The quality of time spent with children in Australian households

Charlene M. Kalenkoski · Gigi Foster

Abstract   Using data from the 1992 and 1997 Australian Time Use Surveys, we explore patterns in the quality of child care time spent by parents in Australia. Drawing on existing research, we construct and evaluate four alternative ways of defining child care quality. We estimate censored regression models of the time parents spend in high-quality child care, lower-quality child care, and market work according to these different definitions. We find that seemingly small changes in how the quality of time spent caring for children is conceptualized markedly affect the conclusions we draw about the associations of different household and personal characteristics with parents' child care time.

1 Introduction

In the past 20 years there has been a renewed interest in time-use research by economists. This has partly been a function of the growth in the availability of time use data since the mid-1980s. One area of interest to applied researchers is the amount of time that parents spend caring for their children, as this time is thought to be an important investment in children's well-being as well as an undocumented economic cost. In addition, differences in the amount and fashion of this investment across households may account, in part, for the heterogeneity in future outcomes observed across children. Thus, detailed time diary data provide us with the

C. M. Kalenkoski (✉)
Department of Economics, Ohio University, Bentley Annex 351, Athens, OH 45701, USA
e-mail: kalenkos@ohio.edu

G. Foster
School of Commerce, University of South Australia, Elton Mayo Building 5-21, North Terrace, Adelaide, SA 5001, Australia

opportunity to enhance our understanding not only of parents' investment choices, but of the potential origins of teen and adult inequality.

Existing child care time use studies typically focus on describing the associations of time spent with or for children with variables such as gender, household structure, and work-related characteristics. Many (e.g., Nock and Kingston 1988; Hallberg and Klevmarken 2003) focus on the total amount of child care time spent. However, if each hour spent by a parent with his/her child is not equally productive and/or not equally costly, then models of parental investment in children that do not capture this fact may be misleading. One way some previous research (e.g., Bianchi 2000; Kalenkoski et al. 2005, 2007; Kimmel and Connelly 2007) has tried to deal with this is by distinguishing between total time spent in child care as a primary activity and total time spent in child care as a secondary activity (child care performed when another, non-child care activity is being performed as the primary activity). However, while this is readily implemented using most time-diary data sets, there is no a priori reason to believe that this is the only or the best way of capturing the quality dimension of parental time inputs to child production.

The developmental psychology literature (see Shaw and Bell 1993 for a review) suggests that it is not only aggregate time but the type of time spent with parents that nurtures a child's healthy development. Some newer time use papers (e.g., Craig 2007; Stafford and Yeung 2005, Yeung and Stafford's Unpublished; Folbre et al. 2005) have begun to explore definitions of high- and low-quality care that are activity-specific and/or focus on the degree of parental engagement. However, there is a lack of standardization in the literature as to how child care should be categorized. This lack of standardization motivates our exploration in this paper of four different classifications of the quality of parental child care time. After defining and justifying these classifications, we apply them to detailed Australian time-diary data from 1992 and 1997. We first briefly document the overall patterns in child care time provision and note differences with respect to how quality is conceptualized. Next, we explore the individual-level and household-level determinants of high- and lower-quality parental child care time for each classification separately. Given well-known gender differences in the amount of time mothers and fathers spend in child care, we provide estimates separately by gender. To account for the time constraint faced by every individual, we specify a model that allows for correlations in the individual-level error terms across the three uses of time (high-quality child care, lower-quality child care, and market work). These results show that, while we confirm some general patterns found in previous research, there are different patterns in and determinants of the time mothers and fathers spend in child care depending on the classification of high- and lower-quality care used.

2 Data and empirical approach

2.1 Sample

The data we use are drawn from the 1992 and 1997 Australian Time Use Surveys. Each survey contains two consecutive days' worth of time-diary data on all adults in

a random sample of Australian households. Given the consecutive nature of the two diary days, we treat them together as one 48-h (2,880-min) reporting period. Our analysis data set therefore includes one observation per individual on an array of household-specific and person-specific variables, including the total number of minutes in that 48-h period that an individual spent in both high- and lower-quality child care (using each of our four classifications), and the number of minutes that the individual spent engaged in labor market activities.

Our sample selection criteria are as follows. First, the few individuals who reported time use only for one day are excluded. Second, to capture the population at risk for child care, only households with children are included. Finally, to be consistent with other studies that investigate parents' child care time and to abstract from parents' own educational investment, we exclude households in which either primary adult (the householder or the spouse of the householder) is studying full-time, part-time, or by correspondence. While we model time use only for primary householders and their spouses or partners living in these selected households, we also include information on other resident relatives of the household head 15 years of age or older (most of whom are under the age of 25) by constructing and incorporating a dummy variable indicating whether an "other adult" of this sort was present in the household. Table 1 provides sample sizes separately for 1992 and 1997, and for the two years combined. Our analysis sample of parents includes over 1,700 fathers and 2,100 mothers, for a total of 3,864 observations.

2.2 Child care quality classifications

Our first child care time quality classification is primary (high-quality) versus secondary (lower-quality) child care. To obtain a measure of primary child care, we sum the number of minutes during which a person reported being engaged in any of the following child care tasks as his or her primary activity: minding child(ren), taking care of sick child(ren), teaching child(ren), playing with child(ren), performing physical or emotional care of child(ren), traveling in association with child care or with child(ren), and miscellaneous child care that includes child care not further defined or not elsewhere classified or specified.[1] Because the Australian Bureau of Statistics (ABS) defines a child as a person aged 0–14, no such care is reported for older children in the data. To construct our secondary care measure, we sum the number of minutes during which a person reported being engaged in any of the previously-defined child care tasks in a secondary or (in 1992) tertiary capacity, being careful not to double-count time in the same activity. This classification of child care into primary and secondary care is almost identical to that used in Bianchi (2000) and Kalenkoski et al. (2005), and the definition of primary child care is very similar to that used in Kimmel and Connelly (2007) and Kalenkoski et al. (2005, 2007).

Our second child care classification, active (high-quality) versus passive (lower-quality) child care, takes advantage of our ability to observe who was present with

---

[1] Our measures of child care time explicitly exclude any time during which the reporting individual (the mother or father) was engaged in sleeping or napping. "Default care" of a sleeping child is counted only if reported by a parent or guardian who was awake while the child slept.

Table 1 Sample sizes

	Year = 1992	Year = 1997	Combined years
Fathers (includes step-fathers and guardians)	936	774	1710
Mothers (includes step-mothers and guardians)	1188	966	2154
Total adults	2124	1740	3864

the time-diary respondent at any minute of the observation period and, in particular, whether a child aged 0–11 was present.[2] To construct our active care measure, we sum the number of minutes during which a person was with a child aged 0–11 years and reported being engaged in any child-related activity in a primary capacity. This measure is different from our measure of "primary" care only in the ages of the children it includes. The major difference between this classification and the previous one is the definition of lower-quality care. To construct our passive care measure, we sum the number of minutes during which a person was with a child aged between 0 and 11 and did *not* report being engaged in a child-related activity as his or her primary activity. This measure of passive child care is modeled after that used in Kalenkoski et al. (2007), although the age category they use is slightly different based on how their data were reported. The active versus passive care classification itself is similar to Stafford and Yeung's (2005) and Yeung and Stafford's (Unpublished) engagement versus accessible time classification. However, the activities they include in their measures are somewhat different given that their data are from the child's, rather than the parents' point of view. They also include 12-year-olds in their measures while our cut-off is 11 years of age.

