Parental Childcare Time and Children's Cognitive Development

Frank Stafford
University of Michigan

W. Jean Yeung
New York University

October 19, 2007

PURPOSE

(1)   **Examine the extent to which parental beliefs, particularly when shared, influence developmental resources, notably time and social capital, devoted to the development of young children.**

(2)   **Examine the relationship between children's time with parents and their cognitive development**

Theoretical Background

Our work relies on the idea of parents' shared beliefs about the common or family public good of child development. If both agree to a high standard child development this leads to greater shared effort to enhance child well-being in multiple ways.

Payoff to shared childcare time:

- collective good of child well-being
- intrinsic satisfaction from child care, or 'process benefits' in the theory of time allocation or 'warm glow' in the theory of privately provided public goods (Andreoni, 1990).
- yet another public good is marriage capital

Theoretical Perspectives on Developmental Resources

Here we consider the process by which child development occurs in a highly stylized 'production' setting. The main idea is that parent's own time, on the one hand, and externally purchased goods and services, on the other, are, beyond some limited range, more likely to be complementary rather than substitutable. In addition, the time of both parents may be complementary – so two hours of one parent's time may not be as effective as one hour of time from each. We assume that those who care most about this family public good are most likely to match up in marriage and that such marriages will tend to be more stable.

If parents' efforts to bring up their children is solely motivated by the joy and satisfaction they obtain by doing it independent of the result, then what we would normally call time inputs to investments in children may be only consumption or produce both consumption and investment as outcomes. Generally, with contextualized measures, parents report childcare as stressful but in answers to global or decontextualized measures parents often report deriving satisfaction from childcare time itself (as distinct from the added routine housework). The idea of some overall value to childcare per se gives rise to the application of impurely altruistic or 'warm-glow' aspects (Andreoni, 1990) to the resources provided by each partner caring for children.

The family has a utility function

(1) $\;\; U = U(N, K_1, Z)$

where N is the number of children, K_1 is child quality or home input received by each child. (Here we ignore inter-child differences and the detail of which parent's time.) All other goods are represented as Z. To simplify we assume K_1 and Z are produced according to the following linearly homogeneous 'household' production functions

(2) $\;\;\; C = C(h_c, M_c)$

(3) $\;\;\; Z = Z(h_z, M_z)$

where C = NQ and h_i and M_i (i = C,Z) are, respectively, vectors of time and goods allocated to children and other pursuits. In the framework one can modify the process by adding childcare time as an argument in utility in (1). Here we develop expressions for the parents' combined allocation of time to childcare ignoring such process benefits. Specifically, it can be shown that the compensated wage elasticity of childcare time can be expressed as:

(4) $\;\; \left| \dfrac{\partial_{hc}}{\partial_w} \cdot \dfrac{w}{h_c} \right|_F \equiv \varepsilon = -(1 - \alpha_c)\gamma_c + (1 - k)\sigma(\alpha_z - \alpha_c)$

where $\alpha_c = wh_c/\Pi_c C$ is the time intensity parameter for the production of C = NQ (α_Z is analogously defined for the production of Z); γ_c is the elasticity of substitution between h_c and M_c in the production of C, k is the share of the full budget (F) going to child care and σ is elasticity of substitution in consumption between C and Z. The algebraic sign of the second term on the right hand side of (4) depends on the

difference in time intensity parameters in the production of C and Z. It seems very plausible that, particularly in the preschool years, the time intensity of childcare exceeds that of other home activities, and $\alpha_C > \alpha_Z$. An increase in market wage of the parent raises the marginal cost of both C and Z, but raises it relatively more for the more time intensive commodity. For $\sigma > 0$ this will lead to a substitution away from C.

The explanation for greater time in child care for more educated parents rests on the underlying income elasticity for C. Further, as distinct from other household activities, the production of child care probably exhibits a very low elasticity of substitution between goods and time (γ_c) and accounts for a large fraction of the family's full budget. For these reasons childcare time can be greater for those with higher wage potential despite the higher time cost and can be much greater per child. In addition, if educated, high wage parents match up in marriage to achieve mutual warm glow benefits from child care, there may be, across families, a resulting high level of dispersion in resources to early development of young children.

