	2.62*	1.39	0.74	1.33	3.28**	0.04***
Not in the labour force	1.79***	6.15***	1.17	0.78	1.09	2.08	0.05***
1 to 34 hours	1.69***	2.07*	0.80	0.81	1.15	1.99	0.67
35 to 50 hours	1.74***	1.45	0.83	0.95	1.13	1.19	0.54**
50 hours or more (reference)							
Low personal income	1.21*	0.98	0.91	0.90	1.11	1.14	1.14
Constant	0.67*	0.01***	0.19***	0.17***	0.06***	0.06***	0.50**
McFadden's adjusted R-squared	0.056	0.271	0.036	0.012	0.045	0.086	0.164

Note: Only includes those who sometimes, often or always have unfilled spare time. Based on logistic regression with standard errors adjusted to allow for clustering of observations within households. Omitted categories for single dummy variables are not shown. The model also included an indicator for having missing income data.
*** $p<0.001$, ** $p<0.01$, * $p<0.05$ N=4,085 for first 5 reasons; N=2100 for last 2 reasons.
Source: Australian Bureau of Statistics, 1997, 2006, own calculations.

Those living in families with children, compared to those without children, were more likely to attribute having unfilled spare time to lack of money, but were less likely to say transport problems were a factor. Being a carer to someone was not significantly related to reporting of particular reasons for having unfilled spare time.

The tendency to attribute unfilled spare time to lack of money was closely linked to employment status. Compared to working 50 hours or more per week, being unemployed, not in the labour force, or working fewer hours resulted in a higher likelihood of giving lack of money as a reason for unfilled spare time.

Surprisingly, unpredictable working hours was most likely to be a reason for having too much spare time for those working the longest hours.

Being unemployed was also associated with having a higher likelihood of saying sickness, ill health or disability and transport difficulties were factors in their having unfilled spare time. Perhaps reflecting reasons for being not in the labour force, those in this category of labour force status had a relatively high likelihood of saying sickness, ill health or disability was a contributing factor to their having unfilled spare time.

Having a low personal income also increased the likelihood of selecting lack of money as a reason for having unfilled spare time, although this was not a particularly large effect relative to the other characteristics. It is likely that labour force status captures some effects of income, given that working less than full-time hours, or being not employed, is likely to indicate relatively low personal income.

Summarising these results, while lack of money was the most common reason, and clearly important to those with lower levels of employment participation or low incomes, there were important differences across groups in the population. Younger people tended to face problems with transport and community facilities, for example, and transport difficulties are also problematic for those who are unemployed, from a non-English speaking background, or with a disability or health problem. Living alone was also a risk factor in regard to perceptions of having no family or friends nearby being a contributing factor to having unfilled spare time.

4.4 Predictors of having more spare time

We now introduce the time use data, to consider whether the findings so far, about who is likely to have unfilled spare time, are similarly found to predict having more spare time. To do this, we have said that "spare" time is equal to time spent on leisure, recreation or social activities. Of course, some people faced with spare time will use it in other ways, such as sleeping, undertaking voluntary work or studying. We will return to this in the next section. For now, we are concerned with time that has not been used for purposes of personal care, paid or unpaid work.

The results of the multivariate analyses of amount of spare time are shown in Table 5. Similar analyses of the other main activities of time use are shown in Appendix Table A2 and A3.

Table 5
Multivariate analyses of total amount of spare time in 1997 and 2006

	Regression coefficient from Ordinary Least Squares, with time measured in minutes per day			
	All males and females	Males	Females	Male-female different?
Year of survey=2006 (Reference=1997)	-20***	-20***	-21***	
Background characteristics				
Male	53***	n.a.	n.a.	
Age=15-24 with parents, dependent student	14*	-5	21**	yes
Age=15-24 with parents, not students	58***	56	59***	
Age=15-24 not with parents	11	5	16*	
25-34	-4	0	-6	
35-54 (reference)				
55-74	23***	3	37***	yes
75 or older	48***	9	74***	yes
Family with no children (reference)				
Family with children	-65***	-57***	-66***	
Non–family household	5	-4	12	
Lives alone	23***	11	28	yes
Main language spoken not English	-32***	-30***	-35***	
Has a disability or long term health condition	16***	19***	11**	
Constraints or commitments				
Unemployed	167***	194***	130***	yes
Not in the labour force	143***	180***	107***	yes
1 to 34 hours	82***	98***	59***	yes
35 to 50 hours	38***	40***	23***	
50 hours or more (reference)				
Is carer to someone	-16***	-22***	-11*	
Low personal income	-5	-10	0	
Weekday	-113***	-136***	-92***	
Constant	293***	356***	299***	
Sample size (days)	25,865	13,202	14,663	
R-squared	0.248	0.277	0.219	

Note: Spare time includes time allocated to leisure, recreation and social activities as main activities. Based on ordinary least squares regression with standard errors adjusted to allow for clustering of observations within persons (up to 2 diaries per person). Omitted categories for single dummy variables are not shown. The model also included an indicator for having missing income data. The final column is based on a model including males and females in which all variables were also interacted by gender. This column indicates those variables for which there was a significant interaction with gender, which indicates the coefficient for males is different to that for females. For other aspects of time use refer to Appendix Tables 2 and 3.
*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.
Source: Australian Bureau of Statistics, 1997, 2006, own calculations.

As for the initial analyses of who is more likely to have unfilled spare time, these analyses were conducted separately for males and females to assess whether there were different predictors of amount of spare time for males and females.

Overall, males have more spare time than females, based on the independent gender difference shown in Table 4. The comparison by survey shows men and women had somewhat less spare time in 2006 compared to 1997. (See Appendix Table A2 and A3: this relates to men spending more time in paid work or study in 2006, and to women spending more time in household/childcare tasks and other care and voluntary activities.)

Not surprisingly, for men and women, more hours of paid work was associated with less spare time. Those unemployed and not in the labour force had the highest amounts of spare time. Of these two groups, the unemployed had a little more spare time, on average. The difference in amount of spare time, comparing non-employment or part-time employment to those working longer hours of paid work, was greater for men than women.

By age, among the younger people, those with the greatest amounts of spare time were young men and women who lived with their parents but were not students. For males, this was the only significant age-related difference in amount of spare time. For females, greater age differences were apparent, with the least amount of spare time reported for those aged 25-34 and 35-54 years. Compared to women aged 35 to 54 years, young women who were students and lived with their parents had somewhat more spare time. Also, for women older than 35 to 54 years, amount of spare time increased, especially among those aged 75 years and older.

According to household type those with the least amount of spare time, not surprisingly, are men and women who live in families with children. The amount of spare time does not differ, then, between non-family households and family households without children. For men living alone, the amount of spare time does not vary from these groups. Women living alone, on the other hand, have more spare time than those living in these other family types.

Others who experience lesser amounts of spare time are those with caring responsibilities and those whose main language spoken at home is not English. In contrast, those with a disability or long term health condition have somewhat more spare time compared to those who do not. Having a low income in itself did not predict amount of spare time.

The aim of this set of analyses was to compare these findings to those of previous findings regarding having unfilled spare time to determine to what extent they were predicted by the same factors. Generally those variables that predicted a higher likelihood of having unfilled spare time also predicted a greater amount of spare time. In particular the factors that were related to both measures in the same way were amount of paid employment, being a carer, having a disability or long-term health condition and living in a family with children.

A few interesting exceptions were apparent. One is that those who mainly spoke a language other than English were more likely to say they had unfilled spare time, compared to those mainly speaking English, but these men and women reported having less spare time than others. Being able to fill their spare time may therefore be related to their particular reasons for

having unfilled spare time, which we showed earlier included transport difficulties, rather than to them having an excess of spare time.

These analyses showed that women living alone had more spare time than those living in a family with no children. The earlier analyses found no differences between these groups in reporting to have unfilled spare time, suggesting that for women living alone, increases in spare time did not necessarily mean this spare time was difficult to fill. For men living alone, however, there was an increased chance of reporting to have unfilled spare time, compared to living in a family with children. These men did not report any greater amount of spare time. This suggests that men living alone might be faced with particular barriers to their using their spare time, and earlier analyses of the reasons for spare time showed that those living alone were more likely to report that having no friends or family nearby was an issue. This, it seems, was more pertinent to men than to women.[3]

It is interesting that women aged 75 years and older have more spare time than any other group for women, and yet their likelihood of reporting to have unfilled spare time was no greater than for women living in families with children. For these women, old age in itself, then, was not related to having difficulties filling in spare time.

4.5   Time use and unfilled spare time

This section explores how time use patterns differ according to the experience of having un-filled spare time. These analyses are exploratory, using only the 2006 data. The main activities undertaken on weekdays and weekends are analysed separately for males and females. To illustrate the overall differences, time has been allocated to broad categories, based on main activity at each time, so that there is no double-counting of time. Main activities have been grouped into spare time, as analysed previously, but separated into time watching television and other spare time (referred to as non-tv spare time), then as paid work or study, household or childcare tasks, other caring or volunteering, personal care (including eating), then sleep. These results are examined first, then more detailed analyses of some of these activities undertaken during spare time are included.

These analyses attempt to show how feelings of having unfilled spare time might spill over into activities other than those classified as spare time. This is a very simplistic approach to this question, and in particular, because all men and all women are grouped together, we perhaps do not see some of the patterns that would emerge if life cycle or demographic characteristics were taken into account. This will have to be the subject for further analyses of these data. (See Bloomfield, 2004, for a different approach to analyses of these data.)

Table 6 shows that time use patterns varied according to the frequency with which people experienced unfilled spare time. For example, men with more unfilled spare time slept for longer: men who always or often experienced unfilled spare time slept 56 minutes more on

---

3   This was confirmed in additional analyses of reasons for unfilled spare time, run separately for males and females.

weekends and 32 minutes more on weekdays, on average, than men who rarely or never experienced unfilled spare time.

Table 6
Time spent in main activities according to frequency of unfilled spare time,
by weekday and sex – 2006

Frequency of unfilled spare time	Non-tv spare time	Watch-ing tele-vision	Paid work or study	House-hold and childcare tasks	Other caring or Volun-teering	Personal care	Sleep
			Mean minutes per day				
			Males, weekday				
Often/always	214	163	238	138	9	146	523
Sometimes	174	137	322	160	18	135	504
Never/rarely	145	94	414	158	17	130	492
Total	160	111	375	156	16	133	497
	(a)(b)(c)	(a)(b)(c)	(a)(b)(c)			(a)	(a)(b)(c)
			Males, weekend				
Often/always	269	184	66	163	15	154	591
Sometimes	269	158	107	194	27	148	551
Never/rarely	265	121	132	235	27	147	535
Total	266	137	121	216	27	148	545
		(a)(c)	(a)(b)	(a)(c)			(a)(b)(c)
			Females, weekday				
Often/always	196	150	132	235	28	160	559
Sometimes	168	115	202	276	26	149	524
Never/rarely	159	83	226	330	31	147	490
Total	164	95	216	309	29	148	502
	(a)(b)	(a)(b)(c)	(a)(b)	(a)(c)		(a)	(a)(b)(c)
			Females, weekend				
Often/always	244	145	72	205	19	159	599
Sometimes	256	122	54	278	28	166	555
Never/rarely	241	93	64	338	32	163	533
Total	244	102	62	318	31	163	542
		(a)(c)		(a)(b)(c)			(a)(b)(c)

Note: Significance of difference across the unfilled spare time groups was tested using ANOVA, with Scheffe tests. Significant differences in time ($p<0.05$) are indicated above when: (a) "Often/always" is not equal to "never/rarely"; (b) "Often/always" is not equal to "sometimes"; (c) " Never/rarely " is not equal to "sometimes". The durations are based on the time spent in these activities as a main activity. Spare time includes leisure, recreation and social activities but is tabulated here to separate out time spent watching television.
Source: Australian Bureau of Statistics, 1997, 2006, own calculations.

Comparing these two extremes, differences were apparent for watching television (men with more unfilled spare time spent, on average, 69 minutes more on weekends and 63 minutes more on weekdays watching television. They also spent more time in other forms of recreation and social activities on weekdays (69 minutes more).

Similar patterns were observed for females. Not surprisingly, those who perceived they had more unfilled spare time spent less time in paid work or study, especially on weekdays. This was also apparent for males on weekends. Those with more unfilled spare time also spent less time doing unpaid work (household and childcare tasks), although this was not statistically significant for males on weekdays. Males and females spent very little time in volunteering or other care activities, and there was no evidence that those with more unfilled spare time spent more or less of their time on these activities. Differences in time spent on personal care activities were quite small.

We now go beyond this in Table 7 to explore a subset of the spare time activities, specifically, to examine those that overall took up the greatest amounts of time. Data for males and females, for weekends and weekdays, have been combined. This table shows that beyond audio-visual entertainment (particularly television) very small amounts of time were spent in the separately identified types of recreation or leisure or social activities, when averaged over all days and all respondents.

Quite small differences were apparent by the frequency of unfilled spare time, except in audio-visual entertainment. These data do not, for example, show that those with more unfilled spare time spent longer "drinking alcohol/social drinking" as a main activity. Differences are evident for "resting, relaxing", "reading a book", "walking" and "listening to the radio" in the direction that would be expected, with a little more time spent in these activities by those who frequently have unfilled spare time compared to those how do not. The total amounts of time in these activities are very small. We were particularly interested in examining whether having unfilled spare time was associated with spending more time in unhealthy or anti-social pursuits. Possible negative pursuits as indentified in the time use diaries include "smoking", "games of chance/gambling", "negative social activities", or even "doing nothing", inasmuch as this might be particularly associated with boredom.

However, so few people reported these as main activities at any time across the day, that it was not possible to detect differences across the categories of frequency of unfilled spare time. Given the infrequency of reporting these activities, they have not been shown in Table 7. Of course, if we were to look not just at main activities, but at what else people were doing while doing their main activity, other results may be found. This is probably most applicable to smoking, or to "drinking alcohol/social drinking" which are perhaps less likely to be reported as main activities. To some extent this is captured in the secondary activities collected in the time use diary.

However, no relationships between spare time use and these particular secondary activities emerged in additional analyses of these data (results not shown). Perhaps the time use survey, in collecting one main activity and one co-occurring activity, does not adequately capture behaviours such as these.

Table 7
Time spent in selected spare time activities by frequency of having unfilled spare time – 2006

	Always /often	Some-times	Rarely/ never	Total	
	Minutes per day				
Total spare time	342	286	231	286	
Selected activities					
TV watching/listening	161	132	96	110	(a)(b)(c)
Communication (in person) associated with recreation/leisure	17	20	20	20	
Audio/visual media not classified elsewhere	18	17	15	15	
Travel associated with social participation	14	15	14	14	
Relaxing, resting	21	13	11	13	(a)(b)(c)
Socialising	15	12	12	12	
Leisure-related communication by telephone	8	9	9	9	
Video/DVD watching	10	10	8	9	
Reading not further defined	9	8	8	8	
Reading a newspaper	9	9	8	8	
Drinking alcohol/social drinking	6	9	7	7	(c)
Reading a book	12	7	6	7	(a)(b)
Travel associated with recreation and leisure	7	6	6	6	
Exercise (excluding walking)	4	4	5	5	(c)
Walking (including for exercise)	7	5	4	5	(a)(b)
Religious practice	4	4	5	5	(c)
Listening to radio	6	5	4	4	(a)
Home computer electronic games/computing	9	5	3	4	(a)(b)(c)
Sample size (person-day records)	799	3,338	8,571	12,708	

Note: Significance of difference across the unfilled spare time groups was tested using ANOVA, with Scheffe tests. Only significant differences in time ($p<0.05$) are indicated above when: (a) "Often/always" is not equal to "never/rarely"; (b) "Often/always" is not equal to "sometimes"; (c) " Never/rarely " is not equal to "sometimes". These durations are based on the time spent in these activities as a main activity. Data include weekdays and weekends and males and females aged 15 years and over.
Source: Australian Bureau of Statistics, 1997, 2006, own calculations.

5   Discussion and conclusion

What do these analyses, overall, tell us about the experience of having unfilled spare time in Australia? First, it is clear that this is an issue for the minority of Australian men and women. The majority of Australian men and women, in 1997 and 2006 reported that they never or rarely had this experience.

There were slightly higher rates of having unfilled spare time among men than among women. This gender difference remained in the multivariate analyses, when controlling for various

different characteristics of men and women. This is consistent with the research on being time pressured, which tends to find men have more free time than women (Bittman and Wajcman, 2000; Sayer, 2005), and are less time pressured than women (Mattingly and Bianchi, 2003; Mattingly and Sayer, 2006).

There was no evidence that there has been any change in frequently having unfilled spare time between 1996 and 2006. The only changes that were apparent seem to be related to the other end of the scale with respect to perceptions of time, with somewhat less reporting of never having unfilled spare time. Future analyses of these data could explore this in more detail, to determine whether specific groups within the population have experienced an increase (or decline) in having unfilled spare time.

The reasons for being unable to fill spare time that were identified here included lack of money, ill health or disability, and transport. This paper shows that money is the main reason people give for frequently having unfilled spare time, however other reasons also apply, and reasons differ for particular groups of people. In addition to those listed above, having no friends or family nearby and lack of community facilities are some of these other reasons.

Those most likely to experience unfilled spare time were the youngest men and women, especially those living with their parents, in addition to men living alone, those with limited commitments to paid work or to caring, and those with a health or language barrier. The findings of this study are consistent with the research on being time pressured, as those most at risk of being time pressured were here observed to have the least risk of having unfilled spare time. For example, this was clearly the case for women with children and also for women aged between 35 to 54, who were the least likely to have unfilled spare time among female respondents. For both sexes, having unfilled spare time was much less likely among those with paid work commitment, especially those working longer hours. Again, this is not surprising given that longer work hours are commonly associated with a greater sense of being time pressured.

Quite often the characteristics that explained having unfilled spare time also explained the actual amount of spare time–or time spent on recreation, leisure or social activities. Just as has been observed in relation to time pressure (Sayer and Treas, 2005; Zuzanek, 1998), it appears that people's perceptions of their time is grounded in the way time is allocated to activities across the day.

However, it is also worth noting that having more spare time does not always go hand in hand with having more unfilled spare time. For example compared to women aged 35 to 54, those aged 55 to 74 years were less likely to report frequently having unfilled spare time, despite reporting to have more spare time than women in the younger age group. Similarly, women living alone had more spare time than women living in a family without children, but women living alone were no more likely to report having unfilled spare time. The opposite was true for men in these situations, with men living alone not reporting any more spare time than those living in a family without children, but having a higher likelihood of having unfilled

spare time. To some extent these findings may reflect the different barriers to using spare time, experienced differentially by men and women at particular life cycle stages.

Also, while the analyses included a broad set of socio-demographic variables, in particular to focus on life cycle differences in the experience of unfilled spare time, other personal characteristics are likely to explain the variation across the population in having this perception. For example, some people may have a personality or disposition that leads to their being easily able to fill in their spare time, regardless of how much spare time they have (e.g. Barnett and Klitzing, 2006). Others may be faced with difficulties such as mental health or substance abuse problems that may affect their experience of unfilled spare time.

In terms of exploring how having unfilled spare time might be associated with poorer wellbeing, this study examined differences in some of the detail of time use patterns according to differences in the frequency of reporting to have unfilled spare time. It is interesting that there was no evidence that an excess of spare time was associated with particularly negative behaviours or activities, such as delinquent or harmful behaviours, but perhaps time use diaries are not the most appropriate mechanism for collection of data on such behaviours, given social desirability may affect reporting by respondents, and also some activities they may be too infrequent to detect when selecting just two random days per person on which to base estimates. These analyses were not particularly sophisticated, however, and a more nuanced approach that also takes account of different socio-demographic characteristics may yield different results. Nevertheless, these analyses did show very clearly that greater amounts of time were spent watching television by those with more unfilled spare time, consistent with analyses by Bloomfield (2004). This is unlikely to be positive in relation to individuals' wellbeing. In future analyses of these data, it will be useful to also explore not only what people are doing with their time, but who they are with during the day, to determine whether feelings of having unfilled spare time are also accompanied by greater amounts of time spent alone.

The experience of having unfilled spare time by an individual may have implications for other family members and also for the community more broadly. Thinking about the family, for example, this analysis showed that young people are the most likely to feel they have unfilled spare time, and this was most common among those living at home with their parents. As the ABS Time Use Survey is a household survey, it is also possible to match the records of children to those of their parents. Not surprisingly, if this is done, we find that the mothers of these children very rarely report having spare time in which they do not know what to do, instead often reporting that they are often or always rushed or pressed for time. In 2006, of the 15 to 24 year olds living at home who said they always or often had unfilled spare time, 53% of their mothers reported being always or often rushed or pressed for time and 3% reported always or often having spare time in which they did not know what to do. It seems therefore that there may be some potential here for a reallocation of activities within households.

It is worth noting that those at higher risk of having unfilled spare time, such as the not-employed and those with health or disability limitations are often identified as being at greater risk of social exclusion. Further, the barriers associated with being able to fill spare time, in-

cluding financial barriers and transport difficulties, are also commonly associated with social exclusion (Hayes et al., 2008). This might suggest some link between social exclusion and being able to use time in a meaningful way. This link between social exclusion and time use has previously been noted by Bittman (1999) in discussing the difficulties that low income people may have in being able to participate in leisure activities. Approaches to social inclusion certainly recognise the value of time, and the potential for individuals with the time to spare to use some of their time to meet the needs of others within the community. For example, recruitment strategies for volunteering recognise this, and therefore target groups such as the unemployed and recently retired. However, encouraging volunteering is not effective for all groups within the community in regard to addressing social inclusion, as some people who are at risk of social exclusion are actually less likely to volunteer (Haski-Leventhal, 2009; Warburton and Crosier, 2001). While research on the reasons for volunteering show that filling in spare time is one reason for volunteering (Clary et al., 1996), time availability is often not the only reason. Various other personal attributes are also important in explaining the likelihood of volunteering (Cnaan and Goldberg-Glen, 1991). As this paper has shown, difficulties with transport (for young people), language difficulties and illness or disability (for example, for older people) are likely to operate as barriers to volunteering.

One approach to harness unfilled spare time and to encourage community participation among those at risk of social exclusion is the use of "time banks". These have been established in several countries, including the US, UK, Japan and Taiwan (Collom, 2008; North, 2003; Seyfang, 2002, 2004). Under these community-level schemes, registered participants can exchange services, such as home maintenance, childcare, tutoring, and providing transport or friendship, with the only currency used being that of time. Evaluations of these schemes suggest that the profile of time bank participants is quite different to that of traditional volunteering, with time bank participants more often unemployed, disabled, aged and members of ethic minority groups. These time banks appear to have great potential for helping the socially excluded to make use of their unfilled spare time, while also contributing to the community.

This paper has some limitations that should be recognised. One is that by taking a broad life cycle perspective, some of the detail of what matters to particular groups may not be observed. For example, if the analyses were to focus only on the unemployed, it may be possible to examine which groups of unemployed men and women have a higher likelihood of having unfilled spare time. Similarly, taking a closer look at the older men and women, or those with a health ability or disability may be equally useful. Sample size limitations, of course, restrict what is possible along these lines. Further, to fully explore the detail of such groups, it may be necessary to know more about the respondents than is available in this large population-based study. The strength of this study is being able to compare across the demographic groups.

This study is based on Australian data, and particular findings may not always translate to other countries. However, the findings here appear consistent with studies of time pressure, and also studies of the time use of particular groups, such as the unemployed, which have

been conducted in a range of countries. This suggests these findings may have broader application to countries other than Australia.

In conclusion, this paper has provided evidence that a small proportion of men and women have difficulty filling in their spare time. Those affected include groups commonly explored with regard their spare time use – those not in employment and youth, for example. Gaining these insights into who is likely to often have unfilled spare time, their reasons for this, and their patterns of time use, may help to identify supports or services that could be valuable in assisting these people to use this spare time that they have.

Appendix

Table A1
Sample distribution

	Males (%)		Females (%)	
	1997	2006	1997	2006
Age=15-24 at home - dependent student	6.4	6.5	7.1	7.2
Age=15-24 at home other	6.5	4.9	3.4	2.8
Age=15-24 not at home	4.6	4.7	6.4	5.7
25-34	19.4	13.7	20.4	14.5
35-54	37.5	38.6	37.8	38.2
55-74	21.2	24.7	19.8	24.7
75 or older	4.4	6.9	5.1	6.9
Main language spoken not English	7.5	8.2	7.6	8.1
Has a disability or long term health condition	31.2	35.2	27.5	33.3
Family with no children	26.7	25.6	30.6	28.1
Family with children	57.8	60.1	53.9	56.5
Non–family household	5.3	3.1	3.7	2.6
Lives alone	10.2	11.2	11.8	12.8
Is carer to someone	9.6	13.9	13.0	19.3
Unemployed	5.1	2.8	4.8	2.7
Not in the labour force	24.4	27.8	42.0	39.9
1 to 34 hours	9.1	11.3	25.4	29.9
35 to 50 hours	36.7	34.5	22.1	21.7
50 hours or more	24.7	23.6	5.7	5.8
Low personal income	22.0	21.9	35.8	33.1
Missing information for income	12.6	5.9	13.3	5.5
Sample size (persons)	3,465	3,774	3,587	3,428

Source: Australian Bureau of Statistics, 1997, 2006, own calculations.

Table A2
Multivariate analyses of males' total amount of time in main activity categories –
1997 and 2006

	Regression coefficient from Ordinary Least Squares, with time measured in minutes per day					
	Recreation, leisure or social	Paid work or study	House-hold and childcare tasks	Other care and voluntary	Personal care	Sleep
Year of survey=2006	-20***	18***	6	0	-4*	-3
Background characteristics						
Age=15-24 with parents - dependent student	-5	141***	-140***	-17***	-36***	40***
Age=15-24 with parents other	56***	3	-88***	-8**	-22***	47***
Age=15-24 not with parents	5	47***	-64***	-8*	-26***	35***
25-34	0	17*	-25***	-6**	-7**	13***
35-54 (reference)						
55-74	3	-37***	26***	5	22***	-13***
75 or older	9	-57***	19*	-9**	41***	-8
Family member, no children (reference)						
Family member, with children	-57***	14*	6***	-2	-13***	-13***
Non–family member	-4	20	-9	11**	-10*	1
Lives alone	11	-5	16**	3	-12***	-8*
Main language spoken not English	-30***	27***	-30***	-10***	11***	21***
Has a disability or long term health condition	19***	-32***	-1	-1	4*	8**
Constraints or commitments						
Is carer to someone	-22***	3	32***	16***	0	-14***
Unemployed	194***	-373***	122***	24***	12***	40***
Not in the labour force	180***	-361***	109***	16***	26***	42***
1 to 34 hours	98***	-198***	69***	16***	9**	16***
35 to 50 hours	40***	-92***	30***	1	8***	12***
50 hours or more (reference)						
Low personal income	-10	0	-10*	-5*	7*	12***
Weekday	-136***	249**	-58***	-9***	-12***	-44***
Constant	356***	269***	156***	22***	140***	520***
R-squared	0.277	0.460	0.183	0.029	0.103	0.103

Note: Omitted categories for single dummy variables are not shown.
*** $p<0.001$, ** $p<0.01$, * $p<0.05$. n=13,202 for all models.
Source: Australian Bureau of Statistics, 1997, 2006, own calculations.

Table A3
Multivariate analyses of females' total amount of time in main activity categories –
1997 and 2006

	Regression coefficient from Ordinary Least Squares, with time measured in minutes per day					
	Recreation, leisure or social	Paid work or study	Household and child-care tasks	Other care and volun-tary	Personal care	Sleep
Year of survey=2006	-21***	7	15***	5**	-2	-1
Backgr. characteristics		.	.	.	.	.
Age=15-24 with parents - dependent student	21***	165***	-211***	-15***	-21***	43***
Age=15-24 with parents other	59***	49***	-133***	-10**	-20***	39***
Age=15-24 not with parents	16*	47***	-80***	-11***	-24***	36***
25-34	-6	11	-10	-8***	-11***	14***
35-54 (reference)						
55-74	37***	-41***	8	7*	12***	-16***
75 or older	74***	-51***	-45***	-15***	24***	-4
Family member, no children (reference)						
Family member, with children	-66***	-46***	156***	-7***	-26***	-20***
Non–family member	12	32*	-52***	24***	5	1
Lives alone	28***	4	-25***	11***	1	-10**
Main language spoken not English	-35***	33***	-22**	-9***	7*	17***
Has a disability or long term health condition	11**	-13***	-15***	-3	9***	5*
Constraints or commitments						
Is carer to someone	-11*	-3	32***	23***	-6**	-11***
Unemployed	107***	-304***	142***	14***	24***	29***
Not in the labour force	130***	-304***	109***	10*	19***	42***
1 to 34 hours	59***	-175***	84***	7*	11**	20***
35 to 50 hours	23***	-63***	21**	-1	5	14**
50 hours or more (ref,)						
Low personal income	0	-27***	22***	1	1	4
Weekday	-92***	154***	-10**	-1	-13***	-39***
Constant	299***	272***	192***	19***	155***	520***
R-squared	0.218	0.405	0.329	0.040	0.080	0.076

Note: Omitted categories for single dummy variables are not shown.
*** $p<0.001$, ** $p<0.01$, * $p<0.05$. n=14,663 for all models.
Source: Australian Bureau of Statistics, 1997, 2006, own calculations.

References

Australian Bureau of Statistics (1997), Time use survey, Confidentialised unit record file 1997, Australian Bureau of Statistics, Australia.

Australian Bureau of Statistics (2006), Time use survey, Confidentialised unit record file 2006, Australian Bureau of Statistics, Australia.

Barnett, L.A. and S.W. Klitzing (2006), Boredom in free time – Relationships with personality, affect, and motivation for different gender, racial and ethnic student groups, in: *Leisure Sciences,* Vol. 28, No. 3, 223-244.

Bittman, M. (1999), Social participation and family welfare – The money and time cost of leisure, Social Policy Research Centre Discussion Paper No. 95, Sydney.

Bittman, M. and J. Pixley (1997), *The double life of the family*, Allen and Unwin, St. Leonards.

Bittman, M. and J. Wajcman (2000), The rush hour – The character of leisure time and gender equity, in: *Social Forces*, Vol. 79, No. 1, 165-189.

Bloomfield, L. (2004), The relationships between unfilled spare time, time use and the unhealthy use of free time, Office for Status of Women Time Use Research Discussion Paper No. 2003/2/1, Canberra.

Bloomfield, L. and G.A. Kennedy (2004), Killing time – Excess free time and men's mortality risk, Paper presented at the time use and gender seminar, University of New South Wales, Australia, 14 June 2004.

Caldwell, L.L., Darling, N., Payne, L.L. and B. Dowdy (1999), "Why are you bored?" – An examination of psychological and social control causes of boredom among adolescents, in: *Journal of Leisure Research,* Vol. 31, No. 2, 103-121.