Our third classification is development-oriented (high quality) versus non-development-oriented (lower quality) care. To obtain our measure of development-oriented care, we sum the number of minutes during which a person reported being engaged in a development-oriented child care task (for children aged 0–14), defined as the following subset of child care activities: teaching child(ren), playing with child(ren), and performing physical or emotional care of child(ren). No distinction is made regarding whether an activity was performed in a primary, secondary, or tertiary capacity.[3] Non-development-oriented care is the difference between total time spent on any child-related activity and total time spent on the subset of those activities that are development-oriented. This quality classification is similar to Stafford and Yeung's (2005) and Yeung and Stafford's (Unpublished) development-oriented versus non-development-oriented care classification but, like their engaged versus accessible classification, they include somewhat different activities and a slightly different age range of children due to the difference in the source of their data.

Our final classification defines high-quality care as sole-tasked care and lower-quality care as multi-tasked care. While no one in the literature has used such a construct of quality, it can be thought to capture the heterogeneous costs to parents

---

[2] The age cutoff of 11 years is different from the cutoff of 14 for the primary child care measure due to the way the surveys report information on who was present during an activity.

[3] Again, care was taken not to double-count child care time.

of child care time, as sole-tasked care by its nature disallows simultaneous productive work toward another objective and therefore inherently has an equal or greater opportunity cost for parents compared to other forms of care. For this reason, investments in sole-tasked care may be even more expensive for parents than investments in other forms of high-quality care, so that the gradients of sole-tasked care with respect to income, education, number of children in the household, and other covariates may be steeper than those for other high-quality care types.

To obtain the sole-tasked care measure, we sum the number of minutes during which a person reported performing as a primary activity any child care task for children 0–14 but did *not* report being simultaneously engaged in any non-child care activity. This measure could not be calculated using data such as the American Time Use Survey (ATUS) where secondary activities are not reported, although there are other time-diary data sets available (e.g., the UK data used by Kalenkoski et al. 2005, 2007) that do provide information on secondary activities. This measure is distinct from the primary child care measure as an individual performing child care as a primary activity could still be doing something else like housework as a secondary or tertiary activity. To obtain our measure of multi-tasked child care time, we sum the number of minutes during which a person reported being engaged in any child care task, whether primary or otherwise, while also being simultaneously engaged in some non-child care activity.

We do not offer any absolute ranking of these quality classifications; which one is best depends on the question the researcher is asking. To facilitate thought about which measure might be best in different contexts, we compare in Table 2 the four alternative classifications used in this study across various characteristics of interest. The first characteristic considered concerns the "adding-up" constraint. The question posed here is whether, if all activities were categorized in the same manner as child care, total time in all activities would sum to a 24-h-per-day time constraint. None of our quality classifications fully meets this criterion; the only measure that meets this criterion is time spent in child care as a primary activity.

A second characteristic of potential interest is whether a particular child care classification captures the intensity of the time parents spend in child care, because more intense time is likely to reflect a greater parental investment. While the primary versus secondary care classification captures a parent's ranking of multiple

Table 2 Comparison of alternative classifications of child care quality

Characteristic	Primary vs. secondary care	Active vs. passive care	Development-oriented vs. non-development-oriented care	Sole-tasked vs. multi-tasked care
Satisfies adding-up constraint?	Primary, yes. Secondary, no	No	No	No
Captures the intensity of care?	No	Yes	No	Yes
Can be assessed without multi- level activity diaries?	Primary, yes. Secondary, no	Yes	Yes	No

activities performed simultaneously, it does not necessarily indicate intensity, but rather order of importance as perceived by the respondent. The active versus passive classification does capture intensity, however, as active time is time spent directly engaged with a child, and passive time is simply time during which a parent is accessible to a child (less intense child care time). The development-oriented versus non-development-oriented classification does not indicate intensity of child care time, but rather the types of child care activities that are being performed. Finally, the sole-task versus multi-task care classification does indicate intensity: sole-tasked child care is by definition care performed where the parent is focused totally on the child (more intense child care time), and multi-tasked care is care performed where the parent has divided attention (less intense child care time).

A final characteristic that we compare across measures is whether multi-level activity time diaries (diaries that record primary, secondary, and perhaps tertiary activities for each respondent) are required in order to compute them. Two of our four taxonomies (active/passive and development-oriented/non-development-oriented) could be constructed without multi-level diaries.

2.3 Other variables

Our empirical model also requires a measure of the time each parent spends in labor market activities, which we calculate by summing all minutes spent on work-related tasks over the 48-h period of observation, regardless of whether the activity was reported as a primary, secondary, or tertiary activity. Explanatory variables included in our time use models include indicators for whether or not the respondent is single; speaks a language other than English in the home; is Australian; is in a certain age range; lives in a non-metropolitan urban area or a rural area; works in a particular industry or occupational group; provided no occupation or industry information; and has attained various levels of education. We also observe for each person whether the household contains disabled children or adults; whether there are other adults in the household related to the household head besides the respondent and a spouse or partner; the number and youngest age of dependent children living in the household; the number of adults in different age ranges living in the household; the number of women in the household; household structure; whether anyone in the household reported that child care was difficult to find; the number of weekend days included in the 2-day diary period; and survey year (1992 or 1997).

2.4 Descriptive analysis

We first present some basic statistical information about our sample and our four quality classification schemes. Table 3 displays descriptive statistics for the time use measures and all of the explanatory variables used in our regressions by gender and year, with the exception of the quarter, industry, and occupation dummy variables. More child care was provided by parents in 1997 than in 1992, which partly reflects the slightly younger sample in 1997 and some changes in household