Joint Time Investments in Two-Parent Families

We assume that much of the simple one-parent model above applies, but that, in addition, there is a sorting and matching process leading to parental pairs of individuals who are similar in their rating of the importance of child development. Moreover childcare may be a source of match-specific enjoyment that solidifies the marriage. In this vein, when such a matching is not the case, we might have either a less stable relationship for the parents and a single-parent outcome, or a situation where one parent has the primary responsibility for child development (possibly motivated by warm-glow feelings) and the other is either a free rider or compensates the partner in some other domains.

Data: 1997 and 2002 Child Development Supplement to the Panel Study of Income Dynamics (CDS)

CDS I - contains information about child development for a national sample of approximately 3,500 children aged 0-12 in 1997.

CDSII – approximately 2,900 children reinterviewed in 2002. Age ranges from 5-18

Analysis Sample: children aged 0-12 who lived with both their biological or adoptive parents in 1997, children of the family head, have valid time diary data, and have a valid cognitive test scores in 2002. N=1,334

Child-based time diaries - for one random weekday and one random weekend day

This paper only analyzes children's primary activities but utilizes the measurement concepts of active and accessible time of parents in conjunction with a selection of time uses seen as relevant for child development.

Diary of Parents

- Multiple caregivers
- Allocation to specific children
- Use of with whom codes
- Limited set of child activities

Diary of the Child

- Likely unbiased measure of childcare
- Cost savings from multiple diaries
- Respondent burden with multiples
- Secondary activities
- Other descriptors
- Complex constructions
- *Allocation to the given child*
- *Multiple Children*

Measures of Parental Childcare Time-

distinct from housework time

"Developmental time" – defined as parental involvement in children's intellectual, physical, and social development as time spent in -

(1)   Caregiving activities, which include care the child received such as bathing, changing, and grooming, as well as eating meals together both at home and away from home

(2)   Play and companionship activities, which include both active and passive play and other types of leisure events

(3)   Achievement-related activities, which include time spent studying, doing homework, reading, and in other educational lesson

(4)   Social activities, which include visiting, household conversations, religious activities, and participation in other social events

Two levels of involvement -

- **Engagement time**: the amount of time a parent interacts directly with a child

- **Accessible time**: the amount of time a parent is available to the child but not directly engaged with the child

Parents' commitments to child development is measured by parents' self reports to a question that assesses the extent to which he or she agrees to the statement that –

"Being a father/mother and raising children is one of the most fulfilling experiences a man/woman can have".

The scale ranges from 1 to 4, indicating low to strong parenting value. Those who responded "strongly agree" are coded as having a "high" value on childrearing.

Four categories of couples are forms:
- **both have high value of child development (32%)**
- **only mother have a high value (18%)**
- **only father have a high value (21%)**
- **neither parent has a high parenting value (29%).**

Table 1: Time Children Spend Directly Interacting with Biological or Adoptive Parents, by Family Type

	A Weekday				A Weekend Day			
	Both bio parents	**Bio-mom only**	**Bio-dad only**	**Other**	**Both-bio parents**	**Bio-mom only**	**Bio-dad only**	**Other**
Total Time	2:15	1:01	1:07	0:54	4:42	1:57	1:30	1:40
With both parents	0:51	0:03	0:02	0:07	2:46	0:13	0:07	0:22
With mom only	1:01	0:56	0:03	0:45	1:13	1:36	0:00	1:12
With dad only	0:23	0:02	1:02	0:02	0:43	0:08	1:23	0:06

Table 4: Total Weekly Developmental Time (in minutes) A Child Spends with Parents by Parents' Attitudes toward Child Development

	N	Engaged time	Engaged + accessible time
ALL			
Time with both parents	943	462.17	908.76
Time with father	943	623.03	1294.96
Time with mother	943	789.79	1691.65
Both High = 42/wk			
Time with both parents	308	496.62	942.39
Time with father	308	693.20	1385.54
Time with mother	308	852.87	1779.65
Only Mom High			
Time with both parents	167	433.07	859.96
Time with father	167	588.07	1279.03
Time with mother	167	795.88	1598.66
Only Dad High			
Time with both parents	209	456.67	920.86
Time with father	209	618.56	1269.06
Time with mother	209	808.00	1777.94
Neither High=36/wk			
Time with both parents	259	444.16	890.44
Time with father	259	566.92	1219.99
Time with mother	259	700.7	1582.92

Table 5: Tobit Estimates of Total Weekly Developmental Time A Child Spends with Parents