Clary, E.G., Snyder, M. and A.A. Stukas (1996), Volunteers motivations – Findings from a national survey, in: *Nonprofit and Voluntary Sector Quarterly*, Vol. 25, No. 4, 485-505.

Cnaan, R.A. and R.S. Goldberg-Glen (1991), Measuring motivation to volunteer in human services, in: *the Journal of Applied Behavioral Science,* Vol. 27, No. 3, 269-284.

Collom, E. (2008), Engagement of the elderly in time banking – The potential for social capital generation in an aging society, in: *Journal of Aging and Social Policy,* Vol. 20, No. 4, 414-436.

Craig, L. and K. Mullan (2009), "The policeman and the part-time sales assistant" – Household labour supply, family time and subjective time pressure in Australia, in: *Journal of Comparative Family Studies,* Vol. 40, 547–561.

Craig, L. and K. Mullan (2010), Parenthood, gender and work family time in the United States, Australia, Italy, France, and Denmark, in: *Journal of Marriage and Family*, Vol. 72, No. 5, 1344-1361.

Farmer, R. and N. Sundberg (1986), Boredom proneness – The development and correlates of a new scale, in: *Journal of Personality Assessment*, Vol. 50, No. 1, 4-17.

Feather, N.T. and M.J. Bond (1983), Time structure and purposeful activity among employed and unemployed university graduates, in: *Journal of Occupational Psychology*, Vol. 56, No. 3, 241-254.

Fryer, D. and S. McKenna (1987), The laying off of hands-unemployment and the experience of time, in: Fineman, S. (Ed.), *Unemployment – Personal and social consequences*, Tavistock, London, 47-73.

Gauthier, A. and T. Smeeding (2003), Time use at older ages – Cross-national differences, in: *Research on Aging*, Vol. 25, No.3, 247-274.

Gordon, W.R. and M.L. 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, No. 124, 883-901.

Grossin, W. (1986), The relationship between work time and free time and the meaning of retirement, in: *Leisure Studies,* Vol. 5, No. 1, 91-101.

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, No. 2, 201-213.

Harris, M.B. (2000), Correlates and characteristics of boredom proneness and boredom, in: *Journal of Applied Social Psychology,* Vol. 30, No. 3, 576-598.

Haski-Leventhal, D. (2009), Addressing social disadvantage through volunteering – Briefing paper submitted to the Australian Prime Minister and Cabinet, The Centre for Social Impact, Australia.

Hayes, A., Gray, M. and B. Edwards (2008), Social Inclusion – Origins, concepts and key themes, Department of the Prime Minister and Cabinet, Social Inclusion Unit, Canberra.

Hugman, R. (1999), Ageing, occupation and social engagement – Towards a lively later life, in: *Journal of Occupational Science,* Vol. 6, No. 2, 61-67.

Iso-Ahola, S.E. and E. Crowley (1991), Adolescent substance abuse and leisure boredom, in: *Journal of Leisure Research,* Vol. 23, No. 3, 260-271.

Iso-Ahola, S.E. and E. Weissinger (1990), Perceptions of boredom in leisure – Conceptualization, reliability and validity of the leisure boredom scale, in: *Journal of Leisure Research*, Vol. 22, No. 1, 1-17.

Iso-Ahola, S.E. (1997), A psychological analysis of leisure and health, in: Haworth, J.T. (ed.), *Work, leisure and well-being,* Routledge, London, 131-145.

Iso-Ahola, S.E. and E. Weissinger (1987), Leisure and boredom, in: *Journal of Social and Clinical Psychology*, Vol. 5, No. 3, 356-364.

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

Jacob, B. and L. Lefgren (2003), Are idle hands the devil's workshop? – Incapacitation, concentration, and juvenile crime, in: *American Economic Review*, Vol. 93, No. 5, 1560-1577.

Leufstadius, C. and M. Eklund (2008), Time use among individuals with persistent mental illness – Identifying risk factors for imbalance in daily activities, in: *Scandinavian Journal of Occupational Therapy*, Vol. 15, No. 1, 23-33.

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

Mattingly, M.J. and S.M. Bianchi (2003), Gender differences in the quantity and quality of free time – The U.S. experience, in: *Social Forces*, Vol. 81, No. 3, 999-1030.

Mattingly, M.J. and L. Sayer (2006), Under pressure – Gender differences in the relationship between free time and feeling rushed, in: *Journal of Marriage and Family*, Vol. 68, No. 1, 205-221.

Møller, V. (1992), Spare time use and perceived well-being among black South African youth, in: *Social Indicators Research*, Vol. 26, No. 4, 309-351.

North, P. (2003), Time banks-learning the lessons from LETS?, in: *Local Economy*, Vol. 18, No. 3, 267-270.

Parker, S. (1975), The sociology of leisure – progress and problems, in: *British Journal of Sociology*, Vol. 26, No. 1, 91-101.

Pentland, W. and M. McColl (1999), Application of time use research to the study of life with a disability, in: Pentland, W.E., Harvey, A.S., Lawton, M.P. and M.A. McColl (eds.), *Time use research in the social sciences,* Kluwer Academic/Plenum Publishers, New York, 169-188.

Robertson, B.J. (1999), Leisure and family – Perspectives of male adolescents who engage in delinquent activity as leisure, in: *Journal of Leisure Research*, Vol. 31, No. 4, 335-358.

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

Roxburgh, S. (2004), 'There just aren't enough hours in the day' – The mental health consequences of time pressure, in: *Journal of Health and Social Behavior*, Vol. 45, No. 2, 115-131.

Sayer, L.C. (2005), Gender, time and inequality – Trends in women's and men's paid work, unpaid work and free time, in: *Social Forces*, Vol. 84, No. 1, 204-303.

Sayer, L.C. and J. Treas (2005), Time pressure and cross-national inequality, Paper presented at the the Conference of the International Union for the Scientific Study of Population, Tours, France, 18-23, July 2004.

Seyfang, G. (2002), Tackling social exclusion with community currencies – learning from LETS to time banks, in: *International Journal of Community Currency Research*, Vol. 6, No. 1, 1-11.

Seyfang, G. (2004), Working outside the box – Community currencies, time banks and social inclusion, in: *Journal of Social Policy*, Vol. 33, No. 1, 49-71.

Shaw, S.M., Caldwell, L.L. and D.A. Kleiber (1996), Boredom, stress and social control in the daily activities of adolescents, in: *Journal of Leisure Research*, Vol. 28, No. 4, 274-292.

Sundberg, N.D., Latkin, C.A., Farmer, R.F. and J. Saoud (1991), Boredom in young adults – Gender and cultural comparisons, in: *Journal of Cross-Cultural Psychology*, Vol. 22, No. 2, 209-223.

Vodanovich, S.J. and J.D. Watt (1999), The relationship between time structure and boredom proneness – An investigation within two cultures, in: *The Journal of social psychology*, Vol. 139, No. 2, 143-152.

Warburton, J. and T. Crosier (2001), Are we too busy to volunteer? – The relationship between time and volunteering using the 1997 ABS time use data, in: *Australian Journal of Social Issues*, Vol. 36, No. 4, 295-314.

Waters, L. and K. Moore (2002), Reducing latent deprivation during unemployment – The role of meaningful leisure activity, in: *Journal of Occupational and Organizational Psychology*, Vol. 75, No. 1, 15-32.

Winefield, A.H., Tiggemann, M. and H.R. Winefield (1992), Spare time use and psychological well-being in employed and unemployed young people, in: *Journal of Occupational and Organizational Psychology*, Vol. 65, No. 4, 307-313.

Zuzanek, J. (1998), Time use, time pressure, personal stress, mental health, and life satisfaction from a life cycle perspective, in: *Journal of Occupational Science*, Vol. 5, No. 1, 26-39.

Maternal child socialization values and children's time in unstructured play and studying

John F. Sandberg

John F. Sandberg
Department of Sociology
McGill University
Stephen Leacock Building Room 712
855 Sherbrooke Street West
Montreal, Quebec, H3A 2T7, Canada
(240) 413-4571
e-mail: john.sandberg@mcgill.ca

Abstract

Using time diary data from the 1997 PSID CDS-I, the present study assesses the association between mother's values concerning qualities they see as good for their children to possess for their future lives and the amount of time children spend in unstructured play and studying. The importance of everyday activity of parents in shaping these child socialization values has long been established. Previous research however has largely been unable to establish a clear association between these parental values and the structure of children's lives. This research demonstrates such a linkage, independent of measures of socioeconomic status, family and child characteristics.

1   Introduction

How children spend their time and the activities they participate in most likely have important implications for the type of adults they become. Differences in time use across activities that represent the routinized structure of children's daily lives may constitute a structural influence on the accumulation of social, cultural, human and economic capital, enabling and constraining future behavioral choices. Since parents have the most influence on how young children spend their time, it is possible that the activities children engage in and the amount of time devoted to them is a fundamental if potentially indirect mechanism for intergenerational transmission from parents to children.

A growing body of research has detailed numerous associations between parental and family demographic characteristics and children's time use. Previous research however has largely neglected the association between ideational characteristics of parents and children's time use. This research tests for one such association: beliefs parents hold about qualities desirable for their children to have, and time their children spend studying and in unstructured play.

Such child socialization values are of particular theoretical importance because a wide and consistent body of research has previously shown that occupational conditions associated with socioeconomic status and social class– a large part of the routinized structure of adult lives – are associated with them. If an association between parental child socialization values and the structure of children's daily lives in terms of time use can be established, it may suggest at least one way in which ideational elements function in transmission of differences from one generation to the next.

2   Background

2.1   Time use and children's development

What activities children participate in, and how much time they spend in them is believed to have important implications for their social and cognitive development and at least partially through this, their lives as adults. Time spent participating in different activities can be seen as a primary domain across which learning takes place, the 'contexts of development' (Larson and Verma, 1999), or 'proximal processes' (Bronfenbrenner and Morris, 1998) in which the acquisition of skills, cognitive and social, takes place.

Though there are many potential influences shaping how children spend their time and what activities they participate in, primary among these is possibly parental direction. Parents play a key role in how children spend their free time. This may be especially true of young children. By demanding or prohibiting, encouraging, discouraging, or modeling particular activi-

ties parents can and do influence the frequency, duration, and context of activities children participate in. A clear behavioral choice is being made, (whether they are conscious of it or not) for example, when a parent tells their child to go watch television, turns it off, tells them to go outside and play, do their homework, or sets a book, puzzle or art project in front of them.

A relatively large amount of recent research has investigated the relationship between children's time use in the Unites States and parental characteristics such as maternal employment, family structure, ethnicity and educational attainment (Bianchi and Robinson, 1997; Yeung et al., 2001; Hofferth and Sandberg, 2001). There is also a growing literature in psychology that examines how expectancies, beliefs and specific achievement related values are associated with activity choices (Eccles and Wigfield, 2002). Despite this, and ethnographic work indicating parents explicitly choose activities to instill desired values in their children (Dunn et al., 2003), no attention has been given to the potential association between core ideational factors such as what parents feel is best for their children and how children spend their time using large scale, representative data sources.

2.2   Child socialization values

One important value system in any society relates to qualities, or traits parents see as desirable for their children to have to prepare them for their future lives. A remarkably consistent cross-disciplinary literature has identified a central dimension of parental values for children in the United States involving a contrast between obedience and autonomy (Alwin, 2001). A wide and fairly consistent empirical literature from North America has shown that these values are shaped in part by differences in the 'conditions of life' (work in particular) experienced by those in different social classes (Kohn, 1963; Kohn and Schooler, 1969). Working class parents are seen in this framework to experience work roles bounded by explicit rules set down by authority which in turn lead them to value obedience in their children more than other traits. Middle class parents in contrast experience a less rigidly hierarchical work environment that places a premium on individual achievement and initiative. Such parents on average place a greater value on autonomy, or independent thinking from their children (Pearlin and Kohn, 1966; Kohn and Schooler, 1969; Ellis et al., 1978). Though ultimately Kohn (1959) was interested in how, in turn, child socialization values influenced parenting behavior and through this children's lives, little consistent evidence has supported such a connection (Kingston, 2000). It is possible that such a mechanism has not been found because previous research has generally utilized an overly constrained conceptualization of what childrearing behaviors entail. For the most part previous research has attempted to establish associations between parental values and children's lives only through a limited number of direct interactions such as disciplinary strategies and the use of punishment (Gecas, 1979; Lareau, 2002), and not with the wider organization of how children experience their everyday lives (for a notable exception see Morgan et al., 1979).

Qualitative research has demonstrated, however, that there are behavioral differences in parenting styles between middle and working class parents influencing the structure of children's daily activities beyond such direct interactions. Children of middle class families have been seen to participate in more structured, adult supervised and achievement oriented activities, while working class children participate in fewer structured activities or achievement oriented activities that are specifically aimed at increasing their human capital (Lareau, 2002; Lareau, 2003).

The combination of these two lines of research suggests a potential mechanism linking parents' child socialization values and what kind of people their children become operating not necessarily solely through direct parenting behaviors but through the more pervasive influence parents may have in structuring the conditions of children's lives in terms of activities engaged in and time spent in them. Such a mechanism, should it exist, would lend support to a more general ecological process of development over the life course through routinized activity as posited by Bronfenbrenner (1989; Bronfenbrenner and Morris, 1998) operating both in the formation of parental values and through these values on children's development.

3   Current investigation

The present investigation focuses on identifying one necessary element of such a mechanism, an independent association between parental (in this case, maternal) child socialization values and children's time use. Two specific aspects of the structure of children's everyday lives that may have important developmental implications are considered here. These are time spent studying and in unstructured play. Time spent in achievement oriented activities such as studying may be associated with higher achievement on standardized verbal test scores (U.S. Department of Education, 1999) and better academic performance (Fuligni, 1997). Time in unstructured play may be also associated with the development of cognitive and social skills (Larson and Verma, 1999; National Research Council and Institute of Medicine, 2000).

Though identifying associations between child socialization values on children's time use in these activities is the primary focus of this research, the modeling strategy employed also allows an indirect assessment of the degree to which differences in time spent in these activities attributable to child socialization values may at least in part due to the relationship between these values and socioeconomic status. If childrearing values in part explain any of the association between measures of socioeconomic status and time use in these activities this will provide evidence consistent with a causal path from parental status to the structure of children's experience operating through values.

Using detailed time-diary data, a two stage modeling approach is taken for both activities. The first stage assesses the association between maternal child socialization values on the likelihood that a child participates in each activity. The second assesses the association between

child socialization values and children's time use in each activity for those children who participated in it.

Child socialization values are measured here through a well-known survey question concerning the character traits parents value as most important for their children's future lives. These include the ability to think for oneself, obedience, hard work, and helping others when they need help. Since no theoretical or empirical work to date has focused on how these central child socialization values might be associated with children's time use, we do not have a strong conceptual base from which to make predictions about their relationships. We can speculate, however, in a general sense, as to what these relationships might be.

Before proceeding to specific hypotheses concerning child socialization values and time in these activities, it is important to note that qualities parents see as desirable for their children have been seen to vary with children's age (Alwin, 2001), and that parents believing it best for their children to have a certain quality may encourage participation in different activities at different ages. At the same time, patterns of children's time use vary dramatically with age (Timmer et. al., 1985; Bianchi and Robinson, 1997; Hofferth and Sandberg, 2001). Because of these relationships, it is necessary and desirable to account for the possibility that the relationship between maternal values and children's time use varies in interaction with the child's age.

Following Lareau's (2002) work suggesting children of working class parents spend more time participating in unstructured activities than children of middle class parents, if valuing obedience is also associated with parental class as in Kohn's work one implication is that a parental value for obedience will be associated with time children spend in unstructured play. This is the first hypothesis to be tested here.

H1: Children whose parents value obedience over other traits will spend more time in unstructured play.

In part, this may be because parental participation and guidance are less necessary. Children of parents valuing the ability to think for oneself above other traits on the other hand may potentially also spend more time in unstructured play, especially at younger ages. This is because play in a general sense is popularly thought to be important for developing a curiosity about the surrounding world. If this was the case the level of play may be relatively stable across ages for children of parents emphasizing obedience because unlike parents valuing the ability to think for oneself, they may not have a developmental motivation that would change with age. We may frame two ancillary hypotheses directly from these observations.

H1a: Children of parents prioritizing the ability to think for oneself will spend more time in unstructured play at younger ages, but less at older ages.

H1b: The amount of time spent in unstructured play will not differ by age as much for children of parents valuing obedience as for children of parents valuing the ability to think for oneself.

Though no theoretical background linking a parental value for hard work and time spent in unstructured play exists, it is expected that children of parents placing primary importance on this trait would be the least likely to play relative to others at any given age. They also may be likely to spend less time playing because play is not often seen as hard work (or work at all), and these parents may encourage their children into more structured activities. This leads to the next hypothesis concerning childrearing values and time in unstructured play.

H2: Children whose parents prioritize hard work will spend less time than others in unstructured play.

The linkage between studying and parental values though less theoretically obvious from Kohn's and Lareau's work can also be viewed through this perspective. Studying, in contrast to the types of play we're concerned with here is a relatively highly structured activity often implying parental or other adult supervision. It is additionally both an intellectual activity and to a certain extent work for children of school age. Following Lareau's and Kohn's observations concerning differences between middle and working class parents we arrive at the third hypothesis to be tested here.

H3: Children of parents placing emphasis on the abilities of children to think for themselves and to work hard will spend more time studying than children of those emphasizing other qualities.

Additionally, though both the likelihood of studying and time spent studying are probably greater for older than younger children, an ancillary hypothesis here is that differences by age will be most pronounced for children whose parents place primary importance on these two traits.

H3a: Differences in time spent studying between children of parents emphasizing the ability to think for oneself and hard work and children of parents valuing other traits will be more pronounced at later ages.

In the case of values for obedience, the ability to think for oneself, and hard work, the derivation of the hypotheses concerning time spent studying and in unstructured play is relatively straightforward. It is unclear, however, how a parental value for helping others may be associated with time spent in these activities. This is in part because there is no obvious relationship between this trait and either achievement orientations or developmental concerns as there are with the others. There is also no theoretical or empirical work detailing structural reasons parents might choose this trait over others as there is with obedience and the ability to think for oneself. Because it is an offered response in the question used here, however, children of mothers choosing helping others as their most valued trait for their children's future need to be included in the analysis. No explicit hypotheses are forwarded concerning how these children differ from others in terms of time spent studying or in unstructured play and therefore results concerning this trait should be treated descriptively though inferential results will be presented to aid interpretation.

Finally, it should be noted that if the indirect causal mechanism linking social class and children's activities through parental values implied by the combination of Kohn's and Lareau's work is valid, we would expect to see a mediation effect in nested models whereby specifications including indicators for maternal values should decrease (or completely eliminate) any direct effect of measures of socioeconomic status identified in specifications in which they are not included. To formalize this in hypothesis 4;

H4: Child socialization values will mediate the association between indicators of socioeconomic status in children's unstructured play and studying.

In contrast, it is possible that the indirect causal linkage between socioeconomic status and children's time use through child-rearing values does not exist and in fact both are explained by socioeconomic status. If this were the case we would expect to see a reduction in estimated associations between child-rearing values and children's time use when socioeconomic status is controlled relative to zero-order associations between them when it is not.

In all of the multivariate analyses presented here differences in effects associated with controls for maternal education and total family income (roughly operationalizing socioeconomic status) across models are assessed with the inclusion of measures for maternal socialization values. This will suggest the degree to which values mediate the relationship between socioeconomic status and time children spend studying and in unstructured play. Zero order bivariate models of both the likelihood of participating in each activity and the time spent in them by those who did and childrearing values provide a point of reference with which to evaluate the possibility that time use and values can be simultaneously explained by socioeconomic status.

4 Data and methodology

Data for the analyses here come from wave I of the Child Development Supplement to the Panel Study of Income Dynamics (PSID CDS-I) and the PSID family file. Interviews were conducted for the CDS-I in 1997 in 2,380 households with children under the age of twelve, and up to two children age 12 and under in the household were sampled. The Panel Study of Income Dynamics is a longitudinal survey of a representative sample of U.S. men, women, children and the families in which they reside. Child development supplement panels were collected in 1997 (CDS-I), 2002 (CDS-II) and 2007(CDS-III). The decision to use only the CDS-I in this investigation was motivated by two primary concerns. First, while the multiple panels in the CDS lend themselves to models of change over time, it is not clear theoretically how or if change in time use would be effected by childrearing values controlling for child age and other developmental change. Second, it is likely that estimates of change in time-use across panels would be strongly influenced by initial values and exhibit regression to the mean. For example, following the hypotheses detailed above, parents emphasizing the ability to think for oneself in the first panel may influence children to spend more time studying. For

this reason, however, the potential increment in change in time studying between panels (controlling for age) associated with this child-rearing value may be small, while time studying for children of parents holding other values placing less emphasis on it in the first panel might increase relatively more as their children age because it started from a low initial value. This is less of a problem in cross-sectional analyses such as the one here simply because any such differences are absorbed to some degree by absolute time use in activities, which incorporate both initial values and change over time. This is not to suggest that models of parental values and change in time use are not viable or potentially important for future investigation, but simply that the cleanest starting point is the cross-sectional model presented here.

Children's time use data come from 24 hour time-diaries. Data concerning maternal child socialization values come from the primary caregiver household instrument. The response rate for the time diaries was 82% and that for the primary caregiver household instrument was 63%. All analyses presented here are based on techniques appropriate for the complex survey design, with the primary sampling unit specified as the household and weighted for non-response in the primary caregiver household instrument. Statistical significance as discussed in the text is set at the .05 alpha level for two-tailed tests unless otherwise specified regardless of whether predictions concerning the direction of a particular relationship were made.

The analytic sample is restricted to children between the ages of 3 and 12 years old for whom both weekday and weekend day time diaries were available. The age constraint was employed because the time use patterns of very young children outside of major activities such as eating, sleeping and playing are expected to largely mirror the time use patterns of their caregivers. The sample was further restricted to children who were the biological or adoptive child of the household head and whose primary caregivers were their biological or adoptive mothers. Both of these restrictions were employed to avoid the potential for unobserved heterogeneity due to differences in respondents' relationships to children in the primary caregiver instrument from which the question concerning child socialization values was taken. The total analytic sample size after imposing these restrictions is 1170 children from 852 families. Since the number of children actually participating in a given activity varies, the sample sizes for the regressions of time spent in each do as well. For the analysis of studying, the sample size is 544 and for play it is 1049. In all analyses presented, standard errors are corrected for primary sampling at the household level.

4.1 Dependent variables – Children's time use

Children's time use data was collected from time-diaries for one randomly selected weekday and one randomly selected weekend day which asked about the child's flow of activities over a 24 hour period beginning at midnight. Respondents were asked to give detailed information concerning each activity engaged in, when it began and ended, with whom the child did it, and what activity came next. Activities coded as studying include homework and non-homework related research, as well as miscellaneous other educational activities. The category for play is composed of a number of activities including unstructured indoor and outdoor

activities, playing with toys, pretend, and board games (a complete list of activities aggregated into each of these categories is presented in Appendix A).

The aggregate times in each activity were recoded into two variables. The first of these is a binary indicator for whether or not a child participated in the particular activity on either the weekend day or weekday sampled. The second is a continuous variable measuring weekly time in each activity which is imputed by multiplying the weekday aggregate time by 5 and the weekend day aggregate time by 2 and summing these products.

4.2 Independent variable – Maternal child socialization values

Children's primary caregivers in each household were shown a list of traits, or qualities children might exhibit which included "to obey", "to be well liked or popular", "to think for himself or herself", "to work hard", and "to help others when they need help". They were then asked the following question:

"If you had to choose, which thing on this list would you pick as the most important for a child to learn, to prepare him or her for life?"

In an unfolding series of questions respondents were asked to rank each value in this way, from most important to least, at each step choosing from those remaining after the previous question. Though conventionally responses to these questions have been integrated into a summative index of the average ranking of each trait, this is not unproblematic. The remaining choices at each iteration of the question are restricted by choices made in earlier ones while an index measure assumes that ranked choices are of equivalent weight between respondents and that response categories are equidistant. To avoid these problems, the independent variable used in the following analyses is a simple categorical indicator of the trait deemed by mothers to be the most important for their children's future lives, excluding the category for 'to be well liked and popular' which was chosen to be the most important trait by less than 1% of mothers.

In evaluating the possible association between maternal values and children's time use, it is important to consider the possible directions of causality implied. In order for the theoretical linkage between values and time use outlined above to be supported, the causal effect must clearly be from values to children's behavior. However, it is also possible that an opposite causal effect occurs; that children's behavior influences parental values. One might hypothesize, for example, that parents of a child who studies more than average would be more likely to choose 'to think for oneself' or 'to work hard' as their most important child socialization value for this reason. Such child effects are in general plausible and there is no way to test for their potential influence here. It is important to note however that the question concerning these values is phrased in general terms, not referring to a specific (sample) child. Further, this data was gathered at the household level, with households in the analytic sample having on an average of 2.4 resident children under the age of 18, and less than 15% of households had only 1 child. For these reasons the child socialization values which are measured here are

likely not specific to the sample children and as such the possibility of child effects influencing them is reduced.

4.3   Control variables

Controls in the analyses to follow include maternal education, maternal work status, family income, whether or not children resided with a single parent, the child's age, sex and race as well as the number of children in the family under 18 years of age and the age of the youngest child in the family.

Maternal education and family income are included as indicators of socioeconomic status. For this reason, it is especially important to consider their role in the association between child socialization values and the structure of children's daily activities. Maternal education has been seen in at least one study to have the strongest influence on child socialization values (even stronger than occupational category), with more educated mothers expressing on average a greater preference for autonomy than mothers with less education, who are more likely to prefer obedience in children (Wright and Wright, 1976). At the same time, maternal education levels are associated with differences in children's time use (Bianchi and Robinson, 1997; Timmer et al., 1984). For the purposes of this study maternal education is measured as a binary indicator dichotomizing years of education completed and is intended to proxy whether or not the mother had a college degree. Previous research has suggested this contrast is important in terms of maternal education's association with children's time use (Bianchi and Robinson, 1997; Sandberg and Hofferth, 2001). This measure is coded as 1 where mothers had 16 years or more of education and 0 otherwise. In the pairwise comparisons of maternal education measured in this way and childrearing values the full analytic sample, in concordance with results cited above a significantly higher percentage of mothers who value the ability to think for oneself (30%) have higher education compared to those valuing obedience in their children (17%, p=.027) and additionally also relative to those who value helping others (16%, p=.039). Mothers valuing hard work had an intermediate percentage relative to these (23%) with higher education.

Family income is also a critical indicator of socioeconomic status and thus may be associated with child socialization values. Income has also been associated with differential children's time use in a number of activities (Bianchi and Robinson, 1997; Hofferth and Sandberg, 2001). Family income is operationalized as the natural log of total taxable and transfer income of all family members in the household. Education and income are obviously associated (r=.39), though not perfectly in the analytic sample and hence concerns of potential multicollinearity are minor.

Having a mother who works outside of the home may also be important in shaping their value orientations concerning children and potentially children's time use as well. In the data used for the present analysis, mothers who did not work at the time of the study preferred obedience about twice as often as mothers who worked, while mothers who were working preferred the ability to think for oneself more than those who were not. Whether a mother works may

also influence children's time use. Again in the data used for the present study, children of working mothers spent significantly less time in unstructured play. Maternal work is operationalized as a binary indicator coded as 1 if the mother worked at all at the time of the survey, and 0 otherwise.

Whether or not the mother of the child used as the unit of analysis is living with the child's father or another partner may also influence the structure of her values for desirable traits in children. Children of single parents may need to take more responsibility for household tasks, their own care or care for other children in the household. This may cause these mothers to place higher value on independence, or autonomy in children. Not having a secondary source of discipline in the house however may cause single parents to value obedience most. Single parent status is also coded with a binary indicator, taking a value of 1 if children's mothers are not married or in long-term cohabiting relationships, and, 0 if they are. In all analyses, a simple multiplicative interaction term between maternal work and single parent status is also included to control for potential variation in the association between child socialization values and children's time use across different family/work types.

Their may also be significant differences in cultural value systems regarding childrearing that will be reflected by race or ethnicity. Such differences in parenting values have been found in previous research, both within the U.S. (Jambunathan, Burts, and Pierce, 2000) and in international comparison (Xiao, 1999). At the same time, race and ethnicity have been found to be associated with differential patterns of children's time use (Bianchi and Robinson, 1997; Hofferth and Sandberg, 2001). Race and ethnicity are operationalized here as a set of binary indicators, one for Hispanic origin, one for non-Hispanic Black, and one for other races/ethnicities. The comparison group is non-Hispanic Whites.

Though there is no a priori reason for assuming that a child's gender, the number of children in the family, and the age of the youngest child are associated with maternal values, they have all previously hypothesized or shown to impact children's time use and as such are included as controls here. Gender is coded as 1 if a child was female and 0 if male. The number of children less than 18 years of age and age of the youngest child in the family are both measured continuously.

5 Results

The majority of children in the analytic sample (64%) had mothers who chose as their most important child socialization value 'To think for himself or herself'; 14% had mothers who chose 'to obey', 12% 'to work hard' and 10% 'to help others when they need help'. Overall 44% of children spent at least some time studying and these children spent on average 4.6 hours during the week doing so. Almost all the children in the sample (92%) participated in some form of unstructured play, with an average of about 13.5 hours weekly.

5.1   Bivariate comparisons

We begin the analysis with simple regressions of the likelihood of participating and time spent in each activity on the indicators for child-rearing values. As expected, children whose mothers chose obedience and the ability to think for oneself were estimated to be the most likely to spend time in unstructured play during the week (94% and 93%, respectively) though the differences with the other two groups were minimal and not statistically significant. Children of mothers who chose the ability to think for oneself and helping others as their most valued trait spent the most time playing (14 and 14.6 hours respectively) during the week, compared to children whose mothers valued obedience (12.7 hours) and hard work most (11.2 hours). As hypothesized, this latter group clearly spent the least amount of time playing; significantly less than children of mothers valuing the ability to think for oneself and helping others.

Children of mothers who prioritized helping others and hard work were estimated to be most likely to spend at least some time studying during the week (54% and 51%, respectively). Children in the former group were significantly more likely to study than children whose mothers chose obedience (38%) and the ability to think for oneself (42%). Children of mothers who chose the ability to think for themselves as their most valued trait and who spent any time studying however, were estimated to have spent the most time doing so, 4.8 hours per week. Children of mothers valuing hard work and helping others, however, spent only slightly less time studying during the week, about 4.5 hours each. As expected, children of mothers who chose obedience were estimated to spend the least amount of time studying, 3.7 hours, significantly less (p=.010) than children of mothers who chose 'think for self'. Though not significant by conventional standards, the difference between children whose mothers valued hard work and those whose mothers chose obedience would be using the .1 alpha level under a one tailed test.