Table 3 Descriptive statistics for the sample, by year

	1992		1997		Pooled years	
	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers
Outcomes (means and standard deviations across persons)						
Total minutes spent in primary child care	73.23	228.37	100.67	263.81	85.65	244.26
	(111.71)	(248.83)	(131.82)	(236.22)	(121.96)	(243.84)
Total minutes spent in active child care	64.91	209.82	91.70	241.96	77.04	224.24
	(107.71)	(251.40)	(129.00)	(239.52)	(118.54)	(246.61)
Total minutes spent in development-oriented child care	137.39	342.16	110.06	294.10	125.02	320.61
	(198.22)	(353.41)	(136.48)	(264.11)	(173.51)	(317.33)
Total minutes spent in sole-tasked child care	38.93	131.13	68.13	201.33	52.15	162.61
	(74.10)	(162.16)	(99.38)	(196.00)	(87.65)	(181.48)
Total minutes spent in market work-related activities	737.46	245.34	751.08	254.53	743.62	249.46
	(536.37)	(379.52)	(520.47)	(386.21)	(529.12)	(382.48)
Person-level explanatory variables (proportions of persons)						
Married or co-habiting[a]	0.98	0.84	0.99	0.86	0.99	0.85
Single	0.02	0.16	0.01	0.14	0.01	0.15
Australian	0.71	0.76	0.72	0.75	0.71	0.75
Speaks language other than English at home	0.13	0.11	0.07	0.07	0.10	0.09
Age 15–25[a]	0.01	0.05	0.01	0.04	0.01	0.05
Age 25–35	0.28	0.35	0.28	0.38	0.28	0.36
Age 35–45	0.42	0.40	0.48	0.46	0.45	0.43
Age 45–55	0.21	0.17	0.20	0.11	0.20	0.14
Age 55+	0.07	0.03	0.03	0.01	0.06	0.02
Did not complete high school[a]	0.29	0.48	0.25	0.40	0.28	0.44
High school terminating	0.10	0.09	0.10	0.15	0.10	0.12
Other post-high school educational qualification	0.01	0.01	0.01	0.03	0.01	0.02
Certificate or diploma	0.15	0.31	0.11	0.12	0.14	0.22
Vocational/trade qualification	0.30	0.04	0.36	0.20	0.33	0.11
Bachelor's degree or higher	0.15	0.08	0.16	0.11	0.15	0.09
No industry or occupation information	0.13	0.43	0.10	0.42	0.11	0.42
Household-level explanatory variables						
Count of women in the household	1.23	1.29	1.15	1.19	1.19	1.24
	(.58)	(.58)	(.50)	(.48)	(.55)	(.54)
Count of persons aged 15–24 in the household	0.59	0.58	0.32	0.32	0.47	0.46
	(.85)	(.84)	(.64)	(.64)	(.77)	(.77)
Count of persons aged 25–34 in the household	0.65	0.60	0.67	0.63	0.66	0.61
	(.83)	(.79)	(.82)	(.78)	(.82)	(.79)
Count of persons aged 35–44 in the household	0.82	0.73	0.95	0.86	0.88	0.79
	(.85)	(.80)	(.84)	(.82)	(.84)	(.81)

Table 3 continued

	1992		1997		Pooled years	
	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers
Count of persons aged 45–54 in the household	0.39	0.34	0.30	0.27	0.35	0.30
	(.69)	(.64)	(.61)	(.58)	(.66)	(.61)
Count of persons aged 55 or older in the household	0.12	0.12	0.07	0.07	0.10	0.10
	(.41)	(.41)	(.32)	(.31)	(.37)	(.37)
Number of weekend days included in survey	0.55	0.55	0.57	0.56	0.56	0.56
Metropolitan area[a]	0.58	0.57	0.56	0.56	0.57	0.56
Non-metropolitan urban area	0.33	0.35	0.26	0.26	0.29	0.31
Rural area	0.10	0.09	0.18	0.18	0.14	0.13
1 if anyone in the household reports difficulty in finding child care	0.18	0.20	0.25	0.27	0.21	0.23
Household has one dependent child[a]	0.24	0.26	0.38	0.39	0.30	0.31
Household has two dependent children	0.39	0.39	0.39	0.40	0.39	0.39
Household has three dependent children	0.21	0.21	0.17	0.16	0.20	0.19
Household has four or more dependent children	0.15	0.14	0.05	0.06	0.11	0.10
Age of youngest child in household is less than 2 years[a]	0.23	0.22	0.22	0.20	0.23	0.21
Age of youngest child in household is 2–4 years	0.18	0.19	0.26	0.23	0.21	0.21
Age of youngest child in household is 5–9 years	0.20	0.20	0.28	0.27	0.24	0.23
Age of youngest child in household is greater than 9 years	0.24	0.23	0.23	0.23	0.24	0.23
Household type: One married/de facto couple with children 0–14 only	0.58	0.49	0.73	0.63	0.65	0.56
Household type: One married/de facto couple with children 0–14 and 15+	0.19	0.16	0.20	0.17	0.20	0.16
Household type: One person with children 0–14 only	0.01	0.09	0.01	0.09	0.01	0.09
Household type: One person with children 0–14 and 15+	0.00	0.02	0.00	0.02	0.00	0.03
Household type: All other households[a]	0.08	0.09	0.06	0.08	0.07	0.09
Indicator for other adults (age 15+) in the household	0.35	0.34	0.21	0.20	0.29	0.28
Number of observations	936	1188	774	966	1710	2154

Notes: The maximum number of minutes spent for each person on any activity is 2,880, which is the total number of minutes in a 48-h period

[a] Variables form part of the left-out category in ensuing regression models

Table 4 Raw correlations (total $N = 3{,}864$)

	Total child care minutes	Primary minutes	Active minutes	Development-oriented minutes	Sole-tasked minutes
Panel A: fathers (N = 1710)					
Total child care minutes	1.0000				
Primary child care minutes	0.6176***	1.0000			
Active child care minutes	0.6157***	0.9720***	1.0000		
Development-oriented child care minutes	0.6905***	0.6373***	0.6429***	1.0000	
Sole-task child care minutes	0.5191***	0.8625***	0.8448***	0.5193***	1.0000
Did not complete high school	−0.0925***	−0.0691***	−0.0764***	−0.0811***	−0.0642***
Bachelor's degree or higher	0.1167***	0.1040***	0.1015***	0.1116***	0.0910***
Four or more dependent children in the household	0.0157	0.0027	0.0049	0.0169	0.0086
Disabled child present in the household	0.0671***	0.0495**	0.0552**	0.0472*	0.0469*
Youngest child in the household under 2 years old	0.2094***	0.2618***	0.2950***	0.2230***	0.1970***
Panel B: mothers (N = 2154)					
Total child care minutes	1.0000				
Primary child care minutes	0.7216***	1.0000			
Active child care minutes	0.7290***	0.9749***	1.0000		
Development-oriented child care minutes	0.7418***	0.7598***	0.7701***	1.0000	
Sole-task child care minutes	0.6382***	0.8799***	0.8634***	0.6275***	1.0000
Did not complete high school	−0.1347***	−0.1204***	−0.1208***	−0.1041***	−0.1172***
Bachelor's degree or higher	0.0645***	0.0452**	0.0440*	0.0429**	0.0376*
Four or more dependent children in the household	0.0052	−0.0037	0.0005	0.0139	−0.0075
Disabled child present in the household	0.0909***	0.0808***	0.0798***	0.0732***	0.0928***
Youngest child in the household under 2 years old	0.4542***	0.5515***	0.5774***	0.5006***	0.4526***