Variable	Both Parents		With Father		With Mother	
	Engaged Time Only	Engaged + Accessible Time	Engaged Time Only	Engaged + Accessible Time	Engaged Time Only	Engaged + Accessible Time
Intercept	642.38***	989.1***	997.87***	1761.96***	1249.89***	2154.22***
	(-62.1)	(65.41)	(47.95)	(78.20)	(56.03)	(85.03)
Child's Age	-2.56	12.99**	-18.38***	-28.91***	-45.25	-63.70***
	(4.45)	(4.63)	(24.55)	(5.56)	(3.99)	(6.04)
Child's Gender (boy=1)	-28.60	-3.54	-5.08	87.37*	-43.58	18.98
	(31.86)	(33.30)	(24.55)	-39.8	(28.46)	(43.24)
Ethnicity (ommitted=white)						
Black	-70.98	-38.04	31.14	19.7	135.71*	-43.49
	(45.64)	(70.71)	(54.64)	(85.86)	(62.45)	(91.60)
Hispanic	-66.69	85.11	-44.79	81.63	85.81+	201.93*
	(64.68)	(60.44)	(45.02)	(72.54)	(51.55)	(78.77)
Other	-145.75	-177.22*	-102.34+	52.43	7.18	31.51
	(80.51)	(76.98)	(55.96)	(92.69)	(64.74)	(99.10)
Father's Hourly Wage	-8.67	-3.95	-13.91***	-10.20	-1.92	-6.94
	(5.27)	(5.31)	(3.87)	(6.31)	(4.51)	(6.90)
Father's Education (whether college)	-10.87	11.09	45.58	42.69	32.82	22.76
	(39.54)	(41.31)	(30.39)	(49.46)	(35.22)	(53.63)
Mother's Earnings/Total Family Income						
25-49%	45.40	-58.16	2.12	-58.49	-41.18	-272.30***
	(37.05)	(39.3)	(29.04)	(46.91)	(33.67)	(50.98)
50% and above	13.86	35.77	10.28	-1.49	-89.42	-255.63***
	(54.85)	(59.98)	(44.43)	(71.50)	(50.92)	(77.76)
Mother's Education (whether college)	-85.24*	-134.77**	-106.69***	-264.67***	-87.12*	-143.87**
	(40.21)	(41.65)	(30.52)	(49.72)	(35.48)	(54.01)
Number of children at home	-43.81***	-41.06*	-61.14***	-71.87***	-60.38***	13.25
	(16.03)	(16.31)	(12.09)	(19.82)	(13.94)	(21.09)
Parenting Attitudes/ Values (omitted= neither high)						
Both high	72.72+	69.56	87.83**	117.75*	63.17+	88.3
	(41.79)	(43.27)	(31.83)	(51.78)	(37.05)	(56.27)
Mom High Only	27.46	-13.55	-20.43	33.75	-3.30	-74.33
	(48.91)	(51.38)	(37.89)	(61.01)	(43.90)	(66.66)
Dad High Only	43.37	27.95	23.1	42.63	57.03	175.3**
	(45.79)	(48.12)	(35.43)	(57.55)	(41.10)	(62.43)
Scale	479.7	654.09	469.43	775.4	555.85	852.1
Loglikelihood	-6312.09	-11930.8	-11072.9	-1241165	-11904.89	-12893.06
censored n	129	59	80	32	32	5
Noncensored n	814	868	847	895	895	922

Note: *** p< .001, ** p<.01, * p<.05, +p<.1

Does parental time seem to affect cognitive development?

Definition of high Developmental Time: (consisting of about one third of the sample)

Measured in CDS-I (1997)

Time Per weekday:
With Both Parents: 40 minutes
With Father: 1 hour
With Mother: 1.5 hour

Time Per weekend day
With Both Parents: 1.5 hour
With Father: 3 hours
With Mother: 3.5 hours

Child Outcomes Measures (in CDS-II, I 2003):

Woodcock-Johnson Achievement Tests Revised (1989)
- **Applied Problem score (age-standardized)**
- **Letter-Word score (age-standardized)**

High Parents' Education – defined as family head has 13 years of education or more