5.2   Multivariate analysis

The multivariate analysis separately addresses the likelihood of participating in each activity and time spent in them among those who do, employing a nested modeling strategy. The first model in each set includes only the control variables. The second adds to this specification the categorical variable for mother's most important child trait. The third and final model in each set refines the second with the inclusion of a multiplicative interaction between maternal child socialization values and child age. In addition to identifying any effects of maternal values on time spent studying and playing independent of the control variables, any changes in the estimates of maternal education and family income in Models 2 and 3 relative to Model 1 may be interpreted as due to the relationship of social class and values.

Table 1 presents the means and standard errors adjusted for the complex sampling scheme for all independent and control variables used in the logistic and OLS regressions.

Table 1
Means, proportions and standard errors for variables used in analyses

	Logistic regression n=1170		Weekly hours studying n=544		Weekly hours playing n=1049	
	Mean	Std.error	Mean	Std.error	Mean	Std.error
Time spent in activity			4.59	0.203	13.54	0.364
Child age	7.49	0.105	8.69	0.130	7.32	0.106
Child sex (0=male)	0.48	0.019	0.46	0.030	0.47	0.020
Mother has college degree (0=No)	0.26	0.021	0.30	0.031	0.26	0.021
White	0.76	0.021	0.75	0.031	0.78	0.020
Black	0.17	0.018	0.22	0.030	0.15	0.016
Hispanic	0.02	0.006	0.02	0.007	0.01	0.005
Other ethnicity	0.05	0..011	0.02	0.008	0.05	0.011
Proportion single parent	0.25	0..021	0.26	0.032	0.24	0.021
Proportion mother working	0.75	0.021	0.76	0.030	0.75	0.022
Total family income (ln)	10.59	0.048	10.66	0.067	10.60	0.049
Number of children under 18 in the family	2.41	0.051	2.45	0.082	2.37	0.047
Age of youngest child in the family	5.79	0.138	6.74	0.214	5.60	0.140
Proportion mothers choosing 'to think for self'	0.64	0.023	0.61	0.034	0.64	0.024
Proportion mothers choosing 'to obey'	0.14	0.016	0.12	0.020	0.14	0.017
Proportion mothers choosing 'to work hard'	0.12	0.017	0.14	0.027	0.12	0.015
Proportion mothers choosing 'to help others'	0.10	0.015	0.13	0.024	0.10	0.015

Note: Standard errors adjusted for multiple children in household.
Source: Panel Study of Income Dynamics Child Development Supplement, CDS I, own calculations.

5.2.1 Unstructured play

The first panel in Table 2 presents the regressions for the likelihood of participating in unstructured play. Model 1 is the baseline model for this analysis including only the control variables. Among these, race/ethnicity, the number of children in the family and the age of the youngest child have significant effects. Measures of socioeconomic status were not significantly associated with the likelihood of participating in unstructured play in any of these models.

Model 2 adds to this specification the maternal value indicators. In support of the first hypothesis above, children of mothers valuing obedience were significantly more likely to engage in unstructured play during the week than children of mothers valuing the ability to think for oneself and helping others. It is important to realize however, that all of these differences are substantively small. All four groups of children are likely to play at some point in the week, with all predicted probabilities being above .95.

Table 2
Regressions of the likelihood of engaging in and weekly
hours in unstructured play by most important maternal child trait and control variables
– Children age 3-12

	Logistic regression of participating in activity (n=1170)			OLS regression of weekly hours spent in activity (n=1049)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Child age	-0.136	-0.149	-0.285	-1.231 **	-1.236**	-1.261**
Child sex (0=male)	-0.137	-0.149	-0.199	-1.194	-1.102	-1.100
Mother has college degree (0=No)	-0.078	-0.062	-0.166	-0.375	-0.411	-0.388
Black (non-Hispanic White=0)	-1.184**	-1.367**	-1.377**	-1.338	-1.023	-1.070
Hispanic	-2.685**	-3.034**	-3.128**	-4.780	-4.623	-4.538
Other ethnicity	-1.378**	-1.380**	-1.352**	-2.431	-2.496	-2.509
Single parent (0=No)	-0.148	-0.081	-0.153	-6.253 **	-6.120**	-6.003**
Mother working (0=No)	-0.126	-0.105	-0.093	-2.388 **	-2.328**	-2.280**
Maternal work status*single parent	-0.497	-0.520	-0.463	5.698 **	5.58**	5.442**
Total family income (ln)	-0.095	-0.082	-0.036	-0.792 *	-0.772*	-0.775*
Number under 18 in the family	-0.609**	-0.605**	-0.520**	0.862 *	0.954*	0.952*
Age of youngest child in the family	-0.245**	-0.238**	-0.222**	0.033	0.047	0.052
Obey (think for self omitted)		0.748*	0.533		-0.737	-1.700
Work hard		0.163	-3.857**		-2.444**	-3.647
Help others		0.216	-2.740		0.566	2.520
Obey*age			0.031			0.134
Work hard*age			0.464**			0.158
Help others*age			0.266			-0.244
Constant	8.773*	8.613*	9.129*	31.966 **	31.69**	31.834**
F	5.25	5.03	4.19	15.49	12.96	11.11
Prob.	.0000	.0000	.0000	.0000	.0000	.0000
Prob, Joint F		.155	.018		.042	.823
R^2				.187	.195	.196
ΔR^2					.008	.001

Notes: Asterisks for significance with regard to child socialization values refer to the contrast to the omitted category, 'think for self'. Other contrasts are discussed in the text. *p<.05, **<.01
Source: Panel Study of Income Dynamics Child Development Supplement, CDS I, own calculations.

The results from Model 3 indicate that some of this homogeneity is masking important differences in the likelihood of unstructured play by age. Including the interactions between maternal values and age significantly increases model fit over the main effects specification. In this model the predicted probability of playing is significantly less as age increases for children of mothers valuing both the ability to think for oneself (in support of ancillary hypothesis H1a) and obedience. This effect is more pronounced for the former group than the latter. This was

expected to be the case if the mechanism linking the likelihood of play and an emphasis on obedience was one that was potentially less closely related to developmental concerns than that linking a high value for independent thinking to play, as formalized in ancillary hypothesis H1b. While the predicted probability of play among children of mothers who choose either trait is .99 at age 3, by age 12, the predicted probability of engaging in unstructured play is significantly higher ($\hat{\pi}=.95$) for children of mothers choosing obedience compared to children of mothers prioritizing the ability to think for oneself ($\hat{\pi}=.89$) The predicted probability of engaging in unstructured play remains relatively low, and constant (about $\hat{\pi}=.93$) across the ages here for children of mothers choosing helping others as their most valued trait, and from a similar level increases, though insignificantly, among children of mothers valuing hard work.

For children who spent any time playing during the week, among the controls in Model 1 of the second panel of Table 3, we see that unlike the models for the likelihood of playing, race/ethnicity and the age of the youngest child in the family have no significant association with time spent playing. Single parent status, maternal work status and their interaction as well as family income also all have significant effects, where they did not concerning the likelihood of playing.

The inclusion of the values measures in Model 2 results in a slight but significant improvement in model fit over the baseline model. This is clearly driven by the relatively lower estimated amount of time spent playing by children of mothers valuing hard work as their most important child socialization trait (11.44 hours) as suggested in hypothesis 2. This is significantly less time than children of mothers valuing the ability to think for oneself (13.9 hours) and helping others (14.45 hours).

Children of mothers valuing obedience, in contrast to the prediction of hypothesis 1 were estimated to spend the second lowest amount of time playing (13.1 hours). Where these children are more likely to engage in unstructured play than children of mothers prioritizing thinking for oneself and helping others, they spent less time, though not significantly less, doing so.

Model 3, which includes the interactions between age and maternal values does not increase model fit relative to the main effects model. This suggests that the relationship between time spent playing and maternal child socialization values does not vary with age as was the case concerning the likelihood of participating in unstructured play.

It is worth noting that the neither specification of Model 2 or Model 3 substantively changed the coefficients for maternal education or family income. This suggests hypothesis 4 is not supported here. Though maternal child socialization values have a clear association with the likelihood of studying, they may not mediate any association with socioeconomic status.

In addition, since the estimates of the direct association between child-rearing values and unstructured play seen in the bivariate results remain relatively unchanged in the multivariate models presented here, we may conclude that our measures of socioeconomic status do not explain any of the association between values and time spent in unstructured play.

Table 3
Regressions of the likelihood of studying and weekly
hours studying by most important maternal child trait and control variables –
Children age 3-12 years old

	Logistic regression of participating in activity (n=1170)			OLS regression of weekly hours spent in activity (n=544)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Child age	0.289**	0.294**	0.281**	0.420**	0.439**	0.598**
Child sex (0=male)	-0.137	-0.114	-0.114	-0.210	-0.195	-0.137
Mother has college degree (0=No)	0.402	0.436	0.433	0.974*	0.904	0.900
Black (non-Hispanic White=0)	0.637*	0.752*	0.759**	0.082	0.363	0.231
Hispanic	0.109	0.321	0.307	0.130	0.404	0.936
Other ethnicity	-1.305*	-1.299*	-1.296*	1.199	1.040	1.045
Single parent (0=No)	0.490	0.554	0.563	-0.814	-0.828	-0.881
Mother working (0=No)	-0.085	-0.041	-0.039	-0.349	-0.393	-0.559
Maternal work status*single parent	-0.277	-0.373	-0.375	0.805	0.849	0.886
Total family income (ln)	0.172	0.165	0.169	-0.157	-0.183	-0.199
Number under 18 in the family	-0.022	-0.064	-0.053	0.210	0.214	0.096
Age of youngest child in the family	0.012	0.005	0.006	0.149*	0.146*	0.125
Obey (think for self omitted)		-0.375	-0.115		-1.114	3.182*
Work hard		0.227	-0.663		-0.760	4.780*
Help others		0.498	0.153		-0.269	-2.222
Obey*age			-0.032			-0.494**
Work hard*age			0.116			-0.612**
Help others*age			0.044			0.210
Constant	-4.379**	-4.301**	-4.286**	1.185	1.551	0.904
F	10.26	8.27	8.27	4.90	4.30	4.54
Prob.	.000	.000	.000	.000	.000	.000
Prob, Joint F		.163	.552		.077	.001
R^2				.134	.144	.170
ΔR^2					.010	.026

Notes: Asterisks for significance with regard to child socialization values refer to the contrast to the omitted category, 'think for self'. Other contrasts are discussed in the text. *p<.05, **<.01
Source: Panel Study of Income Dynamics Child Development Supplement, CDS I,
own calculations.

5.2.2 Studying

The first panel in Table 3 presents the logistic regression of the binary variable for whether or not a child studied on either a weekend day or weekday. Among the controls estimated in Model 1, children's age and race are significantly associated with the likelihood of studying. Notably, neither maternal education nor total family income coefficients are statistically significant. This suggests that perhaps socioeconomic status to the degree it is captured by these indicators net of other variables in the model does not play a critical role in shaping whether children study at least for some time during the week.

Model 2 again introduces the binary indicators for most important maternal trait. Overall, the addition of maternal child socialization values does not increase model fit significantly. As estimated the associations between values and the likelihood of studying are nearly identical to those seen in the bivariate analysis. Children whose mothers chose 'work hard' or 'think for self' were slightly more likely to study (with predicted probabilities of $\hat{\pi} = .58$ and $\hat{\pi} = .53$ respectively) than children whose mothers' placed the highest value on obedience ($\hat{\pi} = .44$). Though these differences from the latter group are in the expected direction of hypothesis 3, they are small and not statistically significant. As in the bivariate results, children of mothers valuing helping others are the most likely to study ($\hat{\pi} = .65$), significantly more likely than children whose mothers valued obedience.

In model 3, where maternal values interact with child age, the probability of spending at least some time studying is greater for older children regardless of maternal values as expected. In partial support of hypothesis 3a, this difference is largest among children of mothers valuing hard work in their children. While at age 6, though most children are equally likely to spend at least some time studying, the predicted probability studying is highest at age 12 ($\hat{\pi} = .84$) among those whose mothers valued hard work most, significantly higher than that for children of mothers valuing obedience ($\hat{\pi} = .61$). Contrary to expectations, children of mothers valuing the ability to think for oneself were not significantly more likely to study at this age ($\hat{\pi} = .72$) than either children of mothers valuing obedience or helping others. The latter group had the second highest predicted probability of studying in this model ($\hat{\pi} = .83$).

The second panel in Table 2 presents analogous models for weekly hours studying by those who spend at least some time doing so. Among the controls in model one, the age of the child, the age of the youngest child in the family, and maternal education are all significantly associated with time spent studying. As estimated, children of mothers with 16 years or more education who spend at least some time during the week studying are predicted to spend approximately one hour more per week doing so than children of mothers with less education. In Model 2, the inclusion of maternal socialization values only slightly increases overall model fit. As hypothesized, in this model children of mothers valuing the ability to think for oneself spent significantly more time during the week (4.9 hours) studying than children of mothers choosing obedience as their most valued trait (3.7 hours, p=.011). Contrary to expectations however, children of mothers choosing hard work as their most valued trait were not esti-

mated to spend significantly any more or less time studying (4.1 hours) than children of mothers valuing other traits.

Model 3, which includes interactions between age and maternal child socialization values results in a large, significant increase in model fit. This model reveals two distinct groups, as can be seen in the predicted weekly hours studying as presented in Figure 1.

Figure 1
Predicted hours per week studying by child age and mothers' choice of most important child trait
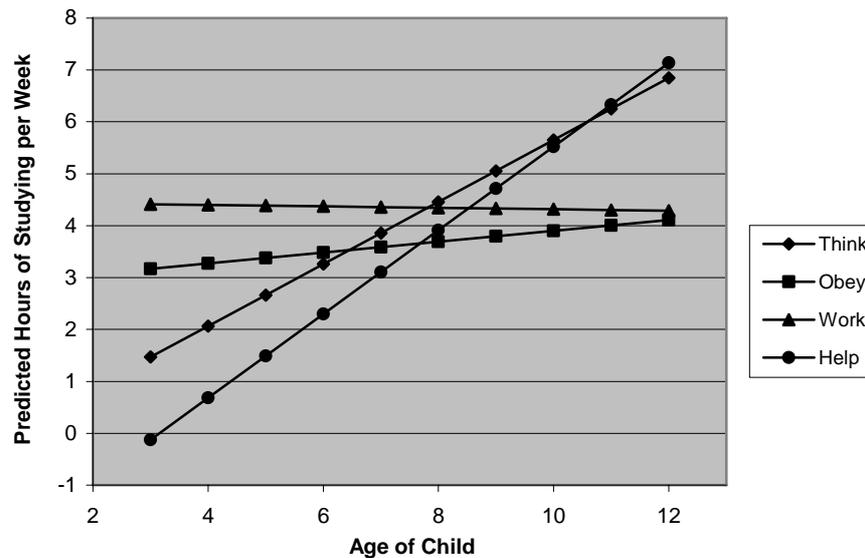
Source: Panel Study of Income Dynamics Child Development Supplement, CDS I, own illustration.

The first group comprises children of mothers valuing the ability to think for oneself and helping others, who spend relatively few hours studying at earlier ages, but dramatically and significantly more at age 12. This result lends partial support to hypothesis 3a. The other group, with children of mothers valuing obedience and hard work, report spending relatively larger amounts of time studying at early ages (around 4 hours a week) but not more in later age groups. Three year old children in the first group were estimated to spent significantly less time studying than children in the second group, and 12 year olds significantly more time studying. One should likely not make too much of the result at age 3 however. By age six, when studying more likely becomes related to school work, there were no significant differences between children whose mothers valued different traits in their children. The most important result is that the children of mothers who value the ability to think for oneself and helping others were estimated to spend about 3 hours more per week studying than those whose mothers valued the other traits by age 12 than at age 6 controlling for other covariates in the model including maternal education and family income. This suggests that net of maternal education, family income, race, family composition and maternal work status and other family and child characteristics in the model maternal child socialization values had a major

and independent association with this potentially critical component of human capital development.

Finally, it will be noted that as was the case with unstructured play, there seems to be no evidence that time studying is linked to socioeconomic status through childrearing values, nor that socioeconomic status explains away the size of the values coefficients. Change in the estimated coefficients related to both maternal education (falling just above the .05 alpha level here) and family income was marginal. The size of the coefficients associated with childrearing values stayed, as in the analysis of play, relatively unchanged relative to the zero order results in the bivariate analysis.

6   Discussion and conclusion

The analysis presented here documents a number of associations between maternal child socialization values and children's time spent studying and in unstructured play in the United States independent of the controls in the analysis including the measures of socioeconomic status. Children of mothers valuing obedience most were significantly more likely to engage in unstructured play compared to children of mothers valuing the ability to think for oneself and helping others. Though the differences in the probability of engaging in unstructured play is greater across age for these two groups, children of mothers valuing obedience were significantly more likely to play at 12 years of age. This finding is concordant with the hypothesis that these differences may be motivated by differing attention to developmental concerns between the two groups of parents. Finally, as was expected, children of mothers valuing hard work were seen to spend significantly less time in unstructured play during the week than other children.

At the same time, children of mothers prioritizing obedience were estimated to be less likely to study relative to children of mothers valuing the abilities to think for oneself, hard work, and helping others. At age 12, the latter two differences are statistically significant. They also spent significantly less time studying than children of mothers choosing the ability to think for oneself as their most important trait. The values-age interaction model revealed that while children of mothers valuing the ability to think for oneself and helping others spent more time studying at older ages relative to younger children, those whose mothers valued obedience or hard work did not. Combined, this produced a large and significant difference in predicted time spent studying (3 hours) between children of mothers valuing the ability to think for oneself and obedience at age 12.

These findings are important in the first instance because how time use is structured in children's lives has been seen to have important relationships to the basic development of social and academic skills. On a broader level however, they provide empirical evidence of how values might more generally be associated with differential developmental contexts in the experience, or to use Kohn's term, conditions of children's everyday lives. The existence of

such a mechanism would suggest that both processes shaping these values in parents and their influence on children's lives may be special cases of a broader ecological form of socialization taking place through routinization and time use (Bronfenbrenner and Morris, 1998).

Perhaps one of the most interesting ancillary findings here is that inclusion of maternal child socialization values in the models presented did not in any case substantively change the (often minimal) effects on time spent studying and in unstructured play associated with maternal education or family income. This means that at least in this analysis child socialization values can be seen as neither an intermediary mechanism between status and children's lives nor as spuriously associated with time use due to their association with the status measures. This of course is subject to the dual qualifications that the controls for socioeconomic status used were rudimentary at best and that only two limited types of activities were investigated. Kohn's work specifically posited that occupation – not education or income – was a locus of development of child socialization values. It is possible that more refined measures of socioeconomic status and of occupational conditions would reveal a relationship between them and children's time use in these and other activities potentially working through parental values.

There are several other limitations of the present study that need to be kept in mind when evaluating the more direct results presented here concerning the association between child-rearing values and time use in these activities. First, there is no direct connection made here between time spent studying or in unstructured play and outcomes for children. Though previous literature suggests such connections exist, there is no way to gauge how the magnitude of differences in time use documented here will make substantive differences in children's lives. Second, some have argued values such as those described here may not have a causal relation to behavior, but rather simply be a reflection, or rationalization of routinized behavior (Homans, 1974, cited in Alwin, 2001). We cannot empirically rule out the possibility that the association between maternal values and children's time use identified in these activities may be at least in part due to the effects of children's behavior on their parent's values. Such hypothetical child effects could produce the same results seen here, but completely negate any potential causal influence of parents on children's time use through their values. There are several reasons however, to think such effects are less likely here than they otherwise would be. As described previously, the particular question employed does not refer to a specific child in the family, and is taken from a household level instrument. Both of these factors mitigate the likelihood that mothers' responses are specific to a particular sample child. Further, the strong and consistently demonstrated structural influence of parental experiences on these values also reduces the likelihood that they can be simply explained as rationalizations of children's behavior.

Despite these limitations, this research for the first time demonstrates an important potential mechanism by which values parents hold for the kind of people their children will become may influence the patterning of children's everyday activity. Future research aimed at elucidating the effect of such a mechanism should address how child socialization values are associated with these and other types of activities while attempting to rule out potential child ef-

fects definitively. One promising avenue for such work will be models of change in both children's time use and parental values over time. As noted above, this type of model is possible using data from the PSID-CDS. Once the scope of any such effects are identified, it may be possible to step back further to Kohn's original objective and identify an empirical linkage between parental social class and the context of child development (and potentially child outcomes) that occurs, at least partially through ideational structures - particularly child socialization values.

Appendix

Table A1
Coding for playing and studying from CDS

Category	Description of activity
Playing	Walking for pleasure, crawling (for babies).
	Playing card games (bridge, poker)
	Playing board games (Monopoly, Yahtzee, etc.) , Bingo,
	Playing social games (scavenger hunts); jump rope, handclap games
	Puzzles/word or educational games
	Indoor playing other indoor activities with children including games, "playing" unless obviously outdoor games.
	Outdoor playing; outdoor activities with children
	Playing computer games
	Other recreational computer activities, "surfing the net" -non-games.
	Pretend, dressup, played house, played fireman.
	Played with toys
	Unspecified play outdoors
	Unspecified playing indoors; getting into stuff, making a mess.
	Unspecified playing games, "played a game."
	Electronic video games (Nintendo, Sony, Game Boy, Sega.)
	Other active leisure
Studying	Using the computer for homework, studying, research, reading related to classes or profession, except for current job
	Library functions (using computer/internet to acquire specialized information)
	Homework (non-computer related), studying, research, reading, related to classes or profession, except for current job; "went to the library", homework non-computer
	Other education; "watched a slide program"

Source: Panel Study of Income Dynamics Child Development Supplement, CDS I.

References

Alwin, D. (2001), Parental values, beliefs, and behavior – A review and promulga for research into the new century, in: Hofferth, S.L. and T.J. Owens (Eds.), *Children at the millennium – Where have we come from, Where are we going?*, Elsevier, Amsterdam, 97-140.

Bianchi, S. and J.P. Robinson (1997), What did you do today? – Children's use of time, family composition, and the acquisition of social capital, in: *Journal of Marriage and the Family*, Vol. 59, No. 2, 332-344.

Bronfenbrenner, U. (1989), Ecological systems theory, in: *Annals of Child Development*, Vol. 6, No. 1, 187-249.

Bronfenbrenner, U. and P.A. Morris (1998), The ecology of developmental processes, in: Lerner, R.M. and W. Damon (Eds.), *Handbook of Child Psychology*, Vol. 1, J. Wiley, New York. 993-1028.

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.

Eccles, J.S. and A. Wigfield (2002), Motivational beliefs, values and goals*, in: Annual Review of Psychology*, Vol. 53, No. 1, 109-132.

Ellis, G., Lee, G.R. and L.R. Petersen (1978), Supervision and conformity – A cross-cultural analysis of parental socialization values*, in: American Journal of Sociology*, Vol. 84, No. 2, 386-403.

Fuligni, A. (1997), The academic achievement of adolescents from immigrant families – The roles of family background, attitudes, and behavior, in: *Child Development,* Vol. 68, No. 2, 351-363.

Gecas, V. (1979), The influence of social class on socialization*, in:* Barr, W., Hill, R., Nye, F. and I. Reiss (Eds.), *Contemporary theories about the family*, Vol. 1, Free Press, New York, 365-404.

Hofferth, S. and J. Sandberg (2001), How American children spend their time, in: *Journal of Marriage and Family,* Vol. 63, No. 2, 295-308.

Jambunathan, S., Burts, D. and S. Pierce (2000), Comparisons of parenting attitudes among five ethnic groups in the United States, in: *Journal of Comparative Family Studies*, Vol. 31, No. 4, 395-407.

Kohn, M.L. (1959)*, Social class and parental values, in: American Journal of Sociology*, Vol. 64, No. 4, 337-351.

Kohn, M.L. (1963), Social class and parent-child relationships –An interpretation*, in: American Journal of Sociology,* Vol. 68, No. 4, 471-480.

Kohn, M.L. and C. Schooler (1969), Class, occupation and orientation, in: *American Journal of Sociology*, Vol. 34, No. 4, 659-678.

Kingston, P. (2000), *The classless society*, Stanford University Press, Stanford.

Lareau, A. (2002), Invisible inequality – Social class and childrearing in black families and white families*, in: American Sociological Review*, Vol. 67, No. 5, 747-776.

Lareau, A. (2003), *Unequal childhoods – Class, race, and family life*, University of California Press, Berkeley.

Larson, R. and S. Verma (1999), How children and adolescents spend time across the world – Work, play and developmental opportunities, in: *Psychological Bulletin*, Vol. 125, No. 6, 701-736.

Morgan, W., Alwin, D. and L. Griffin (1979), Social origins, parental values, and the transmission of inequality, in: *American Journal of Sociology*, Vol. 85, No. 1, 156-166.

National Research Council and Institute of Medicine (2000), Making friends and getting along with peers*, in:* Shonkoff, J.P. and D.A. Phillips (Eds.), *From neurons to neighborhoods – The science of early child development*, National Research Council, Washington, 163-181.

Pearlin, L. and M. Kohn (1966), Social Class, occupation, and parental values – A cross-national study*, in: American Sociological Review*, Vol. 31, No. 4, 466-479.

Timmer, S., Eccles, J. and K. O'Brien (1984), How children use time*, in:* Juster, T.F. and F.P. Stafford (Eds.), *Time, goods, and well being*, Institute for Social Research, Ann Arbor, Michigan, 353-382.

U.S. Department of Education (1999), Start early, finish strong – How to help every child become a reader*,* U.S. Department of Education, Washington D.C..

Wright, J. and S. Wright (1976), Social class and parental values for children – A partial replication and extension of the Kohn thesis*, in: American Sociological Review*, Vol. 41, No. 3, 527-537.

Xiao, H. (1999), Independence and obedience – An analysis of child socialization values in the United States and China*, in: Journal of Comparative Family Studies*, Vol. 30, No. 4, 641-658.

Yeung, W., Sandberg, J., Kean, P. and S. Hofferth (2001), Children's time with fathers in intact families*, in: Journal of Marriage and Family*, Vol. 63, No. 1, 136-154.

Home production – Enjoying the process or the product?

Mette Gørtz

Mette Gørtz
SFI, Danish National Institute for Social Research
Herluf Trolles Gade 11
DK-1052 Copenhagen K, Denmark
e-mail: mgo@sfi.dk

Abstract

This paper tests a household production model on data from a Danish time use survey from 2001 using GMM 3SLS. Household production includes "process benefits" accruing from the pleasure of undertaking certain housework tasks. I find no significant evidence of "process benefits". An identification problem arises from the situation where households alternatively attach extra value to consuming home-produced goods. The outcome of these two types of benefits may in certain cases be observationally equivalent.

JEL-Codes: C31, D13, J22

Keywords: Household production, process benefits, consumption benefits, GMM 3SLS

1 Introduction

The classical household production model (Gronau, 1977; 1980; 1986) states that individuals allocate their time between market work, housework and leisure based on the shadow price of the time they spend in the labour market. Consuming the output of household production is the sole source of utility from housework. Home produced goods are perfect substitutes for market goods, and the output of household production is usually thought of as a public good enjoyed within the family.

However, some housework activities carry additional benefits beyond their consumption value.[1] Beside the pure income/production side of work, working may provide pleasure, self esteem and a sense of identity to people. The benefits accruing from the activity per se have been named "process benefits" (Juster, 1985) or "joint production" (Graham and Green, 1984; Kerkhofs and Kooreman, 2003; Pylkkänen, 2002). Process benefits are close substitutes to leisure and are predominantly a private good enjoyed by the person undertaking the activity. One obvious example is childcare. The time spent caring for one's children contributes to the output of household production, but (usually) parents also derive utility from caring for their children. Other examples are do-it-yourself spells and gardening which may also partially be considered as leisure activities. It is difficult to draw a line between what is housework and what is leisure, and there may be considerable heterogeneity in tastes for undertaking housework activities within and across households.

This paper investigates the question of what is work and what is pleasure in household production. The theoretical setup builds on a model by Kerkhofs and Kooreman (2003) which explicitly includes "joint production" or "process benefits". Kerkhofs and Kooreman's model is an extension of Gronau's classical household production model. The model is tested empirically on a time use dataset of Danish households in 2001. Previous analyses on this model (Kerkhofs and Kooreman, 2003; Pylkkänen, 2002) have used the FIML estimator which relies on the assumption that the error terms are joint normally distributed. In this paper, I use the less restrictive GMM 3SLS estimator. Provided correct moment conditions and without any assumptions about the functional form for the error terms, GMM 3SLS is consistent and efficient. The model without "process benefits" in household production finds substitution between housework of husband and wife. When the model is extended to incorporate the leisure value of household production, I find weak, but insignificant, signs of the presence of process benefits for women.

The paper contributes to the discussion of household production models by suggesting that there may be a supplementary - or alternative – explanation for why households may choose a higher level of household production than what is implied by the classical household produc-

---

[1] In this paper, the term "housework" is used for normal housework activities including do-it-yourself work, gardening, transport of children etc., but not childcare in itself.

tion model. Hence, I argue that across households, there may be a considerable heterogeneity in households' taste for their own home produced goods, and some households may attach a higher value to goods produced by one of the household members than other households. In this sense, the value of home produced goods is not comparable across households. I refer to these benefits as "consumption benefits". The outcome of a higher value of home-made goods may be difficult to distinguish empirically from "process benefits". I demonstrate graphically that household production outcomes with "process benefits" and with "consumption benefits", respectively, may be observationally equivalent. This raises an important identification issue which has not been addressed explicitly in the previous literature on household production models.

Even though the outcome of process benefits and consumption benefits may be equivalent in terms of the amount of household production, the different types of benefits are enjoyed by different persons in the household. Thus, if household production is driven by process benefits, the extra benefits are private benefits which are enjoyed by the person undertaking the household production activity. However, if the chosen level of household production is governed by consumption benefits, the extra utility from home production may be enjoyed by either of the spouses independently of who did the housework. In the first case (process benefits), the level of household production activities is driven by individual household members' tastes for housework. In the last case (consumption benefits), the allocation of household production activities within the family is determined by relative wages and productivity.

More knowledge about the motivation behind time allocation outside the market is crucial for our understanding of time allocation in the family. Understanding the mechanisms for the choice of household production is important for our understanding of female labour supply. Moreover, considerations about alternatives to household produced goods and services may depend on the nature of the extra benefits from household production. If there are large process benefits – that is, if part of household production is considered leisure – then the justification for supporting substitutes for household production seems less evident. However, if the choice of activities at home is governed by consumption benefits, then an increase in the quality of market alternatives may induce families to buy more services in the market. Ultimately, this may have positive implications for female labour supply and lead to productivity gains from increased specialization in society.