Notes: Correlations significant at the 1% level are tripled-starred; those significant at the 5% level are doubled-starred; and those significant at the 10% level are single-starred

Table 5 Average minutes of child care quality by key sample subgroups. Average minutes of high-quality care performed by key sample subgroups, by quality definition (pooled years; standard deviations in parentheses)

Child care quality measure	Primary care	Active care	Development-oriented care	Sole-tasked care
Subsample				
Single mothers ($N = 327$)	218.65 (220.14)	193.78 (224.82)	293.19 (316.70)	140.65 (150.89)
Single fathers ($N = 25$)	91.60 (115.70)	63.80 (106.43)	125.00 (192.31)	66.80 (92.80)
Married mothers with one child ($N = 544$)	222.56 (239.88)	200.46 (244.23)	269.03 (285.76)	139.71 (163.34)
Married mothers with 4+ children ($N = 194$)	241.55 (278.15)	225.10 (279.13)	328.49 (328.38)	160.75 (217.41)
Married mothers with bachelors+ ($N = 178$)	284.93 (267.88)	268.94 (271.11)	367.16 (330.82)	195.48 (201.63)
Married mothers with No HS diploma ($N = 215$)	304.93 (242.35)	285.17 (246.89)	385.95 (314.64)	204.15 (181.35)
Married mothers where youngest child is under 2 ($N = 626$)	361.51 (319.95)	356.03 (320.38)	439.78 (386.51)	238.27 (238.46)
Married mothers where youngest child is 10–14 ($N = 403$)	86.12 (108.05)	38.80 (72.57)	135.44 (173.00)	50.48 (74.95)
Married mothers reporting for two weekdays ($N = 1,050$)	267.02 (256.69)	244.43 (260.31)	331.94 (317.91)	177.78 (196.53)
Married fathers with bachelors+ ($N = 259$)	115.27 (146.56)	105.06 (144.33)	170.56 (205.00)	70.34 (103.55)
Married fathers with No HS diploma ($N = 169$)	82.76 (111.64)	77.35 (108.16)	128.50 (193.39)	51.37 (77.54)
Married fathers where youngest child is under 2 ($N = 529$)	106.84 (144.61)	104.53 (143.32)	145.33 (208.93)	62.10 (99.12)
Married fathers where youngest child is 10–14 ($N = 393$)	38.39 (68.69)	18.45 (47.89)	65.95 (118.51)	21.67 (46.69)
Married fathers reporting for two weekdays ($N = 970$)	80.49 (113.91)	72.79 (110.97)	109.79 (150.27)	49.96 (82.74)
Married fathers with one child ($N = 507$)	76.18 (113.79)	67.07 (110.60)	108.19 (154.23)	43.87 (79.38)
Married fathers with 4+ children ($N = 179$)	87.78 (143.72)	79.89 (140.67)	135.60 (235.88)	55.09 (109.48)

variables across the years. It also partly reflects the increased difficulty in finding child care that parents report in 1997 compared to 1992.[4] Table 4 provides raw correlations among our high-quality child care variables and selected household- and person-level characteristics. For both men and women, our four alternative measures of high-quality time are all strongly positively and significantly associated with one another. The correlations cluster in the 0.5–0.9 interval, with only one correlation exceeding 0.9: that between primary minutes and active minutes. This is not surprising, given the method of construction of these two variables.[5] Although our four measures of high-quality time are strongly related, there is sufficient independent variance overall to support our treatment of them as distinct measures of quality.

There are other statistically significant correlations among the household- and person-level characteristics and our measures of high-quality child care. First, receipt of a bachelor's degree or higher is positively associated with high-quality care for both genders.[6] Second, parents in large families, those with four or more children, spend no more time engaged in high-quality child care than parents in smaller families.[7] Finally, the presence of a very young or disabled child in the household is associated with higher levels of high-quality time by parents of both genders, although the associations are stronger for women.

Finally, Table 5 shows average minutes spent in high-quality child care across the different measures by key sample subgroups. As before, we see that mothers spend substantially more high-quality child care time than fathers across the board. The most time spent in high-quality care by any sample subgroup, for every quality measure, is that spent by married mothers living in households where the youngest child is under age 2. The lowest amount of high-quality care spent, again for every measure of quality, is that spent by married fathers living in households where the youngest child is age 10–14.

---

[4] As noted in the OECD Thematic Review of Early Childhood Education and Care Policy (2001), the Commonwealth's extension of significant child care subsidies to for-profit long day care centers in 1991 translated into a rapid increase in supply of child care options outside the home. However, as also illustrated in another government report entitled Australia's Welfare 2005, the growth in supply brought about by this major policy shift was explosive and uneven; the government capped new funded child care places in 1997 partly to stem unmanaged supply growth. According to Time Use Survey data, whatever supply shift did occur between the years of the surveys was insufficiently matched to demand to counteract the increased difficulty parents had in finding care.

[5] The lower-quality counterparts to these two measures are not as strongly related (for example, the correlation between secondary care and passive care is 0.56 for women and 0.44 for men). Due to space considerations, however, correlations for the different low-quality measures are not included in the table although they are available upon request from the authors.

[6] The finding that more educated individuals spend more time in both child care and market work has been documented elsewhere. For example, Kalenkoski et al. (2005, 2007) find positive relationships between education and both primary and secondary (or passive) child care and market work in the US and the UK, even after controlling for many other variables.

[7] Similar associations (available upon request) are found when investigating correlations of observable characteristics with the lower-quality measures. These are not provided here for space reasons.

3 Model

We jointly estimate reduced-form Tobit models of the determinants of the amounts of high-quality and lower-quality time that mothers and fathers spend in child care along with the amount of time they spend in market work, allowing the three different uses of time to be correlated for each person. We do this to account for the 48-h time constraint faced by each individual respondent that causes time spent in one activity to take away time available for another activity, and also to account for any other person-specific unobserved factor that affects the person's time allocation decision, such as a strong disposition toward child rearing or market work.

The models to be estimated are specified as follows:

$$H_P^* = \alpha'_{HP}HH + \beta'_{HP}X_P + e_{HP} \tag{1}$$

$$L_P^* = \alpha'_{LP}HH + \beta'_{LP}X_P + e_{LP} \tag{2}$$

$$W_P^* = \alpha'_{WP}HH + \beta'_{WP}X_P + e_{WP} \tag{3}$$

where H_P^*, L_P^*, and W_P^* are latent variables referring to the minutes of high-quality child care time, lower-quality child care time, and market work desired by household member P (where $P = $ m if mother, and $P = $ f if father); HH is a vector of household characteristics, X_P is a vector of person-specific characteristics; e_{HP}, e_{LP}, and e_{WP} are the error terms; and α'_{HP}, β'_{HP}, α'_{LP}, β'_{LP}, α'_{WP}, and β'_{WP} are the parameters to be estimated. We observe the latent variables if they are positive, but we observe zero if they are zero or negative.[8]

The error terms of the time use equations for a particular person are assumed to be jointly normally distributed with the following unrestricted covariance structure:

$$\begin{bmatrix} \varepsilon_{HP} \\ \varepsilon_{LP} \\ \varepsilon_{WP} \end{bmatrix} \sim N \left(\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \sigma_H^2 & \rho_{HL}\sigma_H\sigma_L & \rho_{HW}\sigma_H\sigma_W \\ \rho_{HL}\sigma_H\sigma_L & \sigma_L^2 & \rho_{LW}\sigma_L\sigma_W \\ \rho_{HW}\sigma_H\sigma_W & \rho_{LW}\sigma_L\sigma_W & \sigma_W^2 \end{bmatrix} \right) \tag{4}$$

4 Results

Tables 6 and 7 report the marginal effects of key parental and household characteristics on fathers' and mothers' child care time for each of our four quality classifications. The full set of coefficient estimates used to calculate these marginal effects are available from the authors upon request.