Weekend Engaged Time with Parents and Children's Test Scores in 2003

	Applied Problem Scores			Letter-Word Score		
	With both parents	With father	with mother	With both parents	With father	with mother
Intercept	76.85	76.69	76.57	84.73	84.73	84.41
Whether high weekend time	−0.12	0.20	0.55	−0.20	−0.14	0.60
High EDU * HIGH TIME	3.00	2.72	2.49	3.48	3.38	2.86
head 13 or more yrs edu	4.82	4.90	4.97	4.27	4.30	4.46
PCG verbal test score in 1997	0.40	0.40	0.40	0.68	0.68	0.68
total fam income 20-39k	2.87	2.89	2.87	1.72	1.72	1.72
total fam income 40-59k	3.80	3.81	3.81	2.53	2.55	2.55
total fam income 60k +	7.09	7.11	7.10	3.96	3.97	3.98
gender,1=boy,0=girl	2.00	1.98	1.98	−4.52	−4.51	−4.54
Black	−8.26	−8.26	−8.28	−6.44	−6.44	−6.46
Latino	−3.73	−3.75	−3.72	-0.98	-0.97	-0.97
other ethnicity	−0.56	−0.57	−0.58	0.20	0.21	0.17
# children under 18	−0.77	−0.76	−0.75	−1.40	−1.40	−1.37
Cognitive Stimulation	1.22	1.22	1.23	0.11	0.11	0.12
with both bio parents in 2001	−1.00	−1.02	−1.09	0.64	0.63	0.54
Adj. R-squared	0.24	0.24	0.24	0.14	0.14	0.14

*Shaded cells are statistically significant

Weekend Engaged Time with Parents and Children's Test Scores in 2003

WEEKDAY TIME with parents (in minutes)

	Applied Problem Scores			Letter-Word Score		
	With both parents	With father	with mother	With both parents	With father	with mother
Intercept	76.81	76.83	75.74	84.80	85.73	84.56
whether high weekend time	−0.31	−0.62	1.21	-0.97	-2.46	-0.07
High EDU * HIGH TIME	2.28	1.09	0.19	0.00	0.12	-0.22
head 13 or more yrs edu	5.22	5.57	5.76	5.60	5.67	5.66
PCG verbal test score in 1997	0.40	0.40	0.40	0.68	0.67	0.68
total fam income 20-39k	2.85	2.76	2.89	1.56	1.60	1.65
total fam income 40-59k	3.77	3.79	3.98	2.63	2.56	2.63
total fam income 60k +	6.98	6.86	7.08	3.66	3.54	3.74
gender,1=boy,0=girl	1.85	1.90	1.85	-4.56	-4.43	-4.60
Black	−8.24	−8.31	−8.23	-6.54	-6.55	-6.48
Latino	−3.67	−3.66	−3.54	-0.90	-1.17	-0.84
other ethnicity	−0.78	−0.60	−0.46	0.17	0.34	0.18
# children under 18	−0.76	−0.79	−0.72	-1.46	-1.53	-1.43
Cognitive Stimulation	1.24	1.24	1.27	0.12	0.09	0.13
still with both bio parents in 2001	-0.87	-0.77	-0.85	1.00	1.42	0.92
Adj. R-squared	0.24	0.24	0.24	0.14	0.15	0.14

*Shaded cells are statistically significant

IV. Conclusion

Our analyses suggest that parents with interests in child development seek to increase a whole array of inputs to development – ranging from time of each parent, to social capital and traditional measures such as the HOME scale, most likely other developmental resources such as out-of-home schooling. As a result, the assessment of inequality in early childhood development needs to be informed by measures over a large number of domains both in the home, schools and communities. One of the key measures is time input of the parents.

We see that the distribution of time resources to young children will tend to be dispersed by virtue of family public goods and a matching of couples who share beliefs about

child development. These couples will not only be devoting more direct engagement and accessible time to their children, but also, as suggested by economic demography models, have smaller family sizes, producing more resources per child, and are likely to secure greater levels of social capital outside the family as another, complementary, route to enhance children's well-being. As a result, both in-home and out-of-home resources combine for a wide dispersion in resources for early child development.

In using time diaries to create an independent variable predicting cognitive development by parents organizing their weekend time to child related activity, one of the limitations is the inter-day variability of time use. Even parents who provide significant weekend time to the children's development may not have done so on the

randomly selected weekend day. Nonetheless, we find that a rather nuanced measure of substantial weekend time by more educated parents is a consistent predictor of cognitive development as measured by the child's Woodcock-Johnson score.