2   Theoretical model

According to Becker (1965; 1994), households combine time and market goods to consume some basic commodities that directly enter their utility functions. Gronau (1977) developed the classical household production model which is a cornerstone in household production theory. Gronau's model provides an essential development of Becker's framework by explicitly accounting for household production. According to Gronau (1977, p. 1104), "An intuitive distinction between work at home (i.e., home production time) and leisure (i.e., home con-

sumption time) is that work at home (like work in the market) is something one would rather have somebody else do for one (if the cost was low enough), while it would be almost impossible to enjoy leisure through a surrogate. Thus, one regards work at home as time use that generates services which have a close substitute in the market, while leisure has only poor market substitutes." Essential assumptions in Gronau's model are that home produced goods are perfect substitutes for market goods and that home production is subject to diminishing marginal productivity. Diminishing marginal productivity is often thought to be due to fatigue or changes in input proportions. In Gronau's model, diminishing marginal productivity is also due to changes in the composition of housework as a person may increase housework by undertaking more activities with cheap market substitutes.

Gronau's central assumption of perfect substitutability between home-produced commodities and market goods has been the subject of some discussion. Critics have pointed out that people do not always spend their time exclusively on one activity at a time, see e.g. Pollak and Wachter (1975). On the contrary, some of the time spent in housework may partly be considered as leisure. Graham and Green (1984) extend Gronau's model with so-called "joint production" defined as housework also partly being leisure to account for this observation. Implicitly, this extension modifies the strong assumption of perfect substitutability between market goods and home products. Graham and Green (1984) use the American Panel Study of Income Dynamics (PSID) and find substantial "jointness" between home production time and leisure. Kerkhofs and Kooreman (2003) build on Graham and Green's idea of "joint production", but employ a different specification of the household production function. Their empirical application is based on Swedish time-allocation data from the 1984 wave of the HUS survey.

This paper builds on Gronau's household production model with the Kerkhofs and Kooreman (2003) extension. The analysis concentrates on households with two adult members. It is assumed that the household members share one common utility function, i.e. a unitary utility function. In the classical Gronau household production model, households derive utility from the consumption of market goods, X_M, commodities produced at home, Z, and leisure for the man and the woman, l_m and l_f, and it is assumed that market goods and goods produced in the household are perfect substitutes.

(1) $U = U\left(X_M + Z, l_m, l_f\right)$

Household production, $\quad$, is a function of time spent in housework, $\quad$

and $\quad$, for male and female respectively, and auxiliary inputs, $\quad$.
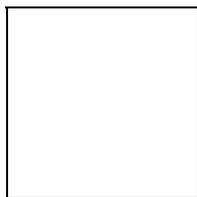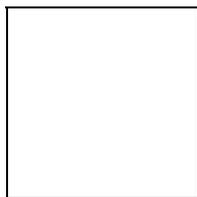
For example, [blank box] could be a meal produced with time inputs of the man and/or the woman, h_m and h_f, and intermediate inputs as food products, X_Z:

$$(2) \qquad Z = Z\left(h_m, h_f, X_Z\right)$$

The household budget consists of non-labour income, y, and labour income, where w_m and w_f are hourly wages, and m_m and m_f are market labour supply in hours, for male and female respectively. This leads to the following budget constraint:

$$(3) \qquad X_M + X_Z = y + w_m m_m + w_f m_f$$

Initially, it is assumed that both partners participate in the labour force. This assumption ensures that individual wages are observed. Evidently, this assumption may lead to selection bias in the sample. Selection problems are addressed in section 5.1.

Each member of the household has a personal time constraint. T is total time endowment (e.g. 24 hours on a daily basis).

$$(4) \qquad h_i + l_i + m_i = T, \quad i = m, f$$

The household maximizes utility (1) subject to (2), (3) and (4), giving the following Kuhn-Tucker conditions:

$$(5) \qquad \begin{aligned} &\frac{\partial Z}{\partial X_Z} = 1 \\ &\frac{\partial U}{\partial Z}\frac{\partial Z}{\partial h_m} = \frac{\partial U}{\partial l_m} = \frac{\partial U}{\partial Z}\frac{\partial Z}{\partial X_Z} w_m + \xi_m \\ &\frac{\partial U}{\partial Z}\frac{\partial Z}{\partial h_f} = \frac{\partial U}{\partial l_f} = \frac{\partial U}{\partial Z}\frac{\partial Z}{\partial X_Z} w_f + \xi_f \end{aligned}$$

where ξ_m and ξ_f denote shadow prices of the inequality constraints on labour time. If both partners participate in the labour force ($m_m > 0$, $m_f > 0$ and $\xi_m = \xi_f = 0$), then one can find an interior solution, and (5) simplifies into:

$$(6) \qquad \begin{aligned} &\partial Z/\partial X_Z = 1 \\ &\partial Z/\partial h_m = w_m \\ &\partial Z/\partial h_f = w_f \end{aligned}$$

For the conditions in (6) to hold, it is important that the net marginal wage rate is exogenous. The interpretation of (6) is that an individual will choose a level of housework where her marginal product of time equals her net wage rate in the market. If the marginal product of housework is lower than her wage rate, she will choose to work more in the market (and perhaps

buy household production in the market). The model predictions in (6) correspond to the classical household production model without "process benefits".[2]

To allow for the possibility that undertaking housework can both enhance household production and function as a sort of recreation activity for the person doing the work, "process benefits" are included in the model. For example, gardening provides utility through two channels: First, gardening enhances the household product, Z, by creating a prettier garden. This can be enjoyed by both partners in the household as a public good. Secondly, gardening may be seen as a sort of leisure activity which provides utility to the person who does the gardening. The first effect is already in the model. The second feature can be included in the model in the following way: If a person spends hi hours on home production, he or she considers a certain part of this time, the "process benefit" $g_i(h_i)$, as a perfect substitute for leisure. The process benefit function g_i is assumed to be increasing, twice differentiable and concave in h_i, $g_i' \leq 1$ and $g_i' \to 0$ as $h_i \to T$, implying that the marginal utility of housework is decreasing in h_i. This is graphically represented in figure 1.

Figure 1
Household production function
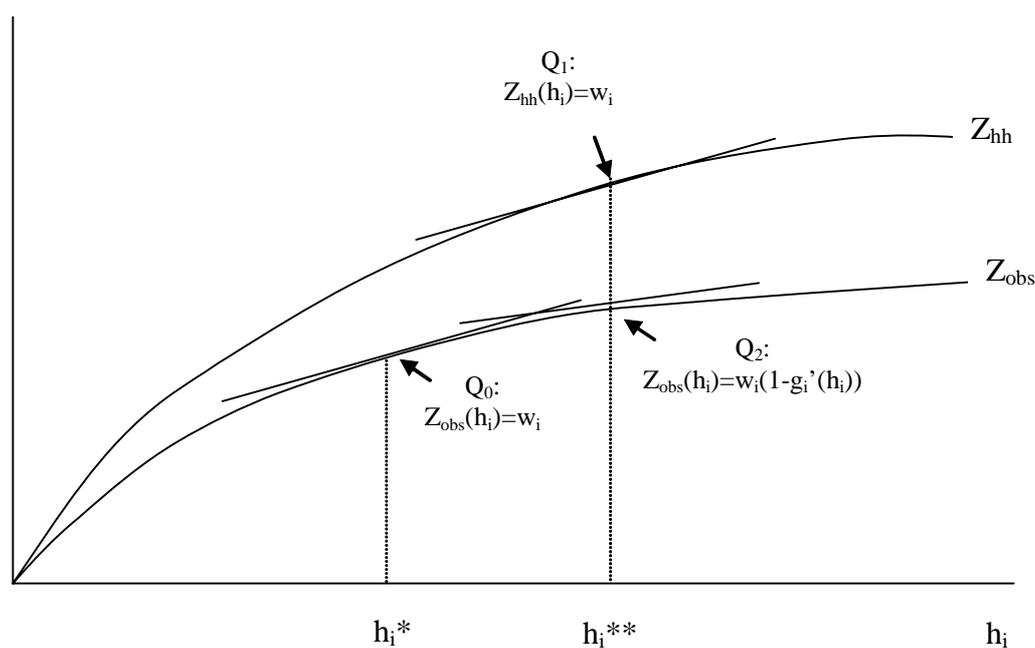
Source: Own illustration.

The equilibrium for the situation without process benefits (the "classical" equilibrium) is found in Q^0. Next, the household utility function is extended to allow for process benefits:

---

[2]   The optimum can be viewed as the result of a two-stage decision process. In the first stage, the household decides on its requested level of household production. In the second stage, the household decides how to allocate non-production time and the purchase of consumption goods. Therefore, the household production model can be analysed only with the help of the production function, whereas the utility function does not appear until in the second stage of the decision process. It is a both necessary and sufficient condition that the production function Z is strictly concave to ensure a local maximum.

(7)
$$U = U\left[X_M + Z, l_m + g_m(h_m), l_f + g_f(h_f) \right]$$

Under the usual budget and time constraints, the first-order conditions are now:

(8)
$$\partial Z / \partial X_Z = 1$$
$$\partial Z / \partial h_m = w_m \left[1 - g_m'(h_m) \right]$$
$$\partial Z / \partial h_f = w_f \left[1 - g_f'(h_f) \right]$$

When taking process benefits into account, the model predicts that the individual members of the household will choose a housework level where the marginal product of their housework equals their wage rate times a correction factor, $0 \le \left[1 - g_i'(h_i) \right] \le 1$. The correction factor reflects that part of individual housework activity may be perceived as leisure. The introduction of process benefits can explain why the chosen level of individual housework may be higher than predicted by the traditional labour supply model. When allowing for process benefits, the optimum is in Q^1 (figure 1).

Household production Z is an increasing function of i's work in household production, h_i, and the marginal product of h_i is decreasing with h_i. According to the classical household production model, person i chooses the number of hours of housework h_i^* where her marginal product in household production equals her wage rate, w_i, i.e. $\partial Z / \partial h_i = w_i$. However, for given wage w_i and given marginal production in household production, $\partial Z / \partial h_i$, we may observe that she works more in the household than the classical household production model would predict. If she instead works h_i^{**} hours in the household, where $h_i^{**} > h_i^*$, the difference between h_i^{**} and h_i^* may reflect that she derives utility in the form of leisure from performing the housework. The extent of these process benefits can be identified from observations on her wage and her household production.[3]

Identification

An important identification problem which has not been given any attention in the previous literature on household production models relates to the character of the "extra" benefits in household production. As discussed in the introduction to this paper, a higher level of household production than what is predicted by the classical household production model does not necessarily have to be ascribed to "process benefits". An alternative – or supplementary - explanation is that households may attach a higher value to goods produced by one of the house-

---

[3]   As pointed out by Kerkhofs and Kooreman (2003), if Z is strictly concave there is still a unique solution (a local maximum) to the problem. However, strict concavity of Z in h_m and h_f is a sufficient condition, but it is no longer a necessary condition, as both the left-hand and the right-hand side of the first-order conditions change when h_m or h_f changes. The model with process benefits allows for increasing returns to scale in household production provided the curvature of the g_i-function is sufficiently high. Thus, increasing returns to scale may make high specialization in the household attractive from a production efficiency point of view. But the additional process benefits from spending many hours in housework may be sufficiently low on the margin to offset the benefits from specialization. Therefore, it is possible to find a solution to the optimization problem with increasing returns to scale if the (negative) second-order derivative of the g_i function is (numerically) large enough to ensure that the combined utility of consuming and performing household production for each individual has a local optimum.

hold members rather than similar goods bought in the market. The value the household puts on home-made goods can be higher than the price they would get for them in a hypothetical market for home-produced goods.

The household-specific value of household production may be due to several factors which are discussed extensively by Chiswick (1982). First, some households may have a higher preference for home-made goods than others, and these preferences may also diverge within the household. Household members may simply prefer home-made goods to substitutes bought in the market. For example, both spouses in the household may attach a higher value to children for whom one or both of them have cared themselves. Secondly, household members may possess household-specific skills which are important in the production of goods that they consume themselves. And thirdly, there may be fixed costs associated with household production which makes it difficult to delegate household tasks to persons outside the household.

The extra value of home produced goods is named "consumption benefits" in this paper. These benefits are not comparable across households. Consumption benefits are inherently different from "process benefits" since the former may be enjoyed by either of the spouses irrespective of who did the housework, while the latter can only be enjoyed by the person undertaking the household production activity. Thus, while "process benefits" through their leisure character are mainly private goods, "consumption benefits" are public goods. Some households may have a higher preference for home-made goods than others, and these preferences may also diverge within the household.

Figure 1 illustrates that household production with "process benefits" and with "consumption benefits", respectively, may be observationally equivalent. Assume we can observe the "market" value of household production, Z_{obs}. According to Gronau's classical household production model, person i is expected to work h_i^* hours in the household. But we observe that she works h_i^{**}. As argued above, the higher input of housework may be due to "process benefits", i.e. her individual pleasure of undertaking household production activities. Since household production generates this extra, leisure-like benefit, she is willing to increase her housework to a point where her marginal product of household production is lower than her wage rate.

Usually, one cannot observe the value of household production, but the household knows its own subjective value on home-produced goods. Suppose the household attaches an additional value to consuming home-made products beyond the "market" value, Z_{obs}. The "true" value of household production for the household equals Z_{hh}. The difference between Z_{hh} and Z_{obs} is defined as "consumption benefits". If individual i does not particularly enjoy working in the house (no process benefits), she chooses her optimal housework when $\partial Z_{hh}/\partial h_i = w_i$. Given the shape and position of the Z_{hh} curve, the optimal amount of housework is h_i^{**}. Thus, in this case, the two situations with "process benefits" and "consumption benefits", respectively, are observationally equivalent.

The distinction between "process benefits" and "consumption benefits" may seem of a somewhat theoretical nature. However, from a policy point of view it is important to establish the

true source of the extra benefits from household production that lead to a level of housework higher than what the classical model predicts. Thus, women's traditionally high level of home production may arise not (only) from the fact that they enjoy housework, but also from the fact that the family as a whole attaches a high value to its output. Understanding the mechanisms behind the family's time allocation outside the market may give us a fuller picture of what drives female labour supply in the labour market.

Another identification issue stems from the fact that the *output* of home production, Z, usually unobserved, and often one does not observe the input of auxiliary goods, x_z, either. The amount of household production therefore has to be based on information about the input of time in household production, and identification of the model is based on the first-order conditions. This poses a number of additional identification questions. These have already been thoroughly discussed in Kerkhofs and Kooreman (2003) where they point out that in general, the model has limited power for identification of process benefits in single earner households. In the following empirical application, the analysis is restricted to couples who are married or cohabiting.

3 Data

The data used to test the model empirically are from the Danish Time Use Survey for 2001 (DTUS). The DTUS complies with methodologies developed at the EU level for conducting time use surveys; see Bonke (2005) for a detailed description. For married and cohabiting respondents, the partner in the household was also asked to participate in the survey. There are two sources of information on time use. First, each respondent filled in a diary stating their activities at a detailed level every 10 minutes in two 24-hour days, one a week-day and the other a weekend day. Second, the questionnaire asked the respondents about their "usual" time use and some personal and household characteristics. Moreover, the survey data has been merged with information from register (administrative) information from Statistics Denmark on the respondent and partner, giving access to further personal and household information. The wage measure used in this paper is from the register data and is therefore not directly linked to the information given in the time use survey.

As mentioned, as well as keeping a time diary, respondents were asked about the time they *usually* spend on housework and in the labour market in a typical week. Usual housework time includes cleaning, laundry, shopping, cooking etc. and gardening, repairs, other do-it-yourself work and transportation of children, but not childcare per se. As always, the classification of childcare as housework is disputable, as discussed above. Since respondents were only asked one question on usual housework, childcare cannot be treated separately.

In general, it is observed that surveys asking about usual or normal time use have a smaller variance, but perhaps a more imprecise mean of time use, while diary information gives more precise means, but with a larger variance, see Juster and Stafford (1991). Based on this, usual

time use rather than the diary information has been used to avoid the very serious infrequency problems in the latter.

In the following, I focus on a sample of households in which both husband and wife work full-time in the labour market.[4] Table 1 gives descriptive statistics of the sample.: One of the reasons for focusing on this sample is that hourly wage rates are determined with more precision for full-time workers in the data, and the determination of household production based on the wage rate is central in the theoretical model. When a person decides how much time to allocate to housework, the shadow price of time is obviously the wage rate *net* of taxes on labour. In the data, I only have information on the gross wage rate. To arrive at a very crude estimate of net wages, a simple imputation of individual marginal tax rates has been performed. Details are given in the Appendix. Our dataset contains 596 couples. Figure 2 shows the distribution of housework and wages for men and women.

Table 1
Descriptive statistics

Variable	Mean	Std.	Min	Max
Male characteristics				
Housework, hours per day	1.63	0.91	0.43	5.00
Gross wage, DKK per hour	210	78	93	649
Age	42.51	9.73	22.00	66.00
Education in years	13.10	2.52	10.00	18.00
Female characteristics				
Housework, hours per day	2.21	1.00	0.43	5.00
Gross wage, DKK per hour	165	48	71	461
Age	40.48	9.51	20.00	61.00
Education in years	13.37	2.57	10.00	18.00
Household characteristics				
Homeownership	0.85	0.35	0.00	1.00
Dummy young children (0-6)	0.30	0.46	0.00	1.00
Dummy children 7-17	0.40	0.49	0.00	1.00
Number of children	1.01	1.01	0.00	4.00
Non labour income, 1000 DKK	23	65	0	1003
Dummy for garden	0.81	0.40	0.00	1.00
Number of square metres	133	41	48	350

Source: Danish Time Use Survey 2001, own calculations.

Out of the sample of full-time employed people, there is information on wage rates for both husband and wife for about ¾ of the couples. For both men and women, the correlation between housework (in hours per day) and wages (in DKK per hour) is small and negative, cf. figure 3.

---

[4]   Full-time market work is defined as at least 30 hours work per week, including commuting time. Part-time work is not very prevalent in Denmark.

Within married couples, both household production and wage rates are strongly correlated (the correlation between wife's and husband's wage is 0.34, and the correlation between wife's and husband's housework hours is 0.55). This may be explained by positive assortative mating (Becker, 1991; Weiss, 1997), the presence of children in the household, and/or correlation in preferences and other unobserved characteristics. Despite the strong correlation of housework within the family, I still find that women do the majority of household production. On average, women do 59 percent of the housework, and the median wife does 58 percent of the housework. In 7 percent of the households, the woman does less than half of the housework. The wife takes on more than 75 percent of the housework in more than 11 percent of the households.

Figure 2
Housework and wages for men and woman
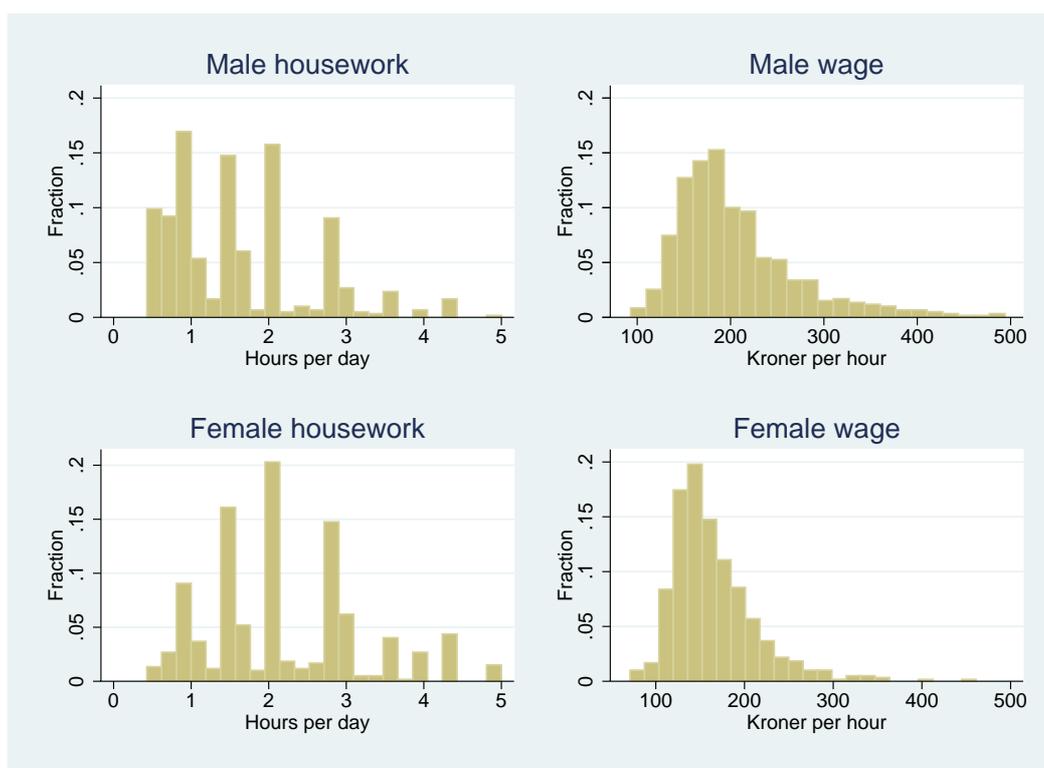
Source: Danish Time Use Survey 2001, own illustration.

Figure 3
Housework and wages for men and women
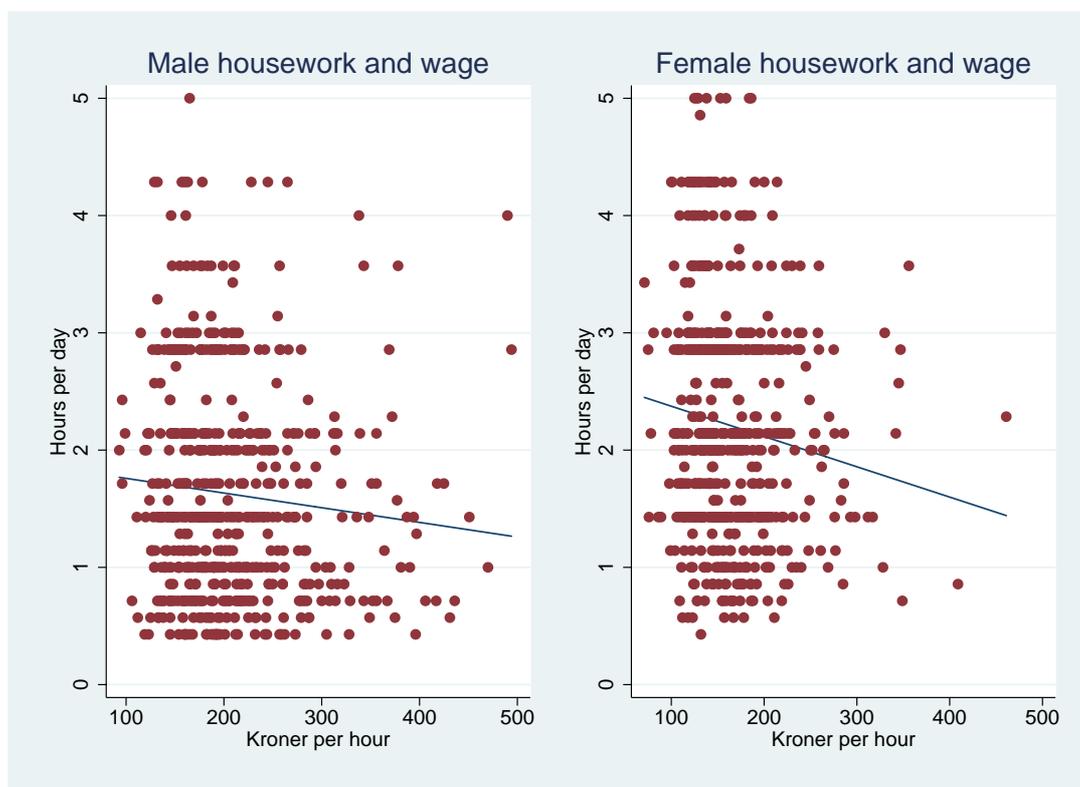
Source: Danish Time Use Survey 2001, own illustration.

4   Empirical specification

The first-order conditions set out in (6) and (8) for the theoretical model without and with process benefits, respectively, are now investigated empirically. According to the theoretical model, household production is a function of housework time, h_m and h_f, and intermediate inputs into household production, X_z. As discussed previously, time use surveys usually do not contain any measure of the output of household production, and due to the imperfect substitution possibilities of household production for comparable market goods, it is difficult to find comparable market prices for the output from household production. Furthermore, as there is no information on auxiliary goods used in household production, X_z, the net product value function is used instead of the (gross) production function. To ensure comparability with Kerkhofs and Kooreman (2003), the net product value function, $\tilde{z}$, is assumed to have the following functional form:

$$(9) \qquad \tilde{Z} = b_m h_m + b_f h_f + \tfrac{1}{2} c_{mm} h_m^2 + \tfrac{1}{2} c_{ff} h_f^2 + c_{mf} h_m h_f$$

b_m and b_f are strictly positive. The C-matrix,

$$C = \begin{pmatrix} c_{mm} & c_{mf} \\ c_{mf} & c_{ff} \end{pmatrix},$$

should be negative definite to ensure a well-behaved production function. Housework of the two spouses, h_m and h_f, can be substitutes or complements; substitutes if $c_{mf} < 0$ and complements if $c_{mf} > 0$. This parameterization of the model is convenient as it ensures that the production function possesses standard characteristics such as a positive marginal product which is decreasing in time inputs. Furthermore, the parametric formulation of the model allows for an investigation of substitutability versus complementarity of time inputs of the two spouses.

Based on equation (9), one can derive the marginal products of male and female housework time:

(10)
$$\frac{\partial \tilde{Z}}{\partial h_m} = b_m + c_{mm} h_m + c_{mf} h_f$$

$$\frac{\partial \tilde{Z}}{\partial h_f} = b_f + c_{ff} h_f + c_{mf} h_m$$

Hence, the marginal productivity of housework time for a married man, h_m, depends on the parameters b_m, c_{mm} and c_{mf} as well as the level of both his own and his wife's housework. This is parallel for a married woman. First-order conditions when process benefits are not accounted for follow equation (6) combined with (10):

(11)
$$\frac{\partial \tilde{Z}}{\partial h_m} = w_m \Rightarrow b_m + c_{mm} h_m + c_{mf} h_f = w_m$$

$$\frac{\partial \tilde{Z}}{\partial h_f} = w_f \Rightarrow b_f + c_{ff} h_f + c_{mf} h_m = w_f$$

And first-order conditions when process benefits are taken into account are obtained by combining (8) and (10):

(12)
$$\frac{\partial \tilde{Z}}{\partial h_m} = w_m \left[1 - g_m '(h_m) \right] \Rightarrow b_m + c_{mm} h_m + c_{mf} h_f = w_m \left[1 - g_m '(h_m) \right]$$

$$\frac{\partial \tilde{Z}}{\partial h_f} = w_f \left[1 - g_f '(h_f) \right] \Rightarrow b_f + c_{ff} h_f + c_{mf} h_m = w_f \left[1 - g_f '(h_f) \right]$$

The household chooses a level of household production time for wife and husband depending both on these factors as well as wages and utility of housework as reflected in the g-function. Furthermore, individuals are heterogeneous in their marginal productivity of housework. It is assumed that b_m and b_f depend on household and individual specific characteristics captured in x_m and x_f, respectively:

(13)
$$\ln(b_m) = x_m ' \beta_m + u_m$$
$$\ln(b_f) = x_f ' \beta_f + u_f$$

This parameterization is also convenient since it secures positive marginal products of both spouses, as would be expected from a well-behaved production function. Combing (11) and (13), the system of equations for the model *without* process benefits expressed in errors is:

$$
(14) \quad
\begin{aligned}
u_m &= \ln\left(b_m\right) - x_m{}'\beta_m = \ln\left(w_m - c_{mm}h_m - c_{mf}h_f\right) - x_m{}'\beta_m \\
u_f &= \ln\left(b_f\right) - x_f{}'\beta_f = \ln\left(w_f - c_{mf}h_m - c_{ff}h_f\right) - x_f{}'\beta_f
\end{aligned}
$$

w_m, w_f, x_m, and x_f are assumed to be exogenous. To estimate the model *with* process benefits, it is necessary to specify a functional form for the process benefit function. As in Kerkhofs and Kooreman (2003) and Graham and Greene (1984), a specific functional form that captures the characteristics for g set out above is assumed:

$$
(15) \quad g_i(h_i) = h_i\left[1 - \frac{1}{1+\delta_i}\left(\frac{h_i}{T}\right)^{\delta_i}\right], \quad i = m, f
$$

where $\delta_m, \delta_f \geq 0$. If $\delta_m = \delta_f = 0$, the model corresponds to the classical household production framework. As $\delta_m, \delta_f \to \infty$, all household production time is perceived as leisure. Differentiating g_i (equation 15) with respect to h_i gives $g_i{}'(h_i) = 1 - (h_i/T)^{\delta_i}$; inserting this in (12) and combining with (13) leads to a system of equations with process benefits:

$$
(16) \quad
\begin{aligned}
u_m &= \ln\left(b_m\right) - x_m{}'\beta_m = \ln\left[\left(h_m/T\right)^{\delta_m} w_m - c_{mm}h_m - c_{mf}h_f\right] - x_m{}'\beta_m \\
u_f &= \ln\left(b_f\right) - x_f{}'\beta_f = \ln\left[\left(h_f/T\right)^{\delta_f} w_f - c_{mf}h_m - c_{ff}h_f\right] - x_f{}'\beta_f
\end{aligned}
$$

In the empirical analysis presented below, I estimate model (14) *without* and model (16) *with* process benefits, respectively.

5 Estimation and results

5.1 Classical household production - no process benefits

The estimations presented in this section focus on the classical household production model in (14). That is, when $\delta_m = \delta_f = 0$. The model is estimated by applying the efficient General Method of Moments for systems (GMM 3SLS). Kerkhofs and Kooreman (2003) estimated this system by maximum likelihood, which is the efficient estimator if the error terms are joint normally distributed. However, normality of the error terms is often a strong assumption. The advantage of GMM 3SLS is that consistent estimates are obtained under much weaker assumptions than estimation based on maximum likelihood, since it is not necessary to assume anything about the functional form of the distribution of the error terms. GMM is efficient is the error terms are not joint normally distributed which is the case with our dataset. See the Appendix for more details on the estimation procedure and the outcome of normality tests.

The imputed measure of net wages is used as a measure of the shadow price of time. Construction of net wages is described in the Appendix. The individual and household character-

istics captured in the X-matrices consist of individual age and age squared, individual education dummies and dummies for the presence of younger and older children. In (14), h_f is endogenous in the first equation and h_m is endogenous in the second equation. Instruments for female household production, h_f, are her gross wage and gross wage squared, her age, her education (in years), the number of children, the number of square metres in the home and a dummy for whether the house has a garden. Equally, instruments for male household production, h_m, are his gross wage and gross wage squared, his age, his education (in years), number of children, number of square metres in the home and a dummy for whether the house has a garden. The moment conditions are constructed under the assumption that the error terms in each equation are uncorrelated with the instruments for the relevant equation. Both sets of instruments are jointly significant in explaining the variation in household production ($\chi^2 - value$ of 20.4 for the joint test of the four instruments), although the overall explanatory power of the estimation equations for the two instruments as measured by R^2 is rather low, $R^2 = 0.12$ for the instruments for female household production, and $R^2 = 0.05$ for the instruments for male household production (see Appendix 1).