---

[8] The percent of zeros ranges from 15% (mothers' primary and development-oriented care) to 48% (fathers' non-development-oriented care). Thus, estimation of a model that accounts for censoring is warranted. While some of the zeros in the data may not be 'true' zeros in the sense that some parents who do not engage in the activity during the diary period may do so over a longer period of time, we cannot distinguish these parents from parents who in fact never perform any consequential amount of the activity. However, given that we have 48 h of consecutive time diary data rather than the usual 24 h provided by most time use surveys, any problem of 'false zeros' is likely to be smaller than that found in other surveys.

Table 6 Marginal effects of key variables on fathers' child care time

	Primary	Secondary	Active	Passive	Development-oriented	Non-development-oriented	Sole-tasked	Multi-tasked
Two dependent children	14.65	11.85	14.20	12.98	9.10	21.83	12.56	13.42
Three dependent children	5.30	22.13	0.77	25.79	11.96	15.08	6.07	19.43
Four dependent children	30.87	45.45	30.50	69.19	33.10	47.63	25.63	50.90
Number of weekend days included	4.51	39.87	4.33	175.73	17.20	25.53	0.81	43.69
Non-metropolitan urban area	−5.28	15.52	−3.85	−6.74	4.03	2.51	−5.28	14.65
Rural area	−9.34	9.16	−7.72	74.23	3.87	−12.60	−3.94	2.34
Count of women in the household	−11.21	−5.16	−8.72	35.68	−9.49	−8.57	−5.51	−13.98
Indicator for disabled child present in the household	−4.14	−13.40	−2.38	29.56	−8.06	−4.15	−2.10	−13.27
Indicator for disabled person present in the household	5.85	12.25	2.94	19.60	10.07	2.57	0.25	21.25
Indicator for other adults (age 15+) in the household	−47.46	−97.03	−55.90	−316.27	−67.91	−91.17	−39.81	−102.28
Indicator for "child care reported to be difficult to find"	12.78	20.88	16.49	107.99	18.91	11.99	11.75	19.14
Youngest child in household is of age 2–4	−6.07	13.30	−7.15	71.73	0.31	−0.78	1.43	2.58
Youngest child in household is of age 5–9	−32.49	16.28	−31.48	92.97	−16.02	−7.81	−15.73	−4.11
Youngest child in household is of age 10–14	−49.38	−37.42	−76.35	−346.40	−46.01	−54.69	−26.74	−60.13
Indicator for non-English language spoken in home	−1.42	−69.40	3.43	−4.77	−17.13	−39.39	5.78	−73.82
Person reporting is of age 25–35	−87.44	−55.14	−82.45	−382.09	−71.45	−93.60	−25.68	−136.46
Person reporting is of age 35–45	−106.44	−118.94	−99.67	−423.60	−134.27	−112.90	−28.71	−216.28
Person reporting is of age 45–55	−100.12	−90.22	−88.90	−311.93	−126.69	−75.01	−18.89	−187.79
Person reporting is 55 or older	−131.99	−197.62	−121.69	−508.19	−172.65	−150.53	−36.35	−296.89
Person reporting is Australian	−4.72	−16.41	0.55	−4.20	−3.72	−14.51	−5.24	−14.79

Table 6 continued

	Primary	Secondary	Active	Passive	Development-oriented	Non-development-oriented	Sole-tasked	Multi-tasked
Person reporting is single	36.73	101.68	22.03	256.27	24.92	140.75	15.18	112.09
High school terminating	1.62	38.21	5.66	10.23	17.54	11.76	4.74	33.10
"Other" qualifications	1.03	31.80	22.23	90.32	1.99	17.80	15.91	9.03
Vocational/trade qualification	6.16	18.49	5.34	−10.67	4.11	22.94	5.95	17.08
Certificate or diploma	12.81	27.38	12.53	40.10	24.49	21.55	9.12	31.02
Bachelors degree or higher	23.10	56.62	23.74	67.47	47.03	29.81	17.13	62.58

Note: Marginal effects are all calculated in comparison to the excluded category of each dummy variable array. The marginal effect of a particular independent variable is the average predicted increase or decrease in the minutes of time spent in the given type of activity over a two-day period, for the male sample, if the independent variable in question were 1 rather than zero for each woman and all other independent variables were to remain at their actual values (unless the variable is part of an array, in which case the marginal effect calculation assumes that all other array variables are held at zero)

Table 7 Marginal effects of key variables on mothers' child care time

	Primary	Secondary	Active	Passive	Development-oriented	Non-development-oriented	Sole-tasked	Multi-tasked
Two dependent children	5.97	21.48	16.20	53.96	26.04	1.22	12.73	13.22
Three dependent children	50.92	51.94	48.44	68.35	74.78	27.80	42.80	54.83
Four dependent children	27.30	77.88	41.85	142.74	52.14	47.43	31.56	67.33
Number of weekend days included	−25.49	29.28	−19.78	86.17	−14.90	10.78	−16.71	21.36
Non-metropolitan urban area	−26.67	2.61	−26.11	−3.46	−25.63	−2.94	−15.59	−7.90
Rural area	−11.62	55.91	−8.76	53.57	−0.24	29.97	−2.77	50.49
Count of women in the household	8.43	17.78	11.85	85.22	28.62	0.67	7.29	16.04
Indicator for disabled child present in the household	16.05	10.68	12.41	40.81	16.71	4.65	11.05	11.63
Indicator for disabled person present in the household	−2.18	−16.53	−0.71	4.53	−5.33	−16.28	−0.66	−19.73
Indicator for other adults (age 15+) in the household	−119.61	−115.54	−129.02	−376.44	−133.18	−102.00	−68.38	−161.61
Indicator for "child care reported to be difficult to find"	32.20	41.52	40.48	107.05	27.61	50.87	19.48	54.06
Youngest child in household is of age 2–4	−120.85	42.41	−121.46	149.22	−121.11	53.19	−64.10	−7.90
Youngest child in household is of age 5–9	−164.18	−65.52	−162.52	77.91	−177.74	−34.68	−95.95	−128.92
Youngest child in household is of age 10–14	−194.66	−167.48	−261.05	−409.28	−214.70	−126.93	−123.47	−227.72
Indicator for non-English language spoken in home	−34.08	−79.65	−34.12	−12.67	−52.30	−59.20	−11.73	−89.69
Person reporting is of age 25–35	−98.82	−119.62	−119.14	−323.78	−166.68	−45.49	−78.00	−135.90
Person reporting is of age 35–45	−139.15	−104.51	−158.72	−385.47	−210.33	−26.05	−110.69	−132.24
Person reporting is of age 45–55	−177.72	−176.94	−222.81	−571.90	−278.09	−52.96	−137.48	−198.18
Person reporting is 55 or older	−282.08	−221.23	−286.75	−525.17	−401.15	−117.47	−220.02	−285.55
Person reporting is Australian	−4.00	11.98	−6.80	−17.29	6.85	4.48	−7.31	19.66

Table 7 continued

	Primary	Secondary	Active	Passive	Development-oriented	Non-development-oriented	Sole-tasked	Multi-tasked
Person reporting is single	29.15	49.86	16.95	60.34	51.94	30.77	−11.47	64.67
High school terminating	37.89	51.31	31.37	43.26	49.88	48.60	21.91	69.81
"Other" qualifications	1.45	46.77	5.44	−72.94	23.10	13.02	−6.52	47.37
Vocational/trade qualification	26.12	46.65	25.22	2.89	33.36	39.76	16.82	55.30
Certificate or diploma	38.51	52.80	29.69	−53.76	40.29	52.77	27.94	64.03
Bachelors degree or higher	77.66	123.41	67.14	44.57	96.61	99.90	45.91	155.12

Note: Marginal effects are all calculated in comparison to the excluded category of each dummy variable array. The marginal effect of a particular independent variable is the average predicted increase or decrease in the minutes of time spent in the given type of activity over a two-day period, for the female sample, if the independent variable in question were 1 rather than zero for each woman and all other independent variables were to remain at their actual values (unless the variable is part of an array, in which case the marginal effect calculation assumes that all other array variables are held at zero)

4.1 Marginal effects for men

Table 6 presents marginal effects for fathers. For fathers, differences across the measures of child care quality are readily apparent, with the largest differences corresponding to comparisons across the lower-quality child care measures and comparisons of the development-oriented versus non-development-oriented classification to the others.

The number of children in a household is the most basic measure of a household's need for child care. Thus, we expect that the greater is the number of children in the household, the more time is spent on child care by parents. Indeed, all of the marginal effects of additional children across the different measures are positive for fathers, with the largest increase in child care time the result of having four or more children compared to one child. However, there are some differences in the magnitudes of the effects of additional children across the measures. While having a second child has an effect of between 11 and 14 min on secondary, passive, and multi-tasked time, its effect on non-development-oriented time is 22 min—twice as much as the effect on development-oriented care. Of the lower-quality measures, it is only the marginal effect on non-development-oriented time that is based on a statistically significant coefficient estimate. Thus, it appears that the additional lower-quality care provided in response to the presence of a second child is disproportionately non-development-oriented. The effect of a fourth child is much larger on lower-quality care than on high-quality care across all classifications, and the difference between the effects on high-quality and lower-quality care is particularly strong for the active/passive and sole-task/multi-task classifications. A similar statement could be made for the third child but for the fact that these marginal effects are based on statistically insignificant coefficient estimates. One potential explanation for the stronger differences for these classifications is that they are more likely than the other classifications to reflect fathers' binding time constraints. Perhaps the addition of a fourth child is forcing fathers to multi-task.

An additional measure of a household's need for child care is the age of the youngest child in the household. Younger children require more care, at least in terms of supervision and physical care. As our excluded dummy category is households whose youngest child is under age 2, we expect the included dummies capturing age of the youngest child in the household to have a negative sign, and we do find this for all age range dummies with respect to primary, active, and non-development-oriented care, and for two out of three age range dummies for development-oriented, sole-tasked, and multi-tasked care. However, for secondary and passive care, the marginal effects are positive for older toddlers and preschoolers, and positive and even larger for children aged 5–9. Note, however, that only the positive effects on passive care are based on statistically significant coefficient estimates. Marginal effects on development-oriented care, sole-tasked care, and multi-tasked care are also positive when older toddlers and preschoolers are the youngest in the household, although these are based on statistically insignificant coefficient estimates. Our last measure of a household's need for child care is an indicator for whether or not a disabled child is present in the household. We expect that the presence of such a child would increase the amount of certain

types of child care required, although it might simply bring about a re-allocation of time away from non-disabled children and toward disabled children, such that total child care time spent is unaffected. In our models the net effects are all negative for fathers, with one exception: passive care is increased by one half hour. This difference may come from the unique inclusion in the passive care measure of time spent in the presence of a child while doing something non-child care related. As we shall see, the presence of a disabled child in the household has the expected positive marginal effects on mothers' child care time. However, for parents of both genders, the marginal effects are not supported by statistically significant coefficient estimates in any care equation.

We also include measures of a household's available resources for child care. The first of these is an indicator for whether or not the reporting parent is single. Households in which there is a single parent have less time and money available for child care. Less time available would suggest a negative effect on child care time, but less money would suggest more parental child care time as paid substitutes are less affordable. For fathers, it appears that the monetary resource effect dominates, as the marginal effects are positive for all child care measures. However, except for non-development-oriented care, they are based on statistically insignificant coefficient estimates, probably due to the very small number of single fathers in our sample. For the high quality care measures they vary from 15 min for sole-tasked care to a high of 37 min for primary care. For the lower-quality care measures the marginal effects vary widely from 102 min for secondary care to a high of 256 min for passive care. Thus, single fathers appear to spend more time in child care, but it is more likely to be passive care than any sort of high-quality care.

Another measure of household resources is whether or not there is a disabled adult present in the household. Presumably, if an adult is present in the household who requires care, less time is available for the care of children. However, the effects for this variable are positive across the board, perhaps because the presence of a disabled adult requires a greater amount of the father's time to be spent in the household and thus with children as well. This explanation makes sense as the positive effects are largest for secondary, passive, and multi-tasked time. However, caution must be used in interpreting this result as it is based on statistically insignificant coefficient estimates.

Household resources are also reflected in the presence of other adults in the household. As expected, the presence of other adults in the household decreases the amount of time a father spends in child care of any sort, presumably because other adults can substitute for the father in the provision of care. The effects on the high-quality measures range from 40 min for sole-tasked care to 68 min (over one hour) for development-oriented care, while the effects on the lower-quality measures range from 91 min for non-development-oriented care to a high of 316 min (over 5 h) for passive care. This pattern suggests that other adults in the household disproportionately reduce the lower-quality time fathers spend with their children and, in particular, time spent with a child while doing something not child care-related. As another measure of a household's internal resources for child care, we include in our analysis a count of the number of women in the household. For fathers, this variable is negative for all types of child care except passive care,

indicating that the presence of additional women further substitutes for fathers' direct care of children. However, this latter result should be treated with caution as the coefficient on the count of women in the household is never statistically significant for fathers.