Selection

The sample consists of couples where both spouses work more than 30 hours a week including commuting time. Thus, the sampling is based on labour market status which is endogenous in the model. This gives rise to selection bias. On the one hand, relatively home-productive individuals might be under-represented in the sample, since these individuals are relatively more likely not to have a paid job (and an observed wage rate). On the other hand, the personal characteristics which determine productivity in the market and thus enhance the chances of being employed may also lead to a relatively high productivity at home, so productivity at home and in the market might be positively correlated through various (observed as well as unobserved) characteristics that affect both productivities in the same direction. Thus people who are productive at home may be over-represented in the sample[5]. Consequently, the net direction of the selection bias is an empirical question and is difficult to predict ex-ante. Possible selection bias is treated by use of the Heckman selection procedure.: Participation in the labour market for husband and wife is estimated in a bivariate probit model. Details of the participation estimation are given in the Appendix. The inverse Mills ratio resulting from the labour supply estimation is added as an extra explanatory variable in the estimation of the model in (14). The estimation results for GMM are shown in table 2, column 1. The overidentifying restrictions test tests whether the instruments are uncorrelated with the error terms. The null hypothesis is accepted at a 5 percent significance level meaning that the instruments are indeed uncorrelated with the error terms.

---

[5] Gronau and Hamermesh (2001) show that there is a positive correlation between the level of education and the demand for variety in time-use activities. Their interpretation is that people with higher levels of education have a higher productivity, not only in market work, but also in housework.

Table 2
Estimation Results

	(1) no process benefits		(2) process benefits	
	Coefficient	t-value	Coefficient	t-value
Curvature male household productivity, c_{mm}	-7.730	-0.96	-10.712	-1.12
Curvature of female productivity, c_{ff}	-1.225	-0.51	4.237	0.84
Substitution factor, c_{mf}	-6.964 ***	-2.70	-5.093	-1.48

Male equation β_m

	Coefficient	t-value	Coefficient	t-value
Constant	4.063 ***	23.48	4.061 ***	23.01
Age	0.016 **	2.11	0.017 **	2.13
Age squared	0.000 *	-1.79	0.000 *	-1.82
Dummy high school	0.088 *	1.96	0.087 *	1.91
Dummy vocational education	0.049 **	2.24	0.051 **	2.28
Dummy short further education	0.050	1.41	0.050	1.40
Dummy medium further educ.	0.073 ***	2.65	0.076 ***	2.73
Dummy higher further education	0.158 ***	4.78	0.163 ***	4.91
Dummy young children	0.080 ***	3.48	0.081 ***	3.46
Dummy children 7-17	0.050 ***	2.56	0.046 **	2.27
Homeownership	0.059 ***	2.56	0.058 **	2.44
Inverse Mills ratio, male	0.133 ***	2.67	0.126 **	2.44

Table 2 Cont.
Estimation Results

	(1) no process benefits		(2) process benefits	
	Coefficient	t-value	Coefficient	t-value
Female equation				
Age squared	0.000 ***	-4.29	0.000 *	-1.95
Constant	3.690 ***	28.10	2.746 *	1.66
Age	0.029 ***	4.60	0.038 *	1.96
Dummy high school	0.040	1.21	0.040	0.91
Dummy vocational education	0.037 *	1.95	0.047	1.42
Dummy short further education	0.061 ***	2.00	0.082	1.33
Dummy medium further education	0.075 ***	3.53	0.097 *	1.82
Dummy higher further education	0.152 ***	4.96	0.185 **	2.13
Dummy young children	0.022	1.26	0.030	1.15
Dummy children 7-17	-0.019	-1.06	-0.025	-0.85
Homeownership	0.024	1.24	0.036	1.15
Inverse Mills ratio, female	0.011	0.34	0.012	0.29
δ_f			0.3	

Note: * p=0.10; **, p=0.05; ***, p=0.01.
Source: Danish Time Use Survey 2001, own calculations.

Details of the overidentifying restrictions test are given in the Appendix. The estimation results with selection are documented in table 2. It appears that the selection parameter (inverse Mills ratio) is significant in the male equation, but not in the female equation. One explanation might be that the explanatory power of the estimation of female labour supply is rather low, see the Appendix.

5.2 Estimation with process benefits

In the previous section, it was assumed that there are no "extra" benefits related to household production. This section analyzes the consequences of relaxing this assumption by estimating the system in (16). Compared to the previous estimation of (14), this implies that the restriction that $\delta_m = \delta_f = 0$ is relaxed when allowing for process benefits. The optimization procedure tends to converge towards a corner solution where male process benefits are zero. As a consequence, δ_m was tied to zero, and δ_f was allowed to vary freely, cf. table 2, column 2. An optimum for the GMM estimation was found where $\hat{\delta}_f = 0.3$. The joint significance of the estimates was tested by using the GMM distance statistic which is χ^2 distributed with 2 degrees of freedom under the null hypothesis $\delta_m = \delta_f = 0$. Joint significance is not accepted, and the null hypothesis that $\delta_f = 0$ is accepted with a p-value of 0.26. Thus, there is no significant evidence of the presence of process benefits for women. See details of the tests in the Appendix. The estimate of c_{ff} is positive but insignificant.[6]

---

[6]   As discussed above, increasing returns to scale (positive c_{ff}) is not necessarily a problem in the extended household production model that allows for process benefits. What matters for the optimization is that the

Table 3 shows sample means and standard deviations for predicted values of male and female housework productivity and value of household production with and without process benefits.

Table 3
Sample averages of predicted household production variables

	No process benefits (Model 1)		Process benefits (Model 2)	
	Mean	Std. dev.	Mean	Std. dev.
b_m	103.2***	23.3	104.0***	23.7
b_f	80.6***	12.8	65.5***	12.1
$Z/(b_m+b_f)$	79.8***	12.7	75.7***	12.9
$g_m(h_m)/h_m)$	-	-	0.0	-
$g_f(h_f)/h_f)$	-	-	0.52	0.06

Note: * p=0.10; **, p=0.05; ***, p=0.01.
Source: Danish Time Use Survey 2001, own calculations.

I insert the parameter estimate of $\hat{\delta}_f = 0.3$ into the g_i-function formulated in (15) and use the observation that the time spent in housework is around 10 percent of the total time for women. It appears that the mean value of household production is around 80 DKK per hour when process benefits are not taken into account and around 76 DKK per hour when process benefits are accounted for. Compared to average gross wage rates of 210 DKK per hour for men and 165 DKK for women and average marginal tax rates around 60 percent, average household production values of that size seem realistic. Moreover, it appears that female marginal productivity is around 66 rather than 81 DKK per hour when allowing for the wife's pleasure of doing housework, i.e. process benefits. Thus, the model with process benefits suggests that the observed high level of female housework is due to women's pleasure from working in the house rather than motivated for the household's demand for this product. I find that *on average* the fraction of housework that is also perceived as leisure is around 0.5.

For comparison, Kerkhofs and Kooreman (2003) estimated that $\hat{\delta}_m=0.135$ and $\hat{\delta}_f = 0.216$. Their estimates were not statistically significant either. Pylkkänen (2002) found significant estimates of $\hat{\delta}_m=0.165$ and $\hat{\delta}_f = 0.076$. Interestingly, Kerkhofs and Kooreman (2003) found female process benefits to be around 1½ times higher than men's process benefits, whereas Pylkkänen (2002) found the opposite result, that men's marginal pleasure of housework is almost the double of women's pleasure of undertaking housework. My results are in line with the estimates found by Kerkhofs and Kooreman (2003).[7]

---

contribution of the second order derivative of the g-function (which is negative) is large enough to counteract the contribution of the positive second-order derivative of the Z-function.

[7] A natural question to ask is whether it is more likely to find process benefits in households where a larger part of household production could be perceived as partly leisure; e.g. families with young children. Out of the 596 full-time couples used in this analysis, a little more than ½ of the families had children below 17 years. Since this is a rather small sample, we have not investigated this question further.

5.3   Discussion

A future step to obtain a fuller picture of the process of allocating time to household production within the household would be to develop a model that incorporates the distribution of "power" within the household, i.e. a "collective" model as proposed by Chiappori (1988, 1992, 1997), or the intra-household allocation model proposed by Apps and Rees (1988, 1996, 1997). Such an extension seems desirable, but would inevitably enhance the empirical identification problems already present, given the limited information in the data about the value of household production, intermediate inputs and intra-household matters.

The analysis above investigates "process benefits" in household production. The analysis implicitly assumes that process benefits do not arise from performing market work. However, this is not necessarily the case. Hallberg and Klevmarken (2003) analyzed the Swedish HUS study of 1984 and 1993, where respondents were asked to state how enjoyable they found various activities on a scale from 0-10. Playing with one's own children and being in charge of one's children produced the highest enjoyment for both men and women measured on the popularity scale (around 8), closely followed by market work (around 7). Making dinner or repair and maintenance tasks were given a 6 on the scale, whereas cleaning the house got the lowest scores (around 3-4) among all activities. Thus, market work was considered nearly as enjoyable as being with one's own children and more enjoyable than most household chores.

Juster and Stafford (1985; 1991) found similar trends in American data. As a pragmatic solution to this conceptional problem, the estimates presented in our paper may be interpreted as a measure of the *relative* process benefits from carrying out household production compared to working in the market.

Certain household services as e.g. cleaning are sometimes purchased at an hourly price which is higher than people's own after-tax hourly wage. This indicates that different types of work vary in popularity. The phenomenon may also partly be explained by differences in productivity between individuals doing housework in their own homes and professionals. But in low-productivity jobs as cleaning, differences in productivity between professional cleaners and individuals cleaning their own house will hardly explain why people tend to buy cleaning in the market. For some well-educated people, the decision to buy services may be based on expected future rather than present income. Buying time through the purchase of domestic services may be invested in human capital investment through formal education or work experience.

The analysis in this paper focuses on married couples. The possible interaction between the demand for the exchange of household production and goods within married couples and the decision to marry or divorce is not treated in this paper. See Grossbard-Shechtman (1984) for a discussion. Furthermore, the model used in this paper does not treat the two partners' possible utility from coordination of leisure and household production activities (Burda et al., 2006).

6   Conclusion

The model in this paper builds on the classical household production model developed by Gronau (1977, 1980, 1986) with an extension allowing for "process benefits" (due to Juster, 1985) or "joint production" (Graham and Greene, 1984; Kerkhofs and Kooreman, 2003). The model is tested empirically on Danish time use data with interpretable results.

First, the model is estimated without process benefits, i.e. without allowing for the possibility that some of the activities which are characterized as household production also provide benefits per se for the person performing the activity. For this formulation of the model, housework by husband and wife show the expected diminishing returns to scale and his and her time in housework are q-substitutes. The results comply with the results from a previous study by Kerkhofs and Kooreman (2003) which used Full Information Maximum Likelihood (FIML) as estimation method. This paper suggests a more flexible estimation method, the efficient GMM 3SLS estimator, which does not rely on the error terms being normally distributed.

In a second step, the household production model with process benefits is estimated. There is some empirical evidence of the *presence* of process benefits in household production for women, but the effect is not significant. The results are in line with a previous analysis by Kerkhofs and Kooreman (2003).

In general, the model's explanatory power is low. Housework of husband and wife are strongly correlated, and the exogenous explanatory variables can only explain a modest part of the variations in housework across households. Thus, there is probably considerable unobserved heterogeneity in housework.

The paper discusses alternative interpretations and identification issues related to the empirical results. The paper argues that possible "extra" benefits related to household production may be related to households having a higher preference for home-made products rather than household products bought in the market. These benefits are called "consumption benefits". The paper shows graphically that "process benefits" and "consumption benefits" can be observationally equivalent. However, the benefits are inherently different in the sense that "process benefits" (in the form of leisure) are private goods, while "consumption benefits" are public goods which directly enhance the utility of both spouses, irrespective of who carried out the housework. This point has not been given any attention in the previous literature on household production models.

Appendix

Construction of net wages

The register data has information on gross hourly wages. I construct a net wage by imputing marginal tax rates based on the gross wage for a person who works full-time (1500 hours) for the whole year. Based on tax rules for marginal tax rates and labour market contributions for 2001, I set the marginal tax rate at 50 pct. for a person with a total gross wage income below 178,000 DKK (US$ 28,000). For total gross wage incomes between 178,000 DKK and 277,000 (US$ 45,000), the marginal tax rate is 55 percent, and for gross wage incomes beyond 277,000 DKK, the marginal tax rate is 68 percent.

Efficient GMM

The formulation of moment conditions for the efficient GMM 3SLS estimator follows Wooldridge (2001, ch. 14). The efficient GMM 3SLS estimator solves:

(A1) $$\min_{\theta \in \Theta} \left[\sum_{i=1}^{n} Z_i q_i(\theta) \right] (n^{-1} \sum_{i=1}^{n} Z_i' \hat{\hat{u}}_i \hat{\hat{u}}_i' Z_i)^{-1} \left[\sum_{i=1}^{n} Z_i q_i(\theta) \right]$$

Where Z is a matrix of instruments for the endogenous variables.

Instruments

In the first equation (A1), I instrument female household production by her wage, her wage squared, her age, her education in years, number of children, a dummy for whether the house has a garden and number of square metres in housing. I use the same procedure in the second equation where male household production is instrumented by his wage, his wage squared, his age, education in years, number of children, dummy for garden and number of square metres. Table A1 shows that the explanatory variables in both equations are jointly significant with a very low p-value for the χ^2 test, but the R^2's are rather low in both equations.

Table A1

3SLS (SUR) estimation of instruments for h_f (1st eq.) and h_m (2nd eq.)

	Coefficient	t-value
Female equation (instruments for equation 13a and 15a)		
Male wage	-0.007**	-2.37
Male wage squared	0.012*	1.65
Male age	0.008*	1.76
Male education in years	-0.033**	-2.29
Number of children	0.277***	6.68
Dummy for garden	0.167	1.56
Log (1 + # of square metres)	0.221	1.56
Constant	1.686**	2.43
R²	0.12	
Chi²	89.9	
p-value	0.000	
Male equation (instruments for equation 13b and 15b)		
Male wage	-0.004***	-2.68
Male wage squared	0.005**	1.97
Male age	0.003	0.83
Male education in years	0.012	0.88
Number of children	0.149***	3.86
Dummy for garden	0.229**	2.25
Log (1 + # of square metres)	-0.057	-0.42
Constant	1.911***	3.05
R²	0.05	
Chi²	33.7	
p-value	0.000	

Note: * p=0.10; **, p=0.05; ***, p=0.01.

Source: Danish Time Use Survey 2001, own calculations.

Selection

The regressions are based on our sample of households where both spouses are employed and the wage rate is observed. Using this selected sample potentially leads to biased results. I treat selection bias by use of the Heckman selection procedure where labour force participation of husband and wife is modelled through a bivariate probit model. The usual challenge is to find suitable instruments which are not included in the core model for the participation decision. Participation is modelled as a function of the logs of his and her age, education dummies for both, a dummy for home ownership, log family size, log number of young children (0-6 years), log number of cars and log non-labour income, cf. Table A2. The estimation is based on 1512 observations.

Table A2
Bivariate probit for participation in labour market

	Parameter	t-value
Male participation		
Log male age	-0.849*	-1.92
Log female age	-0.284	-0.64
Dummy high school, male	-0.386*	-1.96
Dummy short vocational, male	0.137	1.26
Dummy short further educ., male	0.301	1.29
Dummy medium further educ., male	0.343*	1.93
Dummy long further educ., male	0.051	0.27
Dummy high school, female	-0.146	-0.8
Dummy short vocational, female	0.123	1.11
Dummy short further educ., female	0.530*	1.88
Dummy medium further educ., female	0.178	1.22
Dummy long further educ., female	0.071	0.33
Dummy home owner	0.103	0.91
Log family size	1.006***	3.52
Log (1 + number of young children)	-0.382*	-1.91
Log (1 + number of children 7-17)	0.284	1.37
Log (1 + number of cars)	1.240***	5.84
Log (1 + non-labour income)	-0.399***	-12.93
Constant	2.753***	3.95
Female participation		
Log male age	0.639*	1.67
Log female age	-1.016***	-2.68
Dummy high school, male	0.448**	2.35
Dummy short vocational, male	0.166*	1.75
Dummy short further educ., male	0.166	0.91
Dummy medium further educ., male	0.133	0.93
Dummy long further educ., male	-0.128	-0.80
Dummy high school, female	-0.160	-1.00
Dummy short vocational, female	0.426***	4.51
Dummy short further educ., female	0.792***	3.64
Dummy medium further educ., female	0.702***	5.67
Dummy long further educ., female	0.843***	4.48
Dummy home owner	0.258***	2.60
Log family size	0.017	0.08
Log (1 + number of young children)	-0.143	-0.93
Log (1 + number of children 7-17)	0.355**	2.25
Log (1 + number of cars)	0.836***	4.32
Log (1 + non-labour income)	-0.304***	-14.21
Constant	0.030	0.05

Note: * p=0.10; **, p=0.05; ***, p=0.01.
Source: Danish Time Use Survey 2001, own calculations.

The Likelihood Ratio test shows that the explanatory variables are jointly significant. Based on the parameter estimates, I calculate inverse Mills ratios for each equation. The inverse Mills ratio for male participation is then added as an explanatory variable in the first equation in the core model, and the inverse Mills ratio for female participation is added as an explanatory variable in the second equation in the core model.

Overidentifying restrictions tests

I perform an overidentifying restrictions test in order to test whether the instruments are correlated with the error terms for the estimation models (1)-(3). Under the null hypothesis that the residuals are uncorrelated with the error terms, the value of the objective function of the GMM problem is χ^2-distributed with 14 degrees of freedom (equal to number of instruments minus number of explanatory variables). The value of the objective function in the two different models in section 5.1-5.2 is shown in Table A3. The value of the objective function is 19.31 with a p-value of 0.15 in the most restricted model (model 1) without process benefits. Thus, the null hypothesis that the instruments are uncorrelated with the error terms is accepted. Furthermore, the null hypothesis is accepted for model (2).

Table A3
Values of objective function in estimations

	Objective function	p-value
1) No process benefits	19.31	0.15
2) Process benefits	16.44	0.29

Source: Danish Time Use Survey 2001, own calculations.

Normality tests

Figure 4 shows histograms for the residuals from estimation (1). Normality tests (skewness-kurtosis test and Shapiro-Wilkinson test) for the residuals reject the null hypothesis that the error terms are normally distributed. Especially, the test for skewness contributes to the rejection which is also strongly suggested by Figure A1. Rejection of normality rules out the application of maximum likelihood based estimators as e.g. FIML and points to an estimator based on GMM as a consistent and efficient estimator under less restrictive assumptions about the error term.

Figure A1
Histograms for residuals from estimation (1)
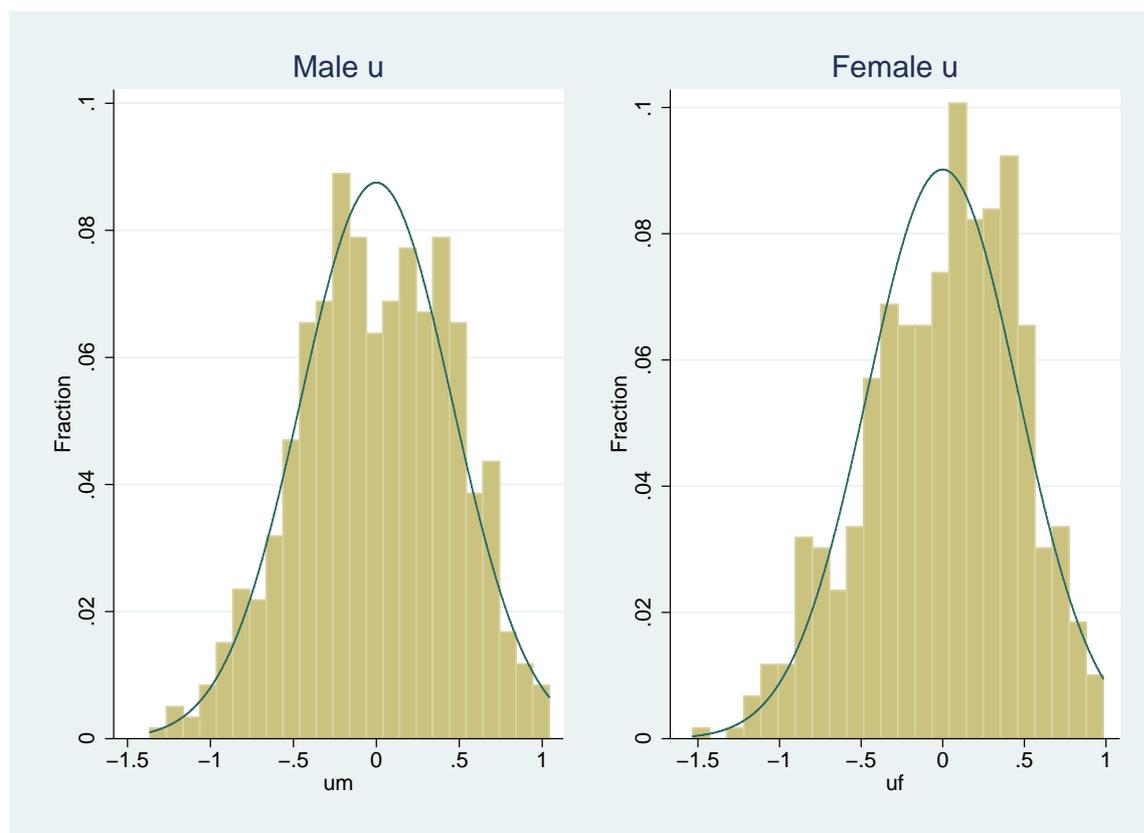
Source: Danish Time Use Survey 2001, own illustration.

References

Apps, P. (2003), Gender, time use and models of the household, IZA Discussion Paper No. 796, Bonn.

Apps, P. and R. Rees (1997), Collective labour supply and household production, in: *Journal of Political Economy,* Vol. 105, No. 1, 178-190.

Apps, P. and R. Rees (1996), Labour supply, household production and intra-family welfare distribution, in: *Journal of Public Economics*, Vol. 60, No. 2, 199-219.

Apps, P. and R. Rees (1988*)*, Taxation and the household, in: *Journal of Public Economics,* Vol. 35, No. 3, 355-369.

Aronsson, T., Daunfeldt, S.O. and M. Wikström (2001), Estimating intrahousehold allocation in a collective model with household production, in: *Journal of Population Economics*, Vol. 14, No. 4, 569-584.

Becker, G.S. (1991), *A Treatise on the family*, Harvard University Press, Cambridge.

Becker, G.S. (1965), A Theory of the allocation of time*,* in: *The Economic Journal,* Vol. 75, No. 299, 493-517.

Bonke, J. and J. McIntosh (2005), Household time allocation – Theoretical and empirical results from Denmark*,* in: *electronic International Journal of Time Use Research*, Vol. 2, No. 1, 1-12.

Bonke, J. (2005), Paid and unpaid work – Diary information versus questionnaire information, in: *Social Indicator Research*, Vol. 70, No. 3, 349-368.

Burda, M., Hamermesh, D. and P. Weil (2006), The distribution of total work in the EU and US*,* IZA Discussion paper No. 2270, Bonn.

Chiappori, P.A. (1997), Introducing household production in collective models of labor supply, in: *Journal of Political Economy,* Volume 105, No. 1, 191-209.

Chiappori, P.A. (1992), Collective labour supply and welfare, in: *Journal of Political Economy*, Vol. 100, No. 3, 493-467.

Chiappori, P.A. (1988), Rational household labor supply, in: *Econometrica*, Vol. 56, No. 1, 63-90.

Chiswick, C.U. (1982), The value of a housewife's time, in: *The Journal of Human Resources*, Vol. 17, No. 3, 413-425.

Davidson, R. and J.G. McKinnon (1993), *Estimation and inference in econometrics*, Oxford University Press, Oxford.

Graham, J.W. and C.A. Greene (1984), Estimating the parameters of a household production function with joint products*, in: *The Review of Economics and Statistics*, Vol. 66, No. 2, 277-282.

Greene, W.H. (2003), *Econometric analysis*, Fifth edition, Pearson Education International, Prentice Hall.

Gronau, R. (1986), Home production – A survey, in: Ashenfelter, O. and R. Layard (eds.), *Handbook of Labor Economics*, Elsevier, Amsterdam, 273-304.

Gronau, R. (1980), Home production – A forgotten industry, in: *The Review of Economics and Statistics*, Vol. 62, No. 3, 408-416.

Gronau, R. (1977), Leisure, home production and work – The theory of the allocation of time revisited, in: *Journal of Political Economy*, Vol. 85, No. 6, 1099-1124.

Gronau, R. and D. Hamermesh (2001), The demand for variety – A household production perspective, NBER Working Paper No. 8509, Cambridge.

Grossbard-Shecthman, A. (1984), A theory of allocation of time in markets for labour and marriage, in: *The Economic Journal*, Vol. 94, No. 376, 863-882.

Hallberg, D. and A. Klevmarken (2003), Time for children – A study of parent's time allocation, in: *Journal of Population Economics*, Vol. 16, No. 5, 205-226.

Hausman, J. (1983), Specification and estimation of simultaneous equations models, in: Griliches, Z. and M. Intriligator (eds.), *Handbook of Econometrics*, Elsevier, Amsterdam, 391-448.

Hausman, J. (1975), An instrumental variable approach to full-information estimators for linear and certain nonlinear models, in: *Econometrica*, Vol. 43, No. 4, 1251-1271.

Juster, F.T. and F.P. Stafford (1991), The allocation of time – Empirical findings, behaviourial models and problems of measurement, in: *Journal of Economic Literature*, Vol. 29, No. 2, 471-522.

Juster, F.T. (1985), Preferences for work and leisure, in: Juster, F.T. and F.P. Stafford (eds.), *Time, goods, and well-being*, Institute for Social Research, Ann Arbor, 335-351.

Kerkhofs, M. and P. Kooreman (2003), Identification and estimation of household production models, in: *Journal of Applied Econometrics*, Vol. 18, No. 1, 337-369.

Pollak, R.A. and M.L. Wachter (1975), The relevance of the household production function and its implications for the allocation of time, in: *Journal of Political Economy*, Vol. 83, No. 2, 255-277.

Pylkkänen, E. (2002), Changes in household production of Swedish two-adult households, Economic Studies, Department of Economics, School of Economics and Commercial Law, Göteborg University 120, Göteborg.

Weiss, Y. (1997), The formation and dissolution of families – Why marry? Who marries whom? and what happens upon divorce?, in: Rosenzweig, M.R. and O. Stark (eds.), *Handbook of Population and Family Economics*, Elsevier, Amsterdam, 81-123.

Wooldridge, J.M. (2001), *Econometric analysis of cross section and panel data*, MIT Press, Massachusetts.

Activity and contextual codes –
Implications for time-use coding schemes

Andrew Harvey and Jamie Spinney

Andrew S. Harvey
Department of Economics
Saint Mary's University
Halifax, NS, Canada B3H 3C3
e-mail: Andrew.Harvey@smu.ca

Jamie E. L. Spinney
Department of Geography
Saint Mary's University
Halifax, NS, Canada B3H 3C3
e-mail: Jamie.Spinney@smu.ca

Abstract

Time-use studies are designed to picture human behaviour as it is played out day by day. That behaviour has many dimensions, with the main activity usually playing the starring role. However, activity context, where people are, whom they are with, "for whom" they are performing an activity, and how they feel about it can be equally, if not more, important. In reality the experience of living is the concurrent experience of all of these. Traditional activity definitions and grouping exhibit a mélange of "activity" codes developed a priory using the several dimensions based on preconceived activity expectations. Contextual dimensions are examined in a brief review of the origin and development of coding practices and major studies identifying problems at the data capture, coding, and analysis levels. A potential remedy is to be found in contextual coding, which could improve the outcome at all three stages. An alternative contextual approach, the incorporation of a "for whom" column in the diary, is recommended. Data collected from Nova Scotia teachers using two diary versions are presented to provide some insight into its use. Results differ both quantitatively and qualitatively. This approach added to both the number of work activities and the total amount of work time.

JEL-Codes: B41, C81, D03, J22

Keywords: Time use, context, data collection, for whom, teachers

1   Introduction

In spite of the long history of time use studies the definition and grouping of activities to reflect human behaviour continues to demand considerable thought. Generally, the perspectives of economists, sociologists, psychologists, and city planners, among many others, seek quantitative and qualitative knowledge of people's use of time. Decision makers need such knowledge to guide decision making. The task facing time use researchers is to design studies that can provide meaningful and usable data for these diverse demands. This paper draws on time use studies of teachers in Nova Scotia (Harvey and Spinney, 2000a; Harvey and Spinney, 2000b; Harvey and Spinney, 2001) undertaken to provide factual insight into the realities of teachers lives. Based on that experience and identified shortcomings in typical theoretical and applied approaches to data collection and classification an alternative collection regimen is recommended for consideration.

Greater attention needs to be paid to the identification and collection of required activity and contextual data in a structure that facilitates optimal accuracy while minimizing respondent/ interviewer confusion and burden. Data collection and coding are different stages in the research process. Collection should be optimized to capture the events of daily life so that they can be classified in a manner that permits, thru manipulation, the formation of constructs required for description and analysis of time related phenomena in a broad range of disciplines. The analytical structures required by various disciplines and decision makers can then be constructed at the analysis and reporting stage.

In undertaking the teachers study the challenge was to develop a self-administered diary instrument that would show, in context, the daily behaviour of school teachers and administrators. This required identifying and integrating relevant and meaningful activities and contextual elements to portray the reality of their daily lives on and off the job. The time diary approach offers many benefits but at least three stand out. First, time diaries address the reality that each activity occurs within a multi-dimensional context including other activities. Second, they provide an accounting framework that enhances the usefulness and validation of the data. Third, they provide analytical hooks to population based data that can be utilized to validate the data and enhance analysis. The Survey of Nova Scotia Teachers was designed with these benefits in mind by building a framework drawing on the Canadian General Social Survey (GSS) time use study.

2   Background

The foundation of time use data collection was laid with the development and execution of the Multinational Time Use Study in the mid 1960s (Szalai, 1972). At the practical level it adopted

a coding scheme incorporating everyday language while at the same time addressing systematic concepts arising out of the theoretical interests of the designers (Szalai, 1972). It was built on ten major activity groups and provided the template for the vast majority of time use studies to the end of the last century.

Over time, time use coding schemes have drawn on a wide variety of perspectives. Among those making contributions to the literature are Patrushev (1961), Govaerts (1969), Javeau (1970), Swedner (1970), Szalai (1972), Clark and Harvey (1977), Ås (1978), Elcardus and Glorieux (1993), Harvey and Niemi (1994), Bedakio and Vanek (1999), EUROSTAT (1999), Hoffman and Mata (1999), and Shelly (2005). In addition, each new time use study has made some alteration/ contribution to coding practice.

The Multinational Study classification was built on ten major groups designed to facilitate collection and provide for disciplinary research needs. Theoretically Swedner (1970) identified five groups (i.e. physiological, free-time, household, family, and economic) while Ås (1978) identified four (i.e. necessary, free, committed and contracted). The Multinational Study classification scheme elaborated all 10 groups providing for up to ten subcategories in each. Swedner's classification incorporated several dimensions in a single activity and was elaborated in all behavioural areas. Ås, primarily interested in leisure, only expanded free time. Over time, with the growing use of computer assisted interviewing, code elaboration has increased.

Two decades later statistical agencies began to take seriously, among others, two realities that have contributed to classification expansion; momentum and shape. First, the need to obtain accurate and comprehensive time use data to facilitate the measurement of non-market production (Chadeau, 1992). Second, the need to capture more meaningful work time data to inform labour legislation to protect the rights of workers, recognizing that working time directly affects workers health, stress levels, the establishment's productivity and costs and overall societal quality of life (Mata-Greenburg, 1992).

As early as the mid 1970s the need to provide more disaggregated time use data for economic measurement was noted from both theoretical (Juster, 1973) and methodological (Harvey and Macdonald, 1976) perspectives. By the 1990s growing demands to value non-market production and properly measure labour time in both developed and less developed societies, made these needs more pressing.

3   Classification building blocks

Givens in capturing and recording the flow of daily behaviour are: the functional unit captured in the diary known as the event or episode, the behavioural unit (i.e. activity), which is used along with other contextual information to classify the action (i.e. behavioural unit), and the behavioural groups that are designed to provide a theoretical structure and facilitate collection. There are two types of contextual information needed for accurate classification, "situational" (e.g. where, with whom, for whom), which are applicable to all events, and "activity deter-

mined" (e.g. mode of transport, material read, communication technology) that apply, and are often unique, to particular activities (Harvey and Royal, 2000).

3.1   Events

Einstein defined an event as something that happens in time and space. Life is a series of events, lived as a stream of behaviour (Barker, 1968), which is manifest in activities housed in and shaped by a flow of objective and subjective contexts. Hence, events are the basic building block structuring an individual's day. An event in the Multinational Study contained information on time slot, what, what else, where, and with whom. Technically a new event was triggered when any one of its dimensions changed. For example, having breakfast alone is a different event after a spouse enters. The event is the heart of time use studies and should contain all contextual information, within response burden limits, that facilitates its collection, defines it, and gives it meaning.

The 2006 Australian Time Use Study captures both situational and activity determined contextual dimensions. As appropriate, an event can contain: time; primary activity; secondary activity; for whom; location (both physical and spatial); mode of transport; technology/communication code where relevant; social contact; age details of any household members present; and, health details of any household members present (ABS, 2008). The event level information is captured in a diary form in the respondents own words.

3.2   Behavioural units – Activities

The concrete and observable "behavioural unit" (activity) must be given priority in the classification process. A list of discrete activities that are essentially independent of the context in which they occur is needed (Ås, 1978; Elcardus and Glorieux, 1993; Harvey and Niemi, 1994). Overt activities are "behavioural units" reflecting "what" expressed by a verb (e.g. eating, teaching, buying, reading) and typically accompanied by a noun, an object of the action (e.g. breakfast, class, groceries, cars, newspaper). Predominantly natural language defines the "behavioural unit". In the initial stage the key is to clarify for both the respondents and interviewers the information needed and establish a framework that will accurately, parsimoniously, and comfortably capture the stream of activity throughout the day. It is necessary to draw a distinction between overt acts on one hand and the meaning that can be attached to them on the other.

A coding scheme gives events meaning through assignment to a "behavioural (activity) group" (Harvey and Niemi, 1994). At the collection stage attention to the ultimate behaviour groups need only relate to any contribution groups may make to the accuracy and efficiency of data capture. Once captured in natural language, the contextual information can be used to assign activities to "behavioural groups" as required by various theoretical and operational needs. A review of the examples in the ATUS Coding Lexicon illustrates the role of natural language and the heavy dependence on "for whom" information in distinguishing activity placement in the ATUS scheme (Bureau of Labor Statistics, 2011b). Ideally, a verbatim record of the re-

spondent's activity description would be maintained along with the code, thus allowing for verification and reassignment as may be required for reporting and analysis.

Chapin (1974) identifies two approaches to classifying activities, a basic research approach that seeks the meaning of the activity to the subject and one that designates activities in terms of their meaning for suppliers of specific services and facilities. From this perspective disciplinary demands parallel the suppliers' perspective. For example, a hobbyist sees making a ceramic bowl as a leisure activity and an occupational therapist may see it as therapy. However, a national accountant sees it as non-market work included in gross national product. Activities must be amenable to assignment to a broad set of meanings.

Examining the meaning of activities to the individual, Elcardus and Glorieux (1993) argue that a semantic taxonomy of activities should comprise four things: an initial list of lexically defined activities; a set of meanings used to classify them; a set of rules for the classification; and, an estimate of the degree to which the lexically defined activities are true to their meanings. In an empirical test of the meaning attached to activities they found that, knowing the activity and its context (e.g. timing, location, and interaction partners), schemes they examined performed fairly well in distinguishing variation in the general meaning of activities. However, they concluded that if one is interested in the meaning individuals attach to an activity (behavioural unit) the meaning needs to be measured explicitly.

This is consistent with findings that show a given activity may have different meanings for men and women and that for a given person an activity may have one meaning in one context and a different meaning in a different context (Clark et al., 1990). In one study more than half of the market/non-market work activities, objectively coded work using a traditional coding scheme, were viewed as leisure, on a work-leisure continuum scale, by its doer (Harvey, 1993). Meanings that others (suppliers, disciplinary demands) attach to activities may be independent of the meaning attached by the individual thus requiring additional data and alternative behavioural groups. The content of the event determines the range of classification possibilities.

Harvey and Niemi (1994) identify five classification principles. A classification scheme should provide a hierarchical structure, ideally a single frame of reference, familiar terminology, definability in terms of specific criteria, and the ability to distinguish defined activities. They make the point that coding should be a classification not a data reduction exercise. The basic structure for the hierarchy is provided by behavioural areas (activity groups).

3.3   Behavioural areas – Activity groups

Behavioural areas provide a meaningful framework to the behavioural units. Any framework reflects underlying assumptions about human behaviour from both intuitive and disciplinary perspectives. Behavioural areas can provide both an instinctive means of reporting events and a template for the data required, thus helping to ensure that necessary contextual variables and categories are captured. A given activity may mean different things to different people or to the same person at different times. Hence, it is best to ensure that the behavioural groups provide a

structure that is meaningful to respondents and interviewers, thus enabling them to faithfully reflect the behaviour in context. There are some shortcomings of such an applied behavioural framework: the motivation or outcome may depart from that which is theorized; specific acts may fit into the framework in more than one place; and, the information available may be insufficient to properly reflect relevant motivations or outcomes. These shortcomings can be minimized in two ways. The first is to ensure that necessary contextual variables are collected with a level of detail that provides optimal flexibility at the coding stage. The second is to avoid data reduction when coding the data.

Activity dimensions are, typically, "what", "where", and "with whom". "For whom" (purpose) and, ideally at least one subjective dimension, should be added. In terms of "for whom", there is an overriding need to distinguish, behaviourally, between economic and non-economic activity in order to measure total societal production. A time use coding scheme must record faithfully what a person is doing, independently from the motivation for doing it (Harvey and Niemi, 1994) or the contractual arrangements under which it is done (Hoffmann and Mata, 1999). Unfortunately, to date most coding schemes have failed to achieve this.

3.4   Coding schemes

The Multinational Time Use Study (Szalai, 1972), as noted above, provided primary guidance for the construction of most time use coding schemes following its implementation. It did so because it reflected, to put it simply, the basic human activities work, rest, and play; and the basic economic and social information needed by its creators. However, the Multinational coding scheme was not designed to provide a picture of general population time use. It was designed to examine differences among individuals living in households with someone engaged in non-agricultural employment in narrowly defined industrial communities.

In spite of the exclusions the Multinational classification proved functional and permitted extensive opportunities for analysis and comparison and has moulded the structure of virtually all existing national time use coding schemes. The Multinational coding scheme had two main advantages and two main disadvantages. Its advantages were the analytical opportunities provided by the grouping of behavioural areas and the provision of comparable socio-economic data. However, it failed to adequately cover all behavioural areas and to provide adequate coverage for the activities of particular sub-populations (Clark and Harvey, 1977). The classification did not adequately reflect generically different activities within a behavioural group nor did it adequately allow for differential meaning for any given activity across individuals or time, particularly where that meaning may be shaped by "a state of being" such as parents, adolescents, or the elderly. In particular, for example, parents and child care.

Capturing childcare has been time use researchers' albatross for decades. It continues to elicit research to develop reasonable and useable measures of it (Goldschmidt-Clermont, 1990; Frederick, 1993; Fedick et al., 2005; Mullan and Craig, 2009). Mullan and Craig (2009) argue that the use of proximity and responsibility are interchangeable and can provide a viable means of generating child care measures as a basis for cross national comparison. Frederick (1993) in-

dentified and examined four methods of collecting child care time use: as a primary activity in the time diary; parental social contact, captured by with whom; a special child care diary; and stylized questions. She found that child care time as a primary activity captured less than 25 percent of directly reported child care. The other three approaches, which all encompassed secondary child care time, provided similar estimates among themselves overall. However, analysis of the several measures yields differing results across sub-populations. There is clearly a need to enhance the contextual data in time use studies in a manner that permits the collection of valid and reliable caring data, not only for children, but for others as well.

Childcare measurement highlights another shortcoming of the conventional collection process, which goes to the heart of being able to move from micro to macro measurement of behaviour. Events performed by a paid worker or by a mother differ economically and socially, putting them in different groups, even though both are childcare. In the Multinational classification a childcare workers time, while working is simply paid work while a mother's care is recorded as childcare. Thus, a mother who is a child care worker by trade contributes more to child care time than is captured. Hence, following the Multinational approach, which is current practice, total societal time use for childcare can only be, if at all, crudely imputed. Similarly viewing TV could be leisure or work at any given time for a teacher. In reality, most activities listed in any coding scheme can be undertaken as paid work and yet the Multinational classification scheme, and all classification schemes to date, have reduced all job time to "paid work." In spite of the shortcomings, as indicated above, the Multinational coding scheme has played a major role in guiding subsequent schemes.

As previously mentioned, around the mid 1970s a recognised need to provide more disaggregated time use data for economic measurement was noted. In 1992 INSTRAW launched a programme leading to the publication of Measurement and Valuation of the Unpaid Contribution: Accounting through Time and Output (INSTRAW, 1995). About the same time the UN Statistical Office began to develop a time use classification that was based on two principals, consistency with the System of National Accounts (SNA) to provide satellite account aggregates and compatibility with existing time use classifications (Bediako and Vanek, 1999). The World Bank included time use in their guide to Living Standards Measurement Studies (Harvey and Taylor, 2000a). And, in the late 1990s, ILO undertook development of a time use diary classification to address the need for improved work time data (Hoffmann and Mata, 1999).

In 1994 EUROSTAT undertook a concerted effort to foster the collection of time use data in the EU and EFTA countries. The work led to development of guidelines for the Harmonized European Time Use studies (HETUS) for member countries. The HETUS activity coding scheme was based on the Multinational Study and modifications in Europe, Canada, and Australia. It was structured by the Ås categories on the basis of the activity imperative from necessary to contracted, committed and free time to reflect assumed activity priority. It maintained 10 behavioural groups, but combined household and child care into one group and created a travel group classification. Contributed data collected as a part of HETUS (2011) over the last decade is available for analysis online, as is ATUS data noted below.

In 2003 the Bureau of Labor Statistics (2011a) launched the American Time Use Survey (ATUS) a landmark study. It was the first full federal time use study in the US and the first study anywhere to gather time use data daily on a continuing basis. The (ATUS) coding system, an adaptation of the Australian 1997 system, is a hierarchical three-tiered system with 17 behavioural areas, each with two additional two-digit categories creating a six-digit classification system (Shelly, 2005). Because the study is continuous, it is a living changing system with the codes being updated prior to the commencement of interviewing each year and the changes are tracked (Bureau of Labor Statistics, 2011b).

3.5   Contextually derived behavioural units – Activities

Time diary data are structured as a flow of events marked by a start time and end time, which define an event. The Multinational study, as noted above, collected primary activity, secondary activity, where, and with whom and a new event was considered to start when any one of the contextual elements changed. An activity classification is assigned either solely on the basis of a lexicon or in conjunction with other contextual variables. Such practices continue to this day. As greater demands were placed on the time use data for the measurement and study of non-market production and the division of labour, among other interests, various attempts to gathering "for whom" data have been implemented. Contextually defined activities were included in the Multinational Study classification scheme, for example "meals at workplace" and "medical care at home" used explicit location; "visiting friends" used explicit "with whom." Additionally, "care to babies" implies "for whom" that must have been captured but not registered.

Multiple frames of reference persist in current classification schemes. For example, the EURO-STAT (1999) classification scheme allows two food consumption related codes as a part of the "Employment" behavioural group with multiple codes (i.e. 112 - Coffee and other short breaks, under 11 - Main job, and 112 - Coffee and other short breaks, under 12 - Second job). Such coding obfuscates what was really being done, in reality, by telling what was not being done "paid work", which was not definitively specified in the first place. The activity may well have been "022 Snacks and drink", "811 Reading periodicals", "511 Socializing and conversation", "724 Communication by computing (e-mail, chat)", or any of a wide array of other codes. With the respondent being provided the code "112 Coffee and other short breaks" the more informative detail is lost. Coding and/or computer analysis can be used to capture the information that the activity occurred either at the workplace or between paid work activities thus showing breaks at work. A more rational approach to capturing and coding activity data would be provided by coding generic activities with relevant contextual data.

Overt action has little meaning out of context. Time, secondary activity, when, where, with whom, for whom, tension, enjoyment, technology, paid or not, are all contextual dimensions that have been explored (Harvey and Royal, 2000). Context may require, provide opportunity for, discourage, impede or prohibit an activity. The challenge in measuring time use is to identify relevant contextual dimensions and meaningful categories that will facilitate both collection and analysis.

Following the Multinational study, secondary activities, where, and with whom have been nearly universally captured in national studies. "For whom", particularly required to understand caring and volunteering, has been infrequently and awkwardly captured. A notable exception is its use and development in the Australian Time Use studies. Each of these contexts should be regularly collected with each activity. Additionally subjective information, such as the level of enjoyment or tension level associated with the activity, greatly enriches the value of the information (Michelson, 1999; Krueger, 2009). Each of these dimensions contributes to the validity of the coding and analysis. For current purposes only the situational contexts, inherent in every activity, are examined here, beginning with "for whom" the activity is performed.

3.6   For whom – Purpose

"For whom" or purpose provides the basic classification framework for the Multinational Study, Ås, and derivative classification systems. Behavioural group assignment to date has been deemed implicit in the activity itself (e.g. meal preparation, child care, shopping, eating) or assigned, oblivious to the actual activity (e.g. paid work, second job). A teacher shopping could be buying groceries for her/his household, a church supper, or buying materials to use for her/his class. In each case the shopping would be the same behavioural unit and should fit into a different behavioural group, but which one? One needs to know "for whom" or the purpose of the shopping to code it correctly. Once coded into a behaviour group, without appropriate context, its purpose is fixed. Although knowledge of whether an activity is performed for work, family, oneself, or others is crucial for correctly classifying behavioural units and assigning each of them to behavioural groups, it has rarely been collected.

"For whom" was first explicitly asked in the 1991/92 German Time Use Survey. Respondents were asked to indicate whether the activity was done for: one's own household, for another household, or social services/voluntary and community work (Ehling, 1999). It has been most intensively used in the 1997 and 2006 Australian time use studies with increasing refinement. In 1997 the "for whom" categories were aligned with their survey of volunteer work making it possible to assign volunteer work to the appropriate organization (Australian Bureau of Statistics, 2002, 2008). In 2006, activities that were done for family members within the household were also coded to reflect the health status of household members (sick, frail, with a disability, well).

In 1998 the EUROSTAT diary, containing a "for whom" option was piloted in several countries. The pilot found that quality diaries revealed helping in all major groups (Rydenstam and Wadeskog, 1998). Unfortunately use of the "for whom" code was found problematic in some countries and was not adopted in the final EUROSTAT recommendations for the time diary.

France was one of the countries using the "for whom" column in 1998 (Roy, 2011). The exact wording of the column was "votre activité est dans un but"... (i.e. the goal of your activity is...) and the choices were: personal (for yourself or your own household), professional, help to another household, or volunteer work within an organization. It was asked of all episodes. When preparing for the 2010 time use survey, consideration was given to removing it in order to make

room in a visually overcrowded diary, since in 1998 it was infrequently used and somewhat confusing to households. The problem was subsequently identified. The decision was made to keep it in 2010 in response to requests from volunteer workers, but most importantly since it was used in the previous activity coding process and they wanted the coding process and activity list to be comparable with that of 1998. Interestingly, in the 2010 time use survey, they over-sampled teachers in response to a Ministry of Education request. The Ministry wanted to measure the "real" work time of teachers, something they have previously been unable to do (Roy, 2011).

The nation-wide Venezuelan time use survey, in progress through 2011, illustrates a frequently used approach to capture non-market production in time use surveys (Blanco, 2011). It contains a question asking, when there was no market exchange, "who benefitted". This was asked for: food preparation, household cleaning, care of persons, repair of cars and other devices, and washing and repairs of clothing when they appeared in the diary. All "for whom" questions provide the same set of options: each one of the household members registered through a questionnaire applied before the diary: family members that are not part of the household; domestic workers; members of other households; a disaggregated set of 8 community, religious, and cultural non-profit organizations; and others.

"For whom" coupled with an appropriate classification for work tasks would enable time use researchers to finally open the black box of paid work as proposed by the ILO (Hoffman and Mata, 1999). Between one-third and one-quarter of all working activities performed by adults for pay or profit are duplicates of activities carried out in everyday life (e.g. cooking, cleaning, researching, learning, caring, meetings to name a few). Therefore, the distinction between employment and other activities is based on the purpose or "for whom" the activity was undertaken (Hoffman and Mata, 1999).

The set of codes used to describe the different possibilities of "for whom" has varied considerably across studies (Harvey and Royal, 2000). International agreement is needed on a basic structure that is flexible enough to permit expansion or contraction as warranted or needed. Two "for whom" classifications provide an analytical example in this paper (see Table 1). The first was developed by the Saint Mary's University Time Use Research Program for the Nova Scotia Teachers Union (NSTU) in order to focus explicitly on various work activities of teachers. The other was developed at the International Labour Organisation (ILO) collapsing work options in favour of an expanded non-work classification. Both allow for closure (the ability to sum the day to 24 hours) by offering categories for all activities.

Table 1
Nova Scotia teachers study (1999) "For whom" classifications

NSTU	ILO
0 Self	10 For work, pay, profit
1 Single student (not individual program plan)	21 Oneself
2 IPP student(s)	22 Own children
3 Multiple students	23 Others in household
4 Administrator	24 Relatives not in household
5 Family	25 Pets
6 Community	30 Other/mixed family/self
7 Teachers' union	31 Other children not of household
8 Other person(s)	32 Other adults not of household
	33 School
	34 Church
	35 Community
	36 Organisation
	40 Other Purposes

Source: Nova Scotia teachers study, Canadian General Social Survey 1999.

3.7   With whom – Social contact

Social contact, measured by "with whom", is significant on several fronts including child care measurement (Frederick, 1993) and travel demand analysis (Harvey and Taylor, 2000b; Spinney et al., 2009). Time alone, with family, or with friends is an important dimension of understanding the contextual setting of a distinct behavioural unit. The same activity undertaken alone, at the workplace, with the family, or with friends is inherently different. As a result, the "with whom" contextual codes are used to determine various dimensions of social contact. For example, "with whom" was used to identify a social companion in a study of the benefits of public holidays (Merz and Osberg 2009). In another study, Merz and Rathjen (2009) used it to account for social participation in defining genuine personal leisure time in an analysis of time and income multidimensional poverty.

Socializing is a difficult concept to illustrate and measure (McLennan, 1997). In order to measure the impact of social interaction on society and the behaviour of the individual, it is necessary to incorporate all the dimensions of the social environment (Schneider, 1972). Australia approached the measurement of socializing in different ways between their 1992 and 1997 national time use surveys (McLennan, 1997). In 1992, visiting someone for a social purpose was coded as socializing, independent of the activities undertaken. The activities undertaken during socializing were recorded in the 1997 survey providing increased detail on the activities people engage in while socializing. Output analysis of the 1992 and 1997 time use surveys indicates that the amount of time spent on socializing had decreased from 77 minutes to 11 minutes, while time spent on eating and drinking increased from 64 to 93 minutes and talking increased

from 16 to 35 minutes. If the average amount of time spent eating, drinking, and talking with people other than members of the household is taken into account, the 1997 estimate for socializing is broadly comparable with the 1992 results (McLennan, 1997). This suggests the data loss that can be experienced through the use of omnibus activity codes, as both quality and quantities were affected.

3.8   Location

Location information can take two forms – generic and spatial. Typically time use studies collect generic location information such as home, workplace, someone else's home, etc. Spatial coordinates, on the other hand, have rarely been collected. However, the availability of GPS technology, which facilitates the capture of spatial coordinates and has the potential to improve the accuracy and precision of time diary data, has generated experimentation with spatially coded time use studies (for examples see Murakami and Wagner, 1999; Jones and Stopher, 2003; Stopher et al., 2007; Spinney and Millward, 2011a).

The location of activities has important implications for the analysis of paid work, even though there are many different definitions of what constitutes work activities (Drago et al., 1999; Mata-Greenwood, 1992). The traditional measure of time spent in employed labour has been hours of work derived from establishment or labour surveys. However, both of these provide macro measures that fail to capture the reality of paid work time as it is realized. All time spent at the work place is not paid work and all paid work time is not done at the work place. Drago et al. (1999) used the location contextual codes to examine the amount of work done at home, especially when household members are present, as a measure of "work invasiveness" defined as the degree to which a dominantly workplace occupation invades family time at the home. Harvey and Spinney (2000a) discovered that Nova Scotia teachers had homework averaging 1 to 2 hours per night, and on the weekend, totalling about 10 hours a week.

Time use and location information also contributes significantly to travel behaviour analysis and modelling (Janelle and Goodchild, 1983; Timmermans et al., 2003; Harvey, 2003). That is, location information, for both the origin and destination of travel activities, is required for traditional four-stage transportation planning models and has been used to examine a wide variety of travel behaviour. For example, Millward and Spinney (2010) have examined differences in time use, travel purpose, and travel mode by residential location along the urban-rural continuum, while Spinney and Millward (2011b) used detailed location information to examine travel mode choices for children's journey to school.

The statuses of "for whom", social interaction, and location, which provide situational context for all activities, are needed to assign behavioural units to different, yet related, behavioural groups. The next section describes an example of the use of "for whom" to define contextually derived behavioural groups, while the subsequent sections illustrate the implications of not using "for whom" in the study of paid work.

4   Data and methods

The ILO and NSTU coding schemes (Appendix A and B, respectively) were implemented during late 1999 with teachers throughout Nova Scotia, Canada. Although the activity codes or behavioural units are deemed the most important aspect of time diary data, the context codes can be equally important. The survey and diary were self-completed by a random selection of teachers throughout Nova Scotia using a diary design that was based on the Dutch SCP studies (van de Broek, 1999).

The study of Nova Scotia teachers created an opportunity to implement the collection of "for whom" for all activities as a column in the teacher's diary. An objective of the teacher's study was to examine the workload implications of the preparation and implementation of Individual Program Plans (IPPs) for special needs students. "For whom" information was needed to allocate various teachers activities between IPP and non-IPP students. As experimentation, and to provide closure, it was decided that options would be provided to encompass all diary activities. A pilot study indicated that it was a viable addition and it was used in the study. During progress of the NSTU study researchers at the ILO, who were interested in new approaches to measuring labour time, asked us to administer a similar instrument that utilised alternate activity and contextual codes (Appendix B) to a sample drawn from the NSTU study population. Completion of the two studies provided the opportunity for comparison of the same population of teachers with two coding schemes, which differed in terms of their behavioural and contextual units.

The NSTU instrument was designed to capture work activities using a 16 category classification with five work-related "for whom" codes and four non-work "for whom" options (Appendix A). The ILO instrument provided an eight category work classification with 14 "for whom" codes including only one work code and 13 non-work options (Appendix B). The ILO activity classification was developed as a compromise between a "what" classification (not pre-defined into behavioural groups) and a classification scheme that can be used by respondents to define their own activities. This means that, given the appropriate context, teachers could potentially use any activity code to describe their work activities.

5   Results

Although the teachers in the NSTU and the ILO studies used a discrete list of "teaching activities" to code their work-related activities, many teachers also identified activities in other behavioural groups as work-related. The NSTU classification scheme was created as a "type of activity" classification that is essentially independent of the context in which activities are being carried out. Contextual work attribution was not made directly to "work" as was the case in the ILO scheme, which explicitly offered "work" as an option. Rather respondents were presented with a defined list of work-related parties "for whom" they may be undertaking the tasks

reported. However, when all activities that were reportedly performed for students, administrators, or the teacher's union were identified, more than two-thirds of respondents in the NSTU sample had recognized the independence of the contextual codes and assigned forty-two additional behavioural units to the behavioural group "employment". Similarly, the ILO data were filtered to include all events that were performed "for work" (code 10). The myriad of different activities that respondents used to describe their work expanded from the eight activity codes listed under "teaching activities" to thirty-five different behavioural units. Two-thirds of all respondents made "contextually derived" assignments to work. The frequencies of the ten most frequently occurring contextually derived (CD) activity codes in the NSTU and ILO samples are illustrated in Table 2.

Table 2
Ten most frequent contextually derived activity codes

NSTU			ILO		
Activity Code	Description of Activity	Percent of all CD Codes	Activity Code	Description of Activity	Percent of all CD Codes
600	Attending meetings	13.5	55	Attending meetings	36.9
800	Coaching	11.8	52	Clerical activities	19.1
92	Travel by car as driver	11.5	21	Driving car	13.4
530	Homework: coursework	5.8	51	Management activities	8.3
100	Meal preparation	5.2	13	Interior decorating	5.1
910	Watching television	5.2	81	Eating/ personal hygiene	4.5
620	Volunteer work	4.5	74	Telephone/Internet	3.8
580	Other study	4.1	41	Buying food/supplies	2.5
500	Full - time classes	4.0	73	Talking/socializing	1.9
550	Breaks / waiting	3.3	54	Organising meetings	1.3
	Total	68.9		Total	96.8

See Appendices A and B for respective coding schemes.
Source: Nova Scotia teachers study, Canadian General Social Survey 1999, own calculations.

The ILO data indicate that the top five primary activity codes make up over 82%, while the top ten primary activity codes represent 97% of all non-work activity codes respondents relied upon to describe their teaching activities. The NSTU data indicate the top 10 primary activity codes represent 69%, while the top 14 make up 79 % of all contextually derived teaching activities. Not as many respondents (34.3%) from the NSTU study compared to those from the ILO study (37.8%) used contextually derived activity codes to describe their work, possibly due to the more exhaustive "employed work" categories within the NSTU activity-coding scheme.

When the NSTU data were filtered to include all activities that were reportedly performed for students, administrators, or the Teacher's Union (codes 1, 2, 3, 4, or 7 in the "for whom" category), the number of activity codes that respondents used to describe their work expanded from 16 to a total of 61. The three most frequently occurring contextually derived codes were attend-

ing meetings (13.5%), coaching (11.8%), and travel (11.2%). Contextually derived teaching activities represent 2.3 additional hours per respondent per week. This compares to an average of 7.4 additional work-hours per respondent per week from contextually derived teaching activities performed by 37.8% respondents in the ILO database.

Contextual coding provides a basis for redirecting the assignment of an event during coding, as some examples from the teacher's work time study illustrate. For example, "for whom" in both the ILO and NSTU versions of the teachers study indicated some instances of work-related shopping activities. Under normal coding procedures such shopping would invariably be classified as "domestic" instead of "work". That would introduce two errors into the data, "domestic work" time would be overstated and "paid work" time would be understated. Only if the task (e.g. shopping) and purpose (e.g. work) are distinguishable in the event can proper assignment be made. As another example, course attendance and homework are typically grouped in "professional development." However, it may actually be "paid work" for teachers during a professional development day.

While the above examples have focused on "paid work", the data indicate that each behavioural group is affected by improper assignment by missing or gaining events due to lack of "for whom" (purpose) information. In fact, organization/volunteer, professional development, domestic, sports, and travel activities, about half the behaviour groups, are represented in the top two-thirds of contextually derived work-related activities in the NSTU sample (Table 2). Similarly, the ILO data indicate six behaviour groups are affected by contextually derived work-related activities, with nearly two-thirds of the CD codes falling under "management". A considerable number of activities were assigned to work in lieu of their traditional assignment. Respondents assigned 63% of all coaching activities, normally assigned to sports, as work-related (Table 3). Over 40% of recorded "other study", "full time classes", "travel by other means", and "meetings" were assigned to "paid work". Other such assignments can be noted in Table 3.

The implications of using "for whom" information are further illustrated in Table 4, depicting the mean daily time allocation for each of the 10 behavioural groups in the NSTU coding scheme. Column A illustrates the amount of time spent in each behavioural group as reported by the activity code, column B indicates the amount of time engaged in those activities if they are reported as being "for work" (i.e. "for whom" equals 1, 2, 3, 4, or 7), while column C lists the daily time budgets for the same activities that were reportedly performed for non-work purposes (i.e. "for whom" equals 0, 5, 6, or 8). The final column reports the ratio of contextually-derived work activities (Column B) as a proportion of the total time spent engaged in that behavioural group (Column A). Contextually derived codes added an average of 19.2 minutes per day from behavioural groups other than work, 2.3 hours a week, to the teachers' workload (Table 4). This is primarily accounted for by "personal development", "meetings", "travel", "sports/hobbies", and "media". In the absence of the contextual coding that time, approximately 10% of the day would have been assigned to the incorrect behavioural groups from the respondents' perspective.

Table 3
Non-work codes attributed to work by coding approach , NSTU study

	Activity coded		For whom coded		Total	
	Number	%	Number	%	Number	%
Coaching	217	62.8	128	37.2	345	100.0
Other study	86	44.6	107	55.4	193	100.0
Full-time classes	76	42.8	102	57.2	178	100.0
Travel by other means	24	41.1	35	58.9	59	100.0
Meetings (union, family, other)	257	40.7	374	59.3	630	100.0
Breaks/waiting for class	60	37.9	99	62.1	159	100.0
Special lectures: occasional	62	31.2	138	68.8	200	100.0
Work for pay at other jobs	64	28.1	165	71.9	229	100.0
Volunteer work	84	24.8	255	75.2	339	100.0
Other classes (part-time)	41	21.7	146	78.3	186	100.0
Waiting before or after work	55	20.7	211	79.3	266	100.0
Leisure & special interest classes	12	20.7	45	79.3	57	100.0
Homework: Career or self	124	19.8	503	80.2	627	100.0

* Data are weighted by "day weight".
Source: Nova Scotia teachers study, Canadian General Social Survey 1999, own calculations.