Our measure of external child care available to the household is an indicator for whether or not such care is reported to be difficult to find. The marginal effects of this variable on fathers' minutes of high-quality care are indeed positive and range from 12 to 19 min. The effects on lower-quality care range more widely across measures, from 20 min for multi-tasked care to 108 min (almost 2 h) for passive care. Thus, it appears that external care, like the presence of other adults in the household, would take the place of fathers' lower-quality time spent with children, especially as defined by engagement in other activities instead of child care while in the presence of a child (passive care). Such a substantial effect would not be apparent if lower-quality care were measured by secondary, non-development-oriented, and/or multi-tasked care only.

Weekend effects also differ widely across the different measures, although they are all positive as expected given the relaxed market work constraint on weekends. However, while the marginal effects for all the lower-quality measures are based on statistically significant coefficient estimates, of all the high-quality measures only the marginal effect for development-oriented care is based on a statistically significant coefficient estimate. An additional weekend diary day increases sole-tasked care by under a minute, primary and active care by 5 min, and development-oriented care by 17 min. The figures are larger and the range even wider for the lower-quality care measures, with an additional weekend day increasing fathers' non-development-oriented time by 26 min and increasing passive care by 176 min (almost 3 h). This indicates that fathers disproportionately increase their investment in lower-quality child care time, as opposed to high-quality time, on the weekends, using three out of four of our quality classifications. However, the relative weight placed on development-oriented time vs. non-development-oriented time is not much changed. This perhaps reflects the notion that the development/non-development-oriented time classification is likely to reflect parents' heterogeneous preferences for child quality rather than individuals' time constraints (the latter of which are more reflected in the other three quality classifications, especially the active/passive and sole-tasked/multi-tasked classifications).

The effects of parents' characteristics also differ across measures. While fathers' education positively affects all types of child care time (although not all of the underlying coefficient estimates are statistically significant), the effect of a bachelor's degree or higher on high-quality care ranges from 17 min for sole-tasked time to 47 min for development-oriented time and its effect on lower-quality care ranges from 30 min for non-development-oriented time to 67 min for passive time. This positive influence of fathers' education may reflect fathers with stronger child quality preferences and/or greater ability to juggle competing tasks selecting into greater levels of education. It also may be the case that becoming educated itself involves a change in preferences and/or an increase in the ability to manage multiple tasks. The pattern with regard to development-oriented versus non-development oriented time in particular suggests that a father's receipt of a

bachelor's degree is associated with stronger preferences to engage in child development activities, although we do not know whether this is due to selection or learning by fathers.

Finally, increasing parental age is associated with decreased expenditure of child care time by fathers across the board, as we would expect given the association of parents' age with the distribution of children's ages in the household and the fact that older children require less care. However, with respect to the active/passive and sole-tasked/multi-tasked quality classifications, a disproportionate decrease in lower-quality care compared to high-quality care is evident as fathers age, which may indicate the presence of a binding time constraint on fathers when their careers are developing and their children are younger overall.

4.2 Marginal effects for women

Table 7 presents marginal effects for mothers. As with the marginal effects for fathers, large differences are found across the lower-quality care measures. However, unlike the marginal effects for fathers, the biggest differences are found when comparing the active versus passive classification against the others (rather than the development- versus non-development-oriented classification against the others). The marginal effects for mothers are also larger than those for fathers, which makes sense given that their average time spent in child care activities is larger.

Marginal effects for the number of children in the household on mothers' child care time of all types are all positive, as is the case for fathers. However, while fathers spend disproportionately more time in non-development-oriented activities than in development-oriented activities in households with two children as opposed to one child, mothers spend disproportionately more time in development-oriented activities. This reverse pattern by gender is also evident, though less prominent, as households increase in size beyond two children. This pattern would be impossible to identify without detailed quality time measures.

We also see that the marginal effects of having a third or fourth child are generally larger for the lower-quality care measures than for the high-quality care measures, as for fathers, with the exception that the marginal effect of the third child is larger for higher-quality, development-oriented time than for lower-quality, non-development-oriented time. The largest marginal effects on the lower-quality measures are for mothers' passive time. Thus, time constraints appear to bind with additional children, although development-oriented time appears to be a priority.

Mothers whose youngest child is an older toddler or preschooler spend more time in lower-quality care and less time in high-quality care, in general, than mothers whose youngest child is an infant or young toddler.[9] This includes more time in non-development-oriented activities and less time in development-oriented activities, thus differentiating mothers from fathers who do not spend less time in development-oriented activities when their youngest child is age 2–4 than when

---

[9] The one negative marginal effect of having an older toddler or preschooler on multi-tasked time is based on a statistically insignificant coefficient estimate.

s/he is an infant or younger toddler. All types of mothers' time with children fall as the youngest child ages beyond 4 years old, with the exception of passive care time, which increases when the youngest child is age 5–9 (as is the case for fathers). This could reflect parents' presence in the home after school when the youngest child is old enough not to need direct parental engagement but too young to participate in many after-school activities.

Our indicator for whether or not a disabled child is present in the household yields a different response pattern for mothers than for fathers, and a difference by quality classification as well. Mothers exhibit an increase in child care time using every measure of care minutes when a disabled child is present in the household, whereas fathers' marginal effects are all negative except for that on passive care. This overall pattern may indicate the presence of a gender-specific division of care for disabled children, where the mother is primarily responsible. For mothers, passive care shows the largest response to the presence of a disabled child, at 40 min of extra time, probably because a disabled child requires greater parental accessibility. In addition, mothers' development-oriented care increases more than proportionally relative to non-development-oriented care, likely because the mother is spending more time in physical care of the child (one of the specific categories included in the development-oriented measure). These results should be treated with caution, however, as the marginal effects of the presence of a disabled child are not supported by statistically significant coefficient estimates in any care equation for either gender.

Turning to our indicators for household resources, we first note that single mothers, like single fathers, spend more child care time of every type than married mothers, probably because they lack a spousal substitute for their time, although none of the coefficients on this variable are statistically significant. However, unlike our findings for fathers, the marginal effects on mothers' child care time when a disabled adult is present in the household are all negative, with the exception of passive care. One explanation for this is that disabled adults may in some instances substitute for the mother's child care time. This pattern could also result if the expectation of adult care falls disproportionately on the mother and so the mother must divide her time between caring for the disabled adult and caring for her children. Passive care could still be higher, as caring for a disabled adult would make a mother more likely to be in the home when her children are present. Like the marginal effects for fathers, however, these marginal effects are based on statistically insignificant coefficient estimates and so must be treated with caution.