Table 4
Time use (mean daily minutes) by work reporting approach, NSTU study

	A	B	C	D
Activity Group	Activity only	For work	Not for work	Ratio B/A [%]
Teaching	364.3	300.1	64.3	82.36
Domestic	125.9	1.7	124.3	1.33
Caregiving	36.7	0.7	36.1	1.78
Shopping	25.1	0.5	24.6	1.91
Personal	612.0	0.0	612.0	0.00
Development	17.0	4.5	12.6	26.27
Meetings	18.6	3.4	15.2	18.39
Entertainment	43.6	0.6	43.0	1.40
Hobbies	29.0	2.5	26.5	8.47
Media	92.2	2.1	90.1	2.28
Travel	75.5	3.4	72.2	4.47
Total	1440.0	319.3	1120.7	

* Data are weighted by "day weight".
Source: Nova Scotia teachers study, Canadian General Social Survey 1999, own calculations.

At the same time, 64.3 minutes, of "paid work", as identified by work activity, was not so assigned contextually. The point is not necessarily the actual numbers themselves, but the gestalt of misallocated time through current approaches to collecting and coding data.

In virtually all cases, if appropriate contextual data is collected and the activity is not compromised by specific assignment to a predetermined group, in a predefined behavioural grouping scheme, it can be properly assigned to any appropriate behavioural group for reporting or analysis through data manipulation.

6   Summary

Although time diaries date back to the early part of the last century, a solid basis on which to identify and classify activities continues to escape time use researchers. The approach of having respondents self-complete their diaries with a set of activity and contextual codes developed a priori requires a rethinking of our approach to coding of time diaries. It is argued here that the proper approach to coding first requires that the "behavioural units" (activities) be established. Once this is done, subsequent manipulation can be carried out to aggregate the identified activities into a plethora of "behavioural groups" (i.e. trading, production, personal care, paid work), each defined by a set of appropriate contextual variables.

The basic premise is that activity codes are essentially independent of their contextual setting. For example, cooking is the activity or behavioural unit and it may be assigned to employed work (if done for pay or profit), household production (if done for self or family at home), leisure/ socialising (if done for pleasure with friends), or professional development (if done as part of a school assignment). The purpose for performing the activity, social contact, and location are the three main contextual codes used to assign behavioural units to appropriate behavioural groups.

The purpose of a behavioural unit is the primary mechanism by which behavioural groups are defined, and its importance should not be underestimated. Whether the activity is performed for work, family, or oneself, determining the purpose of an activity allows researchers to classify that same activity into several different behavioural groups, depending on the objective of the research. The purpose of an activity, independent of the activity itself, also allows researchers to open the black box of paid work. For example, approximately one-third to one-quarter of all working activities performed by adults is for pay or profit. The use of contextual variables permits analysis of the types of activities that are carried out at work, such as cooking, cleaning, researching, caring, and meetings to name a few. The distinction between employment and other activities is based entirely on the purpose or "for whom" the activity was undertaken (Hoffman and Mata, 1999), and not only what it is that is being done.

Since a significant portion of activities occur as secondary activities, such as childcare and media, the purpose of secondary activities needs to be collected as well. Otherwise, there is no precise means of determining whether the secondary activity was performed for the same purpose as the primary activity. However, the other context variables, such as social contact and location are normally fixed for each event and are essentially independent of the activity performed and thus need not be collected separately for the secondary activity.

Social contact or social interaction is a difficult concept to illustrate and measure (McLennan, 1997). The same activity undertaken at the workplace and with the family is inherently different in terms of their social contact. As a result, the "with whom" contextual codes are used to determine various dimensions of social contact. Time alone, with family, or with friends is an important dimension of understanding the contextual setting of a distinct behavioural unit.

The use of locational attributes in concordance with different travel activity permits detailed analysis and modelling of regional travel behaviour. The location of activities also has important implications for the analysis of paid work, even though there are many different definitions of what constitutes work activities. For example, Drago et al. (1999) used the location contextual codes to examine the amount of work done at home, as a measure of "work invasiveness," the degree to which a workplace occupation invades family time at the home.

Two coding schemes, one from the ILO Trial Classification and another used by the NSTU study were used to illustrate the use of contextually derived activity codes and behavioural groups for analysis of time diary data. The primary focus was the varying degrees to which the different coding schemes inherently rely upon contextually derived or defined behavioural groups. The ILO and NSTU coding schemes appear to be, to different degrees, a compromise between a "type of activity" classification that is completely independent of the context in which activities are being carried out and a classification scheme that could be easily used by respondents to code their own activities. Essentially, teachers could potentially use any activity code to describe their work activities.

When the NSTU data were filtered to include all activities that were reportedly performed for students or administrators (codes 1, 2, 3, 4, or 7 in the "for whom" category),

- the number of activity codes that respondents used to describe their work expanded from 16 to a total of 61,
- 34% of respondents used contextually derived activity codes,
- the top 10 contextually derived primary activity codes represent 69% of all the contextually derived teaching activities,
- the three most frequently occurring contextually derived codes were meetings (13.5%), coaching (11.8%), and travel (11.5%), and
- contextually derived teaching activities represent 2.3 additional hours per respondent per week.

When the ILO data were filtered to include all activities that were performed for work (code 10 in the "for whom" category),

- the number of activity codes that respondents used to describe their work expanded from 8 to a total of 22,
- 38% of all respondents used these contextually derived activity codes,
- the top 10 contextually derived primary activity codes represent 97% of all the contextually derived teaching activities,

- the three most frequently occurring contextually derived codes were meetings (36.9%), clerical activities (19.1%), and travel (13.4%), and

- contextually derived teaching activities represent 7.4 additional hours per respondent per week.

The net result of the foregoing analysis is that under current coding practice there are behavioural units that are being improperly coded to behavioural groups through a priory assignment.

7   Conclusions

A need exists to capture both the activities in which individuals engage and the context in which they occur. It is necessary to know, at least, what activities are performed, "for whom" they are done, who was present and where the activities took place if we are to fully understand and accurately describe the use of time. The purpose of an activity, independent of the activity itself, should be the primary mechanism by which behavioural units are aggregated into different behavioural groups. The data structure has to be such that any event is definable to any meaningful descriptive or analytical purpose. The capture and use of social contact continues to challenge time use researchers. However, time-diary data that include "with whom" information permits analysis of social contact and thus needs to be an integral part of any classification of behavioural units into respective groups. The locational context codes are another important means of defining contextually derived behavioural groups, and are often underutilised insofar as their potential to permit linkage of spatial and temporal dimensions to time diary data.

The Australian study appears to offer an ideal testing ground for examining points raised here, from data collection through analysis. Their response rates are excellent given the complexity of their diary. The broad range of contextual variables offers ample opportunity to pursue a variety of behavioural grouping options. With existing database and querying technology, retrieval of alternate groupings for analysis presents only minor challenges. A more significant challenge would be to develop a system that could go from the natural language verbatim information recorded in the diaries, through the coding, grouping, and reporting.

The coding schemes that are used to represent different activities and their contextual settings have moved from the general to the specific. This movement towards the specific is inherently misguided. This report argues that a list of discrete activities, ideally including paid work detail, should be identified first. Then appropriate contextual variables can be identified, and used, as needed, to assign activities to different behavioural groups. The improved use of contextual codes, particularly "with whom" will increase the variety of activities, provide more analytical detail, reduce multiple frames of reference, facilitate comparability among coding schemes and allow researchers to derive significantly more information from the activity data, while relying on more general activity codes.

Appendix

Table A1
ILO coding scheme

Context codes

For whom	With whom	Where	Tension level
10 For work, pay, profit	1 Alone	1 Workplace	0 Very relaxed
21 Oneself	2 Own children	2 Own dwelling & sur-roundings	1 Relaxed
22 Own children	3 Other household mem-bers	3 Shops, banks, other public places	2 Somewhat relaxed
23 Others in household	4 Pets	4 Other premises	3 Neither relaxed nor tense
24 Relatives not in house-hold	5 Non-household relatives	5 Outdoors (parks, street, etc.)	4 Somewhat tense
25 Pets	6 Colleagues		5 Tense
30 Other/ mixed fam-ily/self	7 Friends		6 Very tense
31 Other children not of household	8 Non-household children		
32 Other adults not of household	9 Non-household adults		
33 School			
34 Church			
35 Community			
36 Organisation			
40 Other Purposes			

Activity codes

Teaching activities

  01 Class instruction

  02 Preparations for class instructions etc.

  03 Supervision of class or other groups of students

  04 Marking, grading, filling report cards

  05 Preparation of IPPs and IMPs

  06 Consultations, tutoring of individual students

  07 Student discipline

  08 Other teaching-related

42 Buying household appliances, articles, equipment

43 Buying other capital goods

44 Using banking and other financial services

45 Selling goods or services

46 Keeping accounts, paying bills

47 Other trading/ shopping

Management, administration, meetings (except teaching)

51 Management activities: discussing, negotiating, representing, organising, supervising or inspecting others (except students)

52 Clerical activities: storing, filing, sorting, classifying, calculating, typing

Table A1 cont.
ILO coding scheme

Activity codes	
Production activities and similar	53 Collecting materials, delivering goods
11 Gardening, digging, planting, harvesting, picking, etc.	54 Organising meetings
12 Tending animals	55 Attending meetings
13 Interior decorating, maintaining/ repairing of buildings	56 Other management
14 Making handicrafts, pottery, wood-working	**Caring activities**
15 Weaving, knitting, sewing and similar	61 Teaching, guiding, coaching, leading (other than students)
16 Food preserving: butchering, baking, curing	62 Giving medical care
17 Cooking, serving drinks	63 Washing, dressing, feeding, helping
18 Setting tables, serving food and drinks	64 Protecting
19 Other production activities	65 Accompanying
Driving and being transported	66 Other caring activities
21 Driving car or other vehicles	**Creative activities & entertainment**
22 Driving motorcycle	71 Thinking, researching, analysing, programming, synthesising, designing
23 Bicycling	72 Reading, writing (except as preparation for class instruction = 02)
24 Driving motor-boat, sailing	73 Talking face-to-face , socializing., hosting
25 Being transported in private car, boat or similar	74 Telephoning, Internet-chatting and similar
26 Being transported in public bus, train, boat, airplane, or similar	75 Drawing, painting, creating and performing music, acting, photographing, collecting objects, dancing
27 Other transport	76 Visiting and attending public places and events (museums, sports, religious, concerts,)
Cleaning, sweeping, ordering	77 Watching television
31 Cleaning dwelling, sweeping hall, stairs, yard	78 Physical exercise, playing and walking
32 Cleaning/washing dishes	79 Other creative activities
33 Cleaning/washing clothes/textiles, ironing, etc.	**Personal care & maintenance, passive periods**
34 Ordering papers, books and similar	81 Eating, drinking and personal hygiene
35 Ordering dwelling, rooms	82 Learning, studying
36 Sorting and disposing of garbage and similar	83 Receiving care
37 Other cleaning	84 Sleeping, relaxing, sitting, doing nothing, and affective activities
Trading/ shopping activities	85 Waiting
41 Buying food and household supplies	86 Other personal care

Source: International Labour Organization

Table A2
NSTU coding scheme

Context codes

For whom	With whom	Where	Tension Level
0 Self	0 Alone	0 Home	0 Very relaxed
1 Single student (not IPP)	1 Single student (not IPP)	1 Classroom	1 Relaxed
2 IPP Student(s)	2 IPP student(s)	2 Staff room	2 Somewhat relaxed
3 Multiple students	3 Multiple students	3 Office	3 Neither relaxed nor tense
4 Administrator	4 Administrator	4 Gymnasium	4 Somewhat tense
5 Family	5 Classroom teacher(s)	5 Outside (school yard)	5 Tense
6 Community	6 Specialist teacher(s)	6 Other (in school)	6 Very tense
7 Teachers' Union	7 Spouse/ Partner	7 In transit	
8 Other person(s)	8 Child(ren) of the household	8 Other place	
	9 Other person(s)		

Activity codes

Employed work

001 Class instruction/ tutoring

002 Administration

003 Preparation

004 Supervision

005 Extra-curricular

006 Meetings

007 Student discipline

008 Marking, grading

009 Paperwork, report cards

010 Telephone (work-related)

011 Committee work

012 IPP's

013 Travel during work

014 Waiting/ delays/ idle time at work

015 Work for pay at other jobs

016 Other teaching-related

Professional development

500 Full-time classes

511 Other classes (part-time)

512 Credit courses on television

520 Special lectures: occasional

530 Homework: course, career/self-development

550 Breaks/waiting for class

560 Leisure and special interest classes

580 Other study

Organizational, voluntary and general meetings

600 Meetings: professional, union, political, civic activity, support groups, fraternal and social organisations

610 Meetings: religious, religious services, prayer/bible readings

620 Volunteer work (organisations) and unpaid help for others

630 Other organisational, volunteer, or religious activity

Entertainment (attending)

700 Sports, concerts, fairs, parades, zoos

720 Movies, films, museums, art galleries, ballet, theatre

Table A2 cont.
NSTU coding scheme

Activity codes	
Domestic/household work	730 Socializing. with friends/relatives
100 Meal preparation (baking, cooking, cleanup)	740 Socializing. at bars, clubs (no meal)
120 Indoor cleaning/ outdoor cleaning	750 Casino, bingo, arcade
130 Laundry, ironing, folding, clothing care	760 Other social gatherings
140 Maintenance and repair (interior, exterior, vehicle, other)	**Sports and hobbies (participating)**
150 Gardening and pet care	800 Coaching
160 Other household tasks	810 Sports participation, exercising
Care giving for household members	820 Hunting, fishing, camping, other outdoor activities/excursions
200 Child care (getting ready for bed, school, personal care)	830 Hobbies, home crafts, music, theatre, dance
220 Helping, teaching, reading, talking, play with children	860 Games, video games, leisure computer use
230 Care of household adults (personal, medical, help & other)	870 Pleasure drives, sightseeing, other sport or active leisure
Shopping and services	**Media and communication**
300 Groceries and other regular shopping	900 Listening to the radio
310 Shopping for durable goods	910 Watching television
320 Services (government, financial, medical, dental, lawyer)	920 Listening to CD's, cassette tapes, or records
330 Automobile maintenance and repair services	930 Reading books, magazines, pamphlets, bulletins, newsletters
370 Waiting for purchases or services	940 Reading newspapers
380 Other shopping and services	950 Talking, conversation, telephone
Personal care	960 Mail (reading/ writing), other media and communication
400 Washing, dressing	**Travel**
410 Personal medical care (at home)	091 Travel (walking)
420 Private Prayer, Meditation and Other Informal Spiritual Activities	092 Travel by car as driver
430 Meals /snacks/coffee	093 Travel by car as passenger
440 Restaurant meals	094 Travel by bicycle
450 Sleep/ naps	095 Travel by public transit
470 Relaxing, thinking, resting, smoking	096 Travel by other means
480 Other personal care or private activities	

Source: Nova Scotia Teachers Union

References

Ås, D. (1978), Studies of time-use – Problems and prospects, in: *Acta Sociologica*, Vol. 21, No. 2 125-141.

Australian Bureau of Statistics (2002), The 1997 Australian Time Use Activity Classification, http://www.abs.gov.au/ausstats/abs@.nsf/dossbytitle/0A95B1782162EA4ACA256BD000279391?, Open document.

Australian Bureau of Statistics (2008), Changes to the classifications and coding lists – Time use survey, User Guide 2006, http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/534CC45E2D823CC2CA2573 F5 00149803 ?, Open document.

Bediako, G. and J. Vanek (1999), Trial international classification of activities for time use statistics, in: Merz, J. and M. Ehling (eds.), *Time use-research, data and policy: Contributions from the international conference on time use (ICTU)*, FFB-Schriftenreihe Band 10, Nomos Verlagsgesellschaft, Baden-Baden, 151-161.

Barker, R.G. (1968), *Ecological psychology – Concepts and methods for studying the environment of human behavior*, California University Press, Stanford.

Blanco, M.L. (2011), *Personal correspondence*, Oficina de Investigaciones Económicas Banco Central de Venezuela.

Bureau of Labor Statistics (2011a), The American time use survey user's guide: – Understanding ATUS 2003 to 2010, http://www.bls.gov/tus/atususersguide.pdf.

Bureau of Labor Statistics (2011b), American time use survey – Activity coding lexicons, www.bls.gov/tus/lexicons.htm.

Chadeau, A. (1992), What is households' non-market production worth?, OECD Economic Studies No. 18, OECD.

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

Clark, S.M. and A.S. Harvey (1977), An evaluation of the multinational activity classification and coding system – A working paper, Regional and Urban Studies Centre, Institute of Public Affairs, Dalhousie University, Halifax.

Clark, S.M., Harvey, A.S. and S.M. Shaw (1990), Time and leisure – Subjective and objective aspects, in: *Social Indicators Research*, Vol. 23, No. 4. 35-50.

de Vaus, D., Gray, M. and D. Stanton (2003), Measuring the value of unpaid household, caring and voluntary work of older Australians, AIFS Research Paper 34, Melbourne.

Drago, R., Caplan, R., Costanza, D., Brubaker, T., Cloud, D., Harris, N., Kashian, R. and T.L. Riggs (1999), New estimates of working time for teachers, in: *Monthly Labor Review*, Vol. 122, No. 4, 31-41.

Ehling, M. (1999), The German time use survey – Methods and results, in: Merz, J. and M. Ehling (eds.), *Time use-research, data and policy – Contributions from the International Conference on Time Use (ICTU)*, FFB-Schriftenreihe Band 10, Nomos Verlagsgesellschaft, Baden-Baden, 89-105.

Elchardus, M. and I. Glorieux (1993), Towards a semantic taxonomy – Classifying activities on the basis of their meaning, in: Time use methodology – Toward concensus, ISTAT, Rome.

EUROSTAT (1999), Survey on time use – Activity coding, Eurostat, Statistics Finland.

Fedick, C.B., S. Pacholok 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, No. 1, 67-87.

Frederick, J. (1993), Measuring child care and sleep – Some results from the 1992 Canadian General Social Survey, Statistics Canada, Ottawa.

Goldschmidt-Clermont, L. (1990), Economic measurement of non-market household activities – Is it useful and feasible?, in: *International Labour Review*, Vol. 129, No. 3, 279-299.

Govaerts, E. (1969), *Loisirs des femmes et temps libre*, Universite Libre de Bruxelles, Bruxelles.

Harvey, A.S. (1993), Objective and subjective approaches to the measurement of work, in: Time use methodology – Toward consensus, ISTAT, Rome.

Harvey, A.S. (2003), Time-space diaries – Merging traditions, in: Stopher, P. and P. Jones (eds.), *Transport survey quality and innovation*, Pergamon/Elsevier, New York, 151-180.

Harvey, A. and I. Niemi (1994), An International Standard Activity Classification (ISAC) – Toward a framework, relevant issues, in: Kalfs, N. and A.S. Harvey (eds.), Fifteenth reunion of the International Association for Time Use Research (IATUR), June 15-18, 1993, Amsterdam, 226-245.

Harvey, A.S. and J.E.L. Spinney (2000a), Life on & off the job – Time-use study of Nova Scotia teacher*s,* Time-use Research Program, Saint Mary's University, Halifax.

Harvey, A.S. and J.E.L. Spinney (2000b), Coding for the measurement of teachers' time-use on the job*,* Working paper, Halifax.

Harvey, A.S. and J.E.L. Spinney (2001) When is there time for students? – Exploring the temporal dimension of the teacher-student interface, Time-Use Research Program, Saint Mary's University, Halifax.

Harvey, A.S. and M. Royal (2000), Use of context in time-use research gender issues in the measurement of paid and unpaid work*,* Prepared for Expert Group Meeting on Methods for Conducting Time-Use Surveys, United Nations Document ESA/STAT/AC.79/16, New York.

Harvey, A.S. and M.E. Taylor (2000a), Time Use*,* in: Glewwe, P. and M. Grosh, (eds.), *Designing household survey questionnaires for developing countries lessons from 15 years of the living standards measurement study,* World Bank, Washington.

Harvey, A.S. and M.E. Taylor (2000b), Activity settings and travel behaviour – A social contact perspective, in: *Transportation*, Vol. 27, No. 1, 53-73.

Harvey, A.S. and W.S. MacDonald (1976), Time diaries and time data for extension of economic accounts, in: *Social Indicators Research*, Vol. 3, No. 1, 21-35.

Harmonized European Time Use Study (2011), Web application for the Harmonized European Time Use Study, https://www.h2.scb.se/tus/tus/default.htm.

Hoffamn, E. and A. Mata (1999), Measuring working time – An alternative approach to classifying time use*,* in: Merz, J. and M. Ehling (eds.), *Time use - research, data and policy – Contributions from the International Conference on Time Use (ICTU)*, FFB-Schriftenreihe Band 10, Nomos Verlag, Baden-Baden.

INSTRAW (1995), Measurement and valuation of unpaid contribution – Accounting through time and output, Santo Domingo.

Janelle, D. and M. Goodchild (1983), Diurnal patterns of social group distributions in a Canadian city, in: *Economic Geography*, Vol. 59, No. 4, 403-425.

Javeau, C. (1970), *Les vingt-quatre heures du beige*, Universite Libre de Bruxelles, Bruzelles.

Jones, P.M. and P.R. Stopher (2003), *Transport survey quality and innovation*, Elsevier Science, Oxford.

Juster, T. (1973), A framework for measuring performance, in: Moss, M. (ed.), *The measurement of economic and social performance*, National Bureau of Economic Research, Cambridge 23-110.

Krueger, A., Kahneman, D., Fischler, C., Schkade, D., Schwarz, N. and A. Stone (2009), Time use and subjective well-being in France and the U.S., in: *Social Indicators Research*, Vol. 93, No. 1, 7-18.

Mata-Greenwood, A. (1992), An integrated framework for the measurement of working time, ILO Working Paper 92-2, Geneva.

McLennan, W. (1997), How Australians use their time, Australian Bureau of Statistics.

Merz, J. and L. Osberg (2009), Keeping in touch – A benefit of public holidays using time use diary data, in: *electronic International Journal of Time Use Research*, Vol. 6, No. 1, 130-166.

Merz, J. and T. Rathjen (2009), Time and income poverty – An interdependent multidimensional poverty approach with German time use diary data, FFB-Discussion Paper No.79, Lüneburg.

Michelson, W. (1999), Analysis and exploration of meaning and outcomes in connection with time use data, in: Pentland, W.E., Harvey, A.S., Lawton, M.P. and M.A. McColl (eds.), *Time use research in the social sciences*, Plenum, New York 91-125.

Millward, H. and J.E.L. Spinney (2010), Time use, travel behaviour, and the rural-urban continuum – Results from the Halifax STAR Project, in: *Journal of Transport Geography*, Vol. 19, No. 1, 51-58.

Mullan, K. and L. Craig (2009), Harmonizing extended measures of parental childcare in the time-diary surveys of four countries – Proximity versus responsibility, in: *electronic International Journal of Time Use Research*, Vol. 6, No. 1, 48-72.

Murakami, E. and D.P. Wagner (1999), Can using global positioning system GPS improve trip reporting?, in: *Transportation Research Part C: Emerging Technologies*, Vol. 7, No. 2-3, 149-165.

Patrushev, V.D. (1961), Studium des Zeitbudgets der Werktätigen, in: *Vestnik Statistiki*, No. 11.

Roy, D. (2011), Personal correspondence, INSEE - D3E - Division Redistribution et Politiques Sociales MK2 - Bureau 2047.

Rydenstam, K. and Wadeskog, A. (1998), Evaluation of the european time use pilot studies, Doc E2/TUS/5/98 Eurostat, Luxembourg.

Schneider, A. (1972), Patterns of social interaction. in: A. Szalai (ed.), *The use of time,* Mouton Press, The Hague and Paris.

Shelley, K.J. (2005), Developing the American time use survey activity classification system, in: *Monthly Labor Review*, Vol. 128, No. 6, 3-15.

Spinney, J.E.L., Scott, D.M. and K.B. Newbold (2009), Transport mobility benefits and quality of life: A time-use perspective of elderly Canadians, in: *Transport Policy*, Vol. 16, No. 1, 1-11.

Spinney, J.E.L. and H. Millward (2011a), Weather impacts on leisure activities in Halifax, Nova Scotia, in: *International Journal of Biometeorology*, Vol. 55, No. 2, 133-145.

Spinney, J.E.L. and H. Millward (2011b), Mode choices and the journey between home and school – Examining the children, schools, and neighborhoods, in: *Children, Youth and Environments*, in press.

Stopher, P., Xu, M. and C. FitzGerald (2007), Assessing the accuracy of the Sydney household travel survey with GPS, in: *Transportation*, Vol. 34, No. 6, 723-741.

Swedner, H. (1970), Proposals for a nomenclature for human activities with particular reference to cultural activities, in: *Society and Leisure*, Vol. 4, No. 1, 119-147.

Szalai, A. (1972), *The use of time*. Mouton Press, The Hague and Paris,.

Timmermans, H., van der Waerden, M., Alves, P., Polak, M.J., Harvey, A., Ellis, S., Kurose, K. and R. Zandee (2003), Spatial context and the complexity of daily travel patterns – An international comparison, in: *Journal of Transport Geography*, Vol.11, No. 1, 37-46.

van den Broek A., Knulst, W.P. and K. Breedveld (1999), Different times?, Social and Cultural Studies No. 29, The Netherlands Institute for Social Research, The Hague.

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

ITALIAN TIME USE DIARY AND COMPUTER BASED EDITING

Anna Emilia Martino
ISTAT – Italian Institute of Statistics, Rome

The data quality of the daily diaries is of fundamental importance for the Italian Time Use Survey. This is characterized, for it's amount of questionnaires and diaries, by a long process of data editing. In the past (02/03) and current editions (08/09), it has been optimized, reaching a high level of data editing quality, throughout different procedures and applications.

Among these, two SAS/AF frames have permitted to correct all the residual data which hasn't been corrected throughout all the deterministic and probabilistic procedures because of their excessive inconsistencies, incompatibilities, and impossibility to be corrected by generalized rules.

The first frame, introduced in the 2002/2003 edition, has been developed for the non-automatic correction of the daily diaries; the correction has been possible because of the visualization of the whole diary, other individual and household information, and also the day diaries of the rest of the household.

The second, introduced in the current edition, for the correction of all of the dates on the diaries and questionnaires. The determination of the effective compiling day of the daily and week diary is of fundamental importance for the calculation of the weights. The novelty of this frame, is the possibility to visualize interactively all the information about a household necessary to correct the variables indicating dates; both the daily diary and the weekly diary can be checked out to reconstruct the dynamics of the day/week, and interactively with the ones of the other members of the household; in this way we can also recover missing information with the help of all the questionnaires/diaries, and of all the members of the household. Therefore, also dia-

ries which seemed impossible to correct have been recovered, and the one by one diary correction has let the Time Use Survey improve and reach a better data quality throughout the various editions.

The third edition of the Italian multi-purpose Time Use Survey has been carried out in 2008-09, interviewing a sample of 18,250 households. The data has been collected by using a PAPI technique and the survey instruments used to gather the information have been the daily diary, the week diary, the individual and household questionnaire. All of the survey instruments contain a very detailed and complex quantity of information, related to a household and it's components, a day diary and a reference week of working time.

For the high level of detailed information contained in the day diary, the data quality of the daily diaries is of fundamental importance for the Italian Time Use Survey, since the indicators of measurement of the durations of the various activities are very sensitive to any change or correction. Furthermore, the coherency of all the dates and information reported on all the questionnaires and diaries is necessary to reconstruct the dynamics of the Italian population and to have a realistic picture of the Italian society. The quality of data is considered one of the main objectives of the official statistics, and is pursued in order to obtain a reliable representation of data, access and exploit a file of coherent information and guarantee a high quality of the esteems.

Therefore, the Italian TUS is characterized, for it's amount of questionnaires and diaries, by a complex process of data editing. In the past (2002-03) and current editions (2008-09), it has been optimized, reaching a high level of data editing quality, throughout different procedures and applications.

This paper illustrates the correction process of the day diaries, and of the dates of all of the survey instruments throughout a deterministic process of editing first, and afterwards with the exploitation of two tools developed in the SAS/AF language.

The Correction of the day diary

The information gathered by the day diary concerns the main activity, the parallel activity, the activity's locations, the modes of transport, the with whom codes, and the ancillary codes, which are created during the codification phase to individuate incoherent situations.

Though the language is subject to shared rules, it expresses meanings that can change depending on the context. Hence, at times, the description of the activities is not enough for their codification; it becomes necessary to read the context where the activity was carried out (see Bolasco, 1997; Camporese et al., 2001; Romano, 2004a).

Therefore, the correction process concerns not only the main activities, but also the parallel activities, the locations and the persons with whom the activities were carried out.

Moreover, the lack of coherence in the sequence of activities leads to the necessity of developing procedures that take into account the global vision of the diary.

Only part of the diaries has been corrected by the automatic correction, by using SAS proce-dures throughout rules that compare the main activities, the parallel activities, the locations and the with whom codes on the same record, and, when necessary, the sequence of the episodes in order to maintain a code consistency among and within records. A before-after report permits to check out the editing performed on the data. Only the accurate analysis of this report permits the validation of the correction rules. The report is organized to point out the episodes with er-rors and the successive corrections, and it also shows the two previous and two following epi-sodes , in order to keep under control not only the singular correction, but also the accuracy of the episodes' sequence. (see Baldazzi e al. 2004)

The rules of automatic correction can be very complex, taking into account a high number of variables, comparing more than one preceding episode with more than one following episode. Also textual information is considered, retrieving strings from contiguous episodes enables to compare the activities of the preceding episodes with those of the following. The consistency checks are so numerous that the plan of editing includes up to 950 rules.

The incompatibilities among codes are also individuated by using ancillary codes indicating strange situations. Nevertheless, although the correction rules manage a consistent number of errors and inconsistencies, there are some that create ambiguous corrections (for example, the singular correction can appear right, but the episodes' sequence is contorted), or cannot correct the data because the correction is based on the analysis of the contextual information.

The Day Diary Correction Frame

The non-automatic correction process has been introduced to correct all the residual errors, not otherwise corrected by the automatic procedures. The presence of generic inconsistencies and missing information in the diary have made necessary the visualization of all of the infor-mation, inherent the day diary and fundamental to carry out the corrections.