The presence of other adults in the household reduces mothers' time with children on every metric, as was the case for fathers. However, while the passive care contributed by mothers declines dramatically relative to active care when there are other adults in the household, neither secondary nor non-development-oriented time falls disproportionately relative to its high-quality counterpart. Thus it appears that other adults replace more of a mother's time spent in the presence of her children when she is not performing any direct child care than other time. We also find that the count of women in the household, holding the number of other adults constant, exerts a positive influence for every measure of mothers' child care time whereas for men the estimated coefficients on this variable were generally negative and statistically insignificant. However, only the marginal effects on development-

oriented time and passive time for women are based on statistically significant coefficient estimates. Therefore, it appears that the presence other women in the household allows mothers to spend more time directly investing in their children's development as well as more passive time, perhaps because these other women are helping with both direct child care and other household tasks that would have fallen to the mother.

Our indicator for whether the household reports that child care is difficult to find exerts positive pressure on all measures of mothers' child care time, as was the case for fathers. Furthermore, we find that, like fathers, mothers disproportionately increase their lower-quality care minutes when child care is difficult to find, and for mothers this holds regardless of quality classification. Thus it appears that external care would substitute disproportionately for mothers' lower-quality time spent with children.

On weekends, mothers spend more time in lower-quality care and less time in high-quality care of all sorts, with passive care increasing the most and primary care decreasing the most. Recalling that fathers spend more care of all sorts on the weekends, perhaps due to their more relaxed time constraint, there may be some substitution of fathers' primary time for mothers' primary time on the weekends. There may also be an increase in family togetherness time on the weekends where activities are done together that may not be directly classified as child care and so fall into the passive child care category.

Mothers' education levels generally increase their time spent with children. A striking difference from the overall positive pattern is that mothers with a certificate or diploma or "other post-school qualifications" spend less time in passive care than mothers who have not graduated from high school. This may be due to odd hours that such women work (for instance, night shifts for nurses), making them less accessible to children. However, the marginal effect for "other post-school qualifications" is based on a statistically insignificant coefficient estimate due to the small number of mothers who have indicated "other post-school qualifications" as their highest level of education achieved. The effects of receiving a bachelor's degree or higher are also striking. As for fathers, a mother with a bachelor's degree or higher spends substantially more development-oriented time with her children than mothers with less than a high school degree, with the difference being almost twice as large as that yielded by any other educational qualification. This difference between the highest and lowest-educated mothers is also more than twice as large as that for fathers.

Finally, older mothers spend less time than younger mothers in child care, perhaps because they have generally older children than younger mothers. In addition, when one looks at the active/passive classification, there is a disproportionate decrease in passive care compared to active care as mothers age. Perhaps this again reflects a relaxation of mothers' time constraints as they age, as hypothesized for fathers.

4.3 Additional discussion

It is difficult to condense the many results that we report above into a more digestible form without sacrificing detail. However, we review here a few main

points we draw from our results. First and most importantly, we find a number of empirical patterns leading us to conclude that there are two separate dimensions along which parental investments in child care time adjust. One is parental preferences, which are reflected best in our development/non-development-oriented care measures, and the other is parental and household time resources, which are reflected best in our active/passive and sole-task/multi-task measures. A number of overall patterns with respect to particular variables are also worth noting. First, we find that non-parental substitutes for parental child care time exert an impact on time spent by both mothers and fathers, with care provided outside the home or by other adults in the home substituting mostly for parents' lower-quality care. We also find that on weekends, lower quality care rises for both genders and that some of the increase in fathers' lower quality care on weekends may be substituting for mothers' high-quality time with children during the week. Disabled children or adults present in the household have, surprisingly, no statistically significant net impact on parents' time spent with children, and neither does single-parent status. Finally, both mothers and fathers with bachelor's degrees or higher spend more time in child care than other parents, particularly in development-oriented care.

5 Conclusion

In this paper, we estimate correlated Tobit models of high-quality child care time, lower-quality child care time, and the amount of market work time spent by Australian parents in 1992 and 1997, using data from two Australian time-diary studies and four alternative definitions of child care quality. We estimate these models separately by gender and find that different definitions of the quality of child care time appear to capture conceptually different aspects of parental time with children.

Our paper has compared four ways of conceptualizing and measuring the quality of child care time spent by parents. We find that the measure of quality chosen matters significantly to our results and adds substance and depth to our interpretations. In particular, comparisons across different measures are important for teasing out the types of time that are most affected by particular covariates, and thereby for building a deeper understanding of the nature of parental investments in children. We hope that this work will motivate other time-use researchers and policy makers concerned with the effect of parental child care time on children's outcomes or parents' costs to carefully consider the measure or measures of parents' child care time that they utilize.

References

Australian Institute of Health and Welfare. (2005). Australia's Welfare 2005. AIHW Cat. No. Aus65. Canberra: AIHW.

Bianchi, S. M. (2000). Maternal employment and time with children: Dramatic change or surprising continuity? *Demography, 37*, 401–414. doi:10.1353/dem.2000.0001.

Craig, L. (2007). How employed mothers in Australia find time for both market work and childcare. *Journal of Family and Economic Issues, 28*, 69–87. doi:10.1007/s10834-006-9047-2.

Folbre, N., Yoon, J., Finnoff, K., & Fuligni, A. S. (2005). By what measure?: Family time devoted to children in the United States. *Demography, 42*(2), 373–390. doi:10.1353/dem.2005.0013.

Hallberg, D., & Klevmarken, A. (2003). Time for children: A study of parent's time allocation. *Journal of Population Economics, 16*, 205–226. doi:10.1007/s001480200133.

Kalenkoski, C., Ribar, D., & Stratton, L. S. (2005). Parental child care in single parent, cohabiting, and married couple families: Time diary evidence from the United Kingdom. *American Economic Review, 95*(2), 194–198. doi:10.1257/000282805774670176.

Kalenkoski, C., Ribar, D., & Stratton, L. S. (2007). The effect of family structure on parents' child care time in the United States and the United Kingdom. *Review of Economics of the Household, 5*(4), 353–384. doi:10.1007/s11150-007-9017-y.

Kimmel, J., & Connelly, R. (2007). Mothers' time choices: Caregiving, leisure, home production, and paid work. *Journal of Human Resources, 42*(3), 643–681.

Nock, S., & Kingston, P. (1988). Time with children: The impact of couples' work-time commitments. *Social Forces, 67*, 59–85. doi:10.2307/2579100.

OECD thematic review of early childhood education and care policy: Australian background report. OECD Press: Canberra, March 2001.

Shaw, D. S., & Bell, R. Q. (1993). Developmental theories of parental contributors to antisocial behavior. *Journal of Abnormal Child Psychology, 21*(5), 493–518. doi:10.1007/BF00916316.

Stafford, F., & Yeung, W. J. (2005). The distribution of children's developmental resources. In D. S. Hamermesh & A. P. Gerard (Eds.), *The economics of time use* (pp. 289–313). Amsterdam: Elsevier.