Introduced in the 2002-03 edition, a SAS/AF frame has permitted to navigate among:

• the whole diary

• the individual and household information of the diarist

• the day diaries of the rest of the household

By checking out the diaries of the other household members, and by visualizing the contextual information, the reconstruction of the reality of the diary has been possible and, therefore, the insertion and the editing of the missing information. The diaries to correct have been extracted according to generic rules individuating major inconsistencies or incompatibilities. In corre-spondence to the episodes with missing round trips to/from work, school, and other places, empty records have been inserted to reconstruct the dynamics of the travelling. The visualiza-tion of the sequence of the episodes of the day diaries has enabled the editing, which has been carried out by following the standards agreed upon per each kind of error and incompatibility. In order to keep under control the editing process, a summary with a synthesis of the diaries'

correction indicates the total number of diaries to correct, the total number of the corrected diaries and the total number of diaries still to correct.

Therefore, with the synthesis of the diaries correction, the monitoring of the correction phase has been possible and all the diaries have been corrected.

Automatic editing versus non-automatic editing of the day diary

The correction process is considered an integration between the automatic editing and the non-automatic editing; they interact in a different way, the first cannot substitute the second because its correction is punctual and concerns only part of the diary, meanwhile the non-automatic correction can be broader taking into account the entire context of the diary. In this way, the correction process is complete considering all of the aspects and information contained in the diary. The statistics about the corrected diaries demonstrate the strong interaction between the automatic editing and the non-automatic editing (Table 1):

Table 1

	Frequency	%
Number of diaries corrected at least once	50377	98 %
Number of diaries corrected only by the automatic procedures	14936	30 %
Number of diaries corrected by both procedures, automatic and non - automatic	34917	69 %
Number of diaries corrected only by the non-automatic procedure	524	1 %
Number of episodes corrected at least once	574857	37 %
Mean number of corrections per corrected diary	15,6	

Source: Time use survey 2002-03, own calculations.

In simple terms, each diary is composed of an average of 30 episodes, and at least one episode of almost all the diaries have been corrected.

The Correction of the variables indicating dates

The Time Use Survey's instruments of data collection include, other than the day diary, also the week diary, an individual questionnaire and a household questionnaire. More than one date is surveyed on the questionnaires, and this is necessary to be sure that the dates indicated for the diaries' compilation have been respected and are coherent among themselves.

The variables provided by the questionnaires indicating the dates, and implicated in the correction process are 14:

(1)   Theoretical date provided in the sample (date indicated in the sample for the compilation of the diaries)

(2)   Theoretical day of the week provided in the sample (kind of day indicated by the sample for the compilation of the diaries)

(3)   Effective date of compilation of the day diary recorded in the diary (real date in which the day diary was filled out and reported on the diary)

(4)   Day of the week calculated from the effective date recorded in the diary

(5)   Day of the week recorded on the day diary

(6)   Date of the first compilation day of the week diary recorded in the diary (date of the first day of the week in which the week diary was filled out and reported on the diary)

(7)   The 7 dates recorded in the week diary

The first two dates are not on the questionnaires and are only provided by the sample; they cannot change and are fundamental to correct all of the other information about the dates. Besides the importance the dates' concordance assumes in the evaluation of the type of day the activities are carried out, the correction of the dates is important for many other reasons.

For instance, the determination of the effective compiling day of the daily and week diary is of fundamental importance for the calculation of the weights, and, as known, the weights are necessary for the esteems of the durations of the activities of the population.

Depending on the presence of the daily diary and/or of the weekly diary, we have individuated the cases of correct compilation. 55 correction rules have been formulated to correct automatically the inconsistencies or individuate definitively when the rules of compilation of the diaries haven't been respected.

Most part of the rules considers only the dates, using the criterion of the prevalent of consistent information. In these cases, the editing of the missing dates is performed by using the prevalent dates in which the diaries and questionnaires were filled out.

Anyhow, the complexity of some situations implies the necessity of visualizing all of the information present in the day and week diaries; not only the ones of the individuals with inconsistent dates, but also the ones of the other members of the household.

The Dates' Correction Frame

The second frame has been introduced in the current edition of the survey, for the correction of all of the residual errors, not otherwise corrected by the automatic procedures, regarding the dates on the diaries and questionnaires.

The novelty of this frame, is the possibility to visualize interactively all the information about a household necessary to correct the variables indicating dates; both the day diary and the weekly diary can be checked out to reconstruct the dynamics of the day/week, and interactively with the ones of the other members of the household.

The data about the household members are all treated contemporarily; this in order to compare the dates of the diaries' compilation of each member. In case the general and household information is not enough to reconstruct the reality of the dates, the corresponding day and week diaries of all the members of the household can be checked out. The day diary can indicate the kind of day the diary was filled out, for example on a weekday, Saturday or Sunday. The day diaries of the other members of the household can be checked out to understand if they were compiled on the same day or other. This is all fundamental for a coherent correction of the dates of all the members of the household.

Automatic editing versus non-automatic editing of the dates

In synthesis, in the tables below we can summarize the amount of edits made on the dates of the various diaries and questionnaires (Table 2). The number of individuals with inconsistent dates of the diaries and questionnaires are 14,8%; 11,5% of the individuals' diaries have been corrected by deterministic rules, another 3,3%, the ones with excessive inconsistent information, has been corrected by the SAS/AF frame.

Table 2

Time use survey 2008-2009	N.
Respondents to the questionnaire	44606
Day diaries	40944
Week diaries	37610
Respondents that have filled in at least one diary	42590

Source: Time use survey 2008-09.

Table 3

The situation of the dates	N.	%
Individuals with correct dates of the diaries	36278	85,2
Individuals with inconsistent dates of the diaries	6312	14,8
- Checked with deterministic rules	4917	11,5
- Checked with SAS/AF frame	1395	3,3
Total individuals with at least one diary	42590	100,0

Source: Time use survey 2008-09, own calculations.

This indicates that also diaries which seemed impossible to correct have been recovered, and the one by one diary correction has let the Time Use Survey improve and reach a better data quality throughout the various editions.

In conclusion, the integration of the automatic correction of the Time Use data with the two tools of non-automatic correction has improved the process of data editing. By exploiting all of the available information about the diaries, and by using a human point of view to reconstruct the reality of the diaries it has been possible to live again the diarist's day and bring the proper

corrections to the unfolding of the daily activities; this in the case of the day diaries, but also of the dates.

Furthermore, the strategy of data editing has been text-driven; the recording of strings in a prior stage and the use of textual information has been fundamental for the Time Use editing process, and for the quality of data on the whole.

REFERENCES

Baldazzi, B., Cappadozzi, T., Di Torrice, M. e L. Francovich (2007), *Principali innovazioni nel processo di codifica e correzione nell'Indagine Uso del Tempo 2002-2003,* in I tempi della vita quotidiana. Un approccio multidisciplinare all'uso del tempo, Argomenti n.32 Istat.

Bolasco, S. (1997), *L'analisi informatica dei testi*, in Ricolfi L. (a cura di), La ricerca qualitativa, La Nuova Italia Scientifica, Roma.

Camporese, R. and R. Ranaldi (2001), Time use activities: translation from sentences to codes, paper presented at CLADAG, Palermo, July, 5-6.

Istat (2008), *Time Use in Daily Life- A multidisciplinary approach to the time use´s analysis,* Argomenti n. 35 Istat

Istat (2006), *Il Sistema di Indagini Sociali Multiscopo,* Metodi e Norme n.31, Istat

Romano, M.C., Vitaletti S. E R. Camporese (2004)c, Improving time use data quality. Recent experiences in Italy, paper presented at RC 33 Sixth International Conference on Logic and Methodology, Amsterdam, August, 16-20.

Romano, M.C. (2004), *Le indagini Multiscopo dell'Istat sull'Uso del Tempo*, in Fraire M., I bilanci del tempo e le indagini sull'uso del tempo, CISU, Roma.

Allegra, S. F. and B. Baldazzi (2008), Data Editing and Quality of Daily Diaries in the Italian Time Use Survey, *Quality & Quantity*, Volume 42, N.6, 809-822

NEW APPROACHES OF THE 2009 KOREAN TIME USE SURVEY

Jonghee Choi
Statistics Korea

The 2009 Korean Time Use Survey will be the third survey involved in collecting information on how Koreans spend their time. This survey is conducted every 5 years beginning in 1999. The purpose of the survey is to provide information on how Koreans spend their time and when they conduct certain behaviors. The results of the survey provide information for the evaluation of life style and quality of life of Koreans. Data on time spent on unpaid household work can be used to evaluate household work of women. Data on time spent on other various activities can be used in academic areas and public policies related to labor, welfare, culture, education, and transportation.

Description of the survey

Sample design

The sample for the Time Use Survey can be defined at four levels: a sample of enumeration districts(EDs), a sample of households, a sample of individuals and a sample of diary days. EDs totaling 540 from the survey population and 15 households from each sampled ED were selected by the stratified sampling method and simple random sampling, respectively. Within each household, all household members aged 10 years or older were included in the sample of individuals. The diary days were pre-assigned according to the order in the household address file.

Design of questionnaires and diaries

The 2009 Time Use Survey includes three parts : a Household Questionnaire for the household representative, Individual Questionnaire for respondents 10 years old and over, and the Time-Diary.

The Household questionnaire and individual questionnaire

The Household Questionnaire collected data on household characteristics including the type of occupancy, dwellings and floor space. The Individual Questionnaire collected data on individual characteristics including relationship to the head of the household, gender, age, caring for infant children, feelings about pressure of time, the gender roles, economic activity, side job, weekly working time, industry, occupation, employment status, monthly average of income, days-off, and subjective evaluation of time pressure and tiredness.

Time-diary

In the Time-Diary, all of the household members aged 10 years and over were asked to record the main and simultaneous activities in the time diary which was structured in 10 minutes intervals for the designated two days. Afterwards, all of the self-recorded activities in the Time-Diary were coded into three-digit activity codes designating 144 different activity categories . The Time-Diary included the following main activity, with whom do you do the main activity, simultaneous activity, home or away from home and mode of transportation.

Classification of activities

All of the activities are classified into 9 first-level categories, 50 mid-level categories, and 144 third-level categories.

There are still some limitations in the Classification of Activities. Some activities do not have a clear classification within the three-digit groups.

New approaches of the 2009 KTUS

The third Time Use Survey in Korea has undergone a several changes to meet the new demands.

Methodological issues

In consideration of the various seasonal effects during the year, the KNSO conducted the survey once in spring of 2009 and again in the fall at the same year.

We determined that two observations a year on time usage provides an acceptable average for the entire year. Selection of the survey period and duration of the survey are also very important in accurately representing. In the 2009 KTUS, spring and September were selected as representative months of the year.

Questionnaire

The 2009 Time Use Survey included the phrase "with whom" in the time diary with the activities to assist in fully understanding the main activities.

We defined "with whom" as other person(s) contributed to the same responsibility for the main activity.

We divided the "with whom" categories as follows: alone, child aged under 7, spouse, other family or relatives, other(exclude unknown, audience, etc)

There are some limitations and problems in deciding the definition of "with whom". For example, At church or in a meeting, do we include the audience or crowd? Also, in the work place do we consider the work with others as" with whom" even though employed work separately at their desk without meeting. To consider the correct use of categories "with whom", we need to limit its use to major activities including 4. housework, 5. caring, 6. participants & volunteering, and 7. leisure.

Classification of activities

We developed our own classification of activities in 1999 with consideration to our cultural heritage and the present trends such as the increasing usage of computers and related technologies. We also followed the guidelines from the proposal of EUROSTAT and the UNSD. There are 9 main groups, 50 2-digit groups and 143 3-digit groups in 2009. The difference between the 2004 and 2009 classification of activities are in the 3-digit groups. To incorporate new activities, the KNSO further divided the 3-digit group from 137 in 2004 into 143 in 2009.

For example, 260 purchasing employment related goods is divided by 261 purchasing employment related goods through off-line methods(visiting store) and 262 purchasing employment related goods through on-line methods(Internet, home shopping, etc). Also, it was applied in the same way to 330. purchasing education related goods and 780 leisure activities related goods.

As there are many kinds of outlets for media in leisure activities, we clarified the new medium's groups, for example, PMP(Portable Multimedia Player) and DMB(Digital Multimedia Broadcasting). For 737 Internet surfing, the KNSO breaks it down into 737 Internet surfing for information and 738 other Internet use(Homepage, Blog management) according to the purpose of internet use.

To calculate women's time spent caring for their children under school age, we focused on time spent supervising children. The reason behind this is that supervising children and passive child care might have been under-reported in the previous survey. Time spent supervising chil-

dren would have to be obtained as a secondary activity to the main activities, such as doing housework, watching television, or meeting friend. So the KNSO included both direct care activities and indirect ones such as time for taking their child along to activities because of a lack of alternative supervisor.

As computer usage is increasing, we separately classify shopping for 2. Employment, 3. Study, and 7. Social life, recreation and leisure as shopping via the Internet and offline methods(4.Domestic activities related to shopping has already been separated as online and offline in the previous survey)

We do not separate the "pet care" activity as its own 3-digit group but the activity is included in the category of 443 other home maintenance within 44 . household upkeep.

The KNSO need to separate the "pet care" activity from the present category such as other countries since the population that owns pets is increasing in Korea.

Conclusion and suggestions

The KNSO carried out the time use survey once a year in 1999 and 2004. In 2009, the KNSO pursued a new trial for conducting the survey twice a year to more fully represent people's time use patterns during the entire year. In order to nullify the seasonal effect in the future, we need to carry out the survey four times a year or even perhaps 12 times to accurately represent the time use of people throughout the whole year.

The KNSO classified several further activities to properly reflect our life patterns. However, limitation exist in classifying some activities. We need to clarify some categories for new trends in activities, for example, the use of PC and Internet.

To get the optimal sample for the time use survey, we have to consider the inclusion of household's characteristics such as the number of families in a strata for sampling. It would be more effective to include a household's characteristics in sampling instead of considering them after stratifying for weight which has been applied to the 2009 survey.

For the non-response sample, we take the substitute method, which means if a household refuses to answer questions, we substitute another household neighborhood within the same ED. Therefore, we have over a 98% collecting rate for questionnaires. This collecting rate is very different from the response rate, so we have to prepare a solution for the non-response treatment in future.

Expert groups involved in the international classification for time-use activities need to further discuss the development of an international standard for the Classification of Activities for comparison between countries.

To overcome the problem and to develop the survey, the KNSO have to study the survey and improve it constantly. Thus, we are now considering the option of conducting the survey every 3 years instead of every 5 years.

After releasing the data for 2009, the KNSO will hold Time Use Research seminar for further analysis in time use. The KNSO will encourage users not only to analyze further time use data but also to provide some idea for the future survey's development. In the future, we would like to hold an international conference to share the information concerning time use research with the international community.

GOING GLOBAL – EXPANDING CAPACITY TO ANALYSE TIME USE DATA

Kimberly Fisher

Centre for Time Use Research, Department of Sociology, University of Oxford

From its first incarnation as the Working Group on Time Budgets and Social Activities at the International Sociological Association meeting in Varna, Bulgaria in September 1970, the International Association for Time Use Research has had global interests and attracted a global audience. Two of the first twenty conferences took place in Mexico City (Mexico 1982) and Delhi (India 1986). Early IATUR members hailed from Brazil, Colombia, the Dominican Republic, Egypt, Kuwait, India, Mexico, Nigeria, Sri Lanka, South Africa, Tanzania, Thailand, Turkey and Venezuela. Nevertheless, until very recently, most time use surveys were collected in the more developed Northern Hemisphere countries (Fisher et.al. 2011). The overwhelming majority or time-relevant publications and papers presented at academic conferences have concentrated on daily activity patterns in Australia, Canada, the USA, European countries, and the more developed North-East Asian countries. While IATUR Regional Council Members have tended to live and work in the regions they represent, until 1992, the Council Member for Africa was based in Europe or North America. Prior to the election of co-Vice-Presidents Lara Gama de Albuquerque Cavalcanti from Brazil and An Xinli (   ) from China in 2011, no member of the IATUR core executive came from the global south.

The Beijing Platform for Action from the United Nations, Fourth World Conference on Women in 1995 urged more countries to collect time use data to reveal the extent of women's economic contributions, which at that time, and even now, to a large extent, remain invisible (Antonopoulos and Hirway 2010; Esquivel et. al. 2008). Since then, a number of UN agencies, including the United National Development Program (UNDP), United Nations Statistics Division (UNSD) and the United Nations Development Fund for Women (UNIFEM), have sponsored and encouraged the collection of time use statistics, though the overall impact of these initiatives have been limited to date. Statistics South Africa at present is the only country in the global south to have an official national sample time diary survey time series (2000 and 2010), though a number of countries in Latin America have collected time series recall time use questions covering a range of domestic activities (Esquivel et. al. 2008), and smaller scale survey time diary time series have been collected in Brazil, Chile, India and Pakistan. The main barriers to the wider collection of time use studies include:

- The cost of collecting data (even though time diary surveys offer value for money in terms of the overall policy-relevant research output each survey can produce, the initial cost outlay is high, and can prove prohibitive without an external support for many national statistical agencies);

- A general lack of awareness of the value of time use surveys and capacity to analyse diary data. In contrast with the wealth of text books training economists, statisticians, demographers and other social scientist to use labour force survey and household expenditure data, only a handful of text books teach the practicalities of collecting and analysing time use data, and these books are available only in English (Michelson 2005), Spanish (Durán 2007) and Portuguese (Durán 2010). Few summer schools or universities offer time use courses, and such courses as do exist have been treated as speciality subjects rather than core curriculum. Few of those courses that do exist have been offered in the global south. Some national statistical offices, particularly Statistics Norway (Gustav Haroldsen and Odd Frank Vaage) and Statistics Sweden (Klas Rydenstam), have made extensive efforts to train national statistical office staff in other countries and assisted with the collection of time use surveys, but usage of these surveys has been minimal as few academics and civil servants have had the training to make use of these resources once collected.

- A lack of co-ordination of efforts to expand capacity to use time use surveys around the world.

Happily, these circumstances are changing. Indira Hirway, the IATUR Council Member for South Asia and the Middle East, who has championed the cause of increasing time diary research in the global south for decades, has achieved a number of recent successes. She and co-editor Rania Antonopoulos have released a seminal book documenting the policy significance of time use research in economic development (2010). She has secured funding to set up the Time Use Research Cell (TURC) in the Centre for Development Alternatives (www.cfda.ac.in). TURC hosted a workshop, Harmonization of Time Use Surveys at the Global Level with Special Reference to Developing Countries, in April 2011, and has been developing a curriculum for increasing capacity to collect and analyse time use studies in developing countries (http://www.cfda.ac.in/curriculum_development.html).

While IATUR devotes a significant portion of institutional income to the Andrew Harvey Fellowships that fund the travel of students and people from developing countries to annual conferences, the miniscule budget on which the Association operates has meant these funds are not large, and hence the participation by people from many countries has been limited to a fraction of those interested in this research field. In an effort to raise more generous travel support, IATUR President, Michael Bittman has explored options to improve IATUR income streams. At the same time, Professor Hirway, Nancy Folbre, and Valeria Esquivel (IATUR Council Member for Central and South America), who all are active members of IATUR as well as the International Association for Feminist Economists (IAFFE), with Maria Sagrario Floro and Xiaoyuan Dong (then of IAFFE – now associated with both research communities), sought

funding to promote greater gender awareness in policy in the global south. Collaboration enabled IATUR and IAFFE to secure funding from the Swedish International Development Cooperation Agency (SIDA) for six exchange panels (three with IAFFE members presenting work at IATUR conferences and three with IATUR members presenting work at IAFFE conferences), and for two training workshops designed to increase the capacity to analyse time use data in developing countries. The first four of these exchange panels took place at the 2010 and 2011 IATUR and IAFFE conferences, and these panels and subsequent discussions have produced a programme of training workshops, now featured on the IATUR website (http://iatur.timeuse.org/workshops).

Former IATUR President Bill Michelson led the development of curriculum for the first of these training workshops, which took place in collaboration with the National Bureau of Statistics of China in Beijing from 29 June to 1 July 2011. He, Professors Bittman, Dong, Floro, and Hirway, along with Ignace Glorieux (IATUR Council Member for Western Europe), Jiri Zuzanek (IATUR Council Member for North America), Klas Rydenstam (former IATUR Vice-President), and IATUR Secretary Kimberly Fisher (all of whom volunteered time and many of whom travelled at their own expense) delivered the first workshop to 25 people, 8 of whom work at or in collaboration with the NBS, and 17 of whom had travel funded by the SIDA grant. Participants included 11 people from official statistical offices, four working in other government agencies or for the UN, seven academics, one postgraduate student and one person

working in private business. Participants came from Brazil, China, Djibouti, Hungary, India, Moldova, Pakistan, the Philippines, the Republic of Korea, South Africa, and Venezuela. In post-workshop evaluations collected by Professor Bittman, 24 of the 25 participations reported agreeing or strongly agreeing that they had learned "new things about the applications of time use data" during the workshop. All participants reported that they found the course very beneficial or helpful. A video produced by the NBS gives a visual overview of the event (http://www.youtube.com/watch?v=5ngDPpY-ohM). The majority of instructors from the Beijing workshop offered a one-day mini-version of this workshop in Oxford before the 2011 IATUR conference for 27 participants. Four people applied for every funded place at the first workshop in Beijing, and a further 30 people attending the IATUR conference expressed regret that they could not travel for a longer period to attend the follow-on workshop.

IATUR, IAFFE, and TURC efforts are taking place in renewed global interest in time use data. UNSD has coordinated meetings to upgrade its guidelines for conducting time use studies and its harmonised International Classification of Activities for Time Use Statistics (ICATUS) over the summer and autumn of 2011. UNDP and the International Labour Organization have funded research developing alternatives to conventional income poverty thresholds, including the Levy Institute Measure of Time and Income Poverty (LIMTIP) (Masterson 2011). The UN Economic Commission for Africa has collaborated with the collection of a national sample time diary survey in Ghana (previously, round three of the 1991-92 and round four of the 1998-99 Ghana Living Standards Survey (GLSS) collected one-week stylized estimate time use ques

tions). The first post-data collection workshop transpired in the last full week of October 2011, with future surveys planned for Djibouti, then other African nations. The Agencia Española de Cooperación Internacional Para el Desarrollo (AECID) is co-funding a time use study in Paraguay in 2012. Annual time use conferences have taken place for two or more years in Brazil, Chile and Mexico, and the Economic Commission for Latin America and the Caribbean has sponsored a growing number of time use workshops and meetings.

The impacts of these efforts have begun to emerge. The 33rd IATUR conference, hosted by the Centre for Time Use Research at the University of Oxford (UK) from 1-3 August 2011, not only attracted participants from the widest range of academic disciplines, government agencies and other fields than any previous IATUR conference, but this event also included people from 39 countries, the widest range of any previous time-use event. Twenty-one presentations (12% of oral and poster presentations at this conference) focussed on time use in the global south. This conference included four sessions dedicated to time use in developing countries, and could have included many more sessions and papers had funding been available to assist with the travel costs. Many of these papers now are in press or under review for publication. The second of the SIDA-funded IATUR-IAFFE training workshops will take place in late 2012 in India. IATUR 2013 returns to Brazil (the first Brazilian conference took place in 2000), when the workshop training team hopes to host a 3rd event. Watch this space – there will be more to come!

REFERENCES

Antonopoulos, R. and I. Hirway (2010), *Unpaid work and the economy: Gender, time use and poverty in developing countries*, Palgrave Macmillan, London.

Durán, M.A. (2007), *El valor del tiempo: Cuántas horas te faltan al día?*, Espansa, Madrid.

Durán, M.A. (2010), *O valor do tempo: Quantas horas te faltam ao dia?*, Secretaria de Políticas Para as Mulheres, Presidência de República, Brasília.

Esquivel, V., Budlender, D., Folbre, N. and I. Hirway (2008), Explorations: Time-use surveys in the South, in: *Feminist Economics*, Vol. 14, No. 3, 107-152.

Fisher, K., Bennett, M., Tucker, J., Altintas, E., Jahandar, A., Jun, J. and other members of the Time Use Team (2011), *Technical details of time use studies*, Last updated 30 November 2011, Centre for Time Use Research, University of Oxford.

Masterson, T. (2011), *Quality of match for statistical matches used in the development of the Levy Institute Measure of Time and Income Poverty (LIMTIP) for Argentina, Chile, and Mexico*, Working Paper 692, The Levy Economics Institute, New York.

Michelson, W. (2005), *Time use: Expanding explanation in the social sciences*, Paradigm Press, Colorado.

Book notes
by Kimberly Fisher

Bormans, Leo (ed.)
The world book of happiness

Contributing Auhtors: Contributions from 100 authors who have published research relating to happiness Publicastion
Plublisher: Arnhem, Belgium, Lannoo Groep, and London, UK, Marshall Cavendish International
ISBN: 978-143-4632-0 (paperback)
Website:
http://www.theworldbookofhappiness.com/
Languages Available: hardback: Dutch, English, French and German; Paperback: English

This popular science collection includes brief excerpts from academic in a range of disciplines as well as contributions from self-help groups and religious communities, all of which reveal some aspect of living conditions which make people happy. Some excerpts concentrate on individual-level happiness, whilst others explore what factors cheer communities, members of organizations or national populations. While the book as a whole covers a range of topics, a number of the entries are specific to time and time use.

Budlender, D. (eds.)
Time Use Studies and Unpaid Care Work (2010)

Contributing Authors: An, M., Budlender, D., Esquivel, V., González, I. E., Palriwala, N. N., Palriwala, R., Shikata, M. and Y. Tamiya
Publisher: Routledge/UNRISD Research in Gender and Development, New York, USA
ISBN: 978-0415-882-248
Website:
http://unrisd.org/unrisd/website/document.nsf/%28httpPublications%29/414BA4D59E6D9AB1C125775B00480FD7?OpenDocument
Languages Available: English

This book explores the economic contribution of unpaid care work (mostly performed by women) in Argentina, India, Japan, Nicaragua, the Republic of Korea, South Africa, and Tanzania. While some similar themes emerge with care research produced elsewhere, these chapters also reveal a need to adapt diaries to local contexts. The distribution of care work in the more complex household structures in some developing countries as well as households comprised of survivors of HIV-AIDS, conflict or disasters impact the both person-level well-being as well as regional economic conditions. These authors demonstrate a need for more time use data to measure the course of development in the global south.

Conelly, R. and J. Kimmel
Time Use of Mothers in the United States
at the Turn of the 21st Century (2010)

Publisher: W. E. Upjohn Institute for Employment Research, Kalamazoo, Michigan, USA
ISBN: 978-0880-993-692
Website:
http://www.upjohninst.org/publications/titles/tuom.html
Languages Available: English

Connelly and Kimmel make exhaustive use of the American Time Use Study to examine daily activities of mothers of children aged up to 12 in the United States. This book explores associations between mother's daily schedules and their children's development. The authors discuss how education, tax and child care policies might enable mothers to adjust the balance of paid and unpaid work, care and leisure in ways that improve the well-being of children and their parents.

Drobnic, S. and A. M Guillén (eds.)
Time Use Studies and Unpaid Care
Work (2011)

Contributing Authors: Beham, B., Bygren, M., Chung, H., Dema, S., Drobnic, S., Duvander, A.-Z., Fagan, C., Ferrarini, T., Guillén, A. M., Ibáñez, Z., Lammi-Taskula, J., Rostgaard, T., Salmi, M. and P. Walthéry
Publisher: Palgrave Macmillan, Basingstoke, United Kingdom
ISBN: 978-0230-289-499
Website:
http://www.palgrave.com/products/title.asp

x?pid=488084
Languages Available: English

This edited collection explores the degree to which policy frameworks in European countries facilitate the ability of people to reconcile paid work, family and personal commitments. Some chapters use time diary surveys, but even those which do not draw on other sources of time and scheduling data. Over all, though the authors find that individuals have some capacity to adjust their schedules, and that policy interventions can favourably influence work-life balance. Even so, conditions on the job (total hours worked, flexibility of employment requirements, working conditions and other job characteristics) have the greatest influence on the capacity to reconcile work, care, and personal life conflicts. The authors find associations between higher life and job satisfaction (and potential for greater productivity) in more family-friendly workplaces.

Hagell, A. (eds.)
Changing Adolescence: Social Change
and Its Role in Adolescent Mental Health
(2012)

Contributing Authors: Hagell, A., Giménez-Nadal, J. I., Peck, S., Symonds, J. and N. Zarrett
Publisher: The Policy Press, Bristol, United Kingdom
ISBN: 978-1447-301-042
Languages Available: English

This book draws together findings from a range of projects included in the Nuffield

Foundation's Changing Adolescence Programme to build a picture of how young people in the United Kingdom have responded to social and demographic change from the 1970s through 2000s. The book as a whole analyses a range of data sources on the mental health, behaviour, and well-being of young people as they work through transitions to adulthood, with the aim of informing debate between policy-makers, academics, charities and community groups. Many chapters have indirect relevance to time use research. One chapter, Time Trends in Adolescent Time Use in the UK, makes use of the Multinational Time Use Study to compare how social institutions in different countries have shaped young people's behaviour over time. This chapter also breaks down the details of young people's social interactions, both examining inherently social activities and patterns of time with different groups of people, highlighting the complex associations between interaction patterns and mental health.

Inbakaran, C. and M.-L. Van Der Klooster (eds.)
2010 Time Use in Australia and Europe (2011)

Contributing Authors: Arentze, T., Beugels, S., Borgers, A., Ghassemi-Boenisch, S., Hanglberger, D., Inbakaran, C., Kemperman, A., Merz, J., Rathjen, T., Roeters, A., Van Der Klooster, M.-L. and P. Vitartas
Publisher: Deakin University, Melbourne, Australia
Languages Available: English

This collection of short methodological articles details current applications of time use data to six policy areas: a) design of urban space and physically active travel behaviour; b) working hours and scheduling of paid work during the day; c) work and family life; d) shopping behaviour; e) time and income poverty; and f) survey methods to model national activity patterns. Articles draw on surveys collected in Australia, Austria, the Netherlands, and Germany.

Nelson, M. K.
Parenting Out of Control: Anxious Parents in Uncertain Times (2010)

Publisher: New York University Press, New York, USA
ISBN: 978-0814-758-533
Languages Available: English

Nelson interviewed parents in the United States to explore perceptions and expectations contemporary Americans hold of their parenting roles. She considers how parents respond to changes in education systems, workplaces, and new technologies marketed to "help" parents interact with and monitor (or spy on) their children. While she finds parents of many backgrounds experience challenges setting realistic goals and expectations for guiding children from cradle to career, she also reveals significant variations in parenting styles across class boundaries as well as among parents of more privileged backgrounds. Nelson argues 'parenting out of control' roles reflect parent's struggle to manage burgeoning opportunities as well as dangers their children face.

Vogel, H. L.
Entertainment Industry Economics: A
Guide for Financial Analysis: 8th Edition
(2010)

This book has an indirect relevance to time use research, but includes a number of tables detailing changing patterns of participation in various dimensions of the entertainment industry. Though this book concentrates more on spending than behaviour, it nonetheless does inform the choices people make in their leisure time in the context of changes in the modes of delivery of entertainment services and changing legal frameworks governing this industry. While more analysis covers the United States, the book includes some international comparative data.