

Single Mothers' Time Preference, Smoking, and Enriching Childcare: Evidence from Time Diaries

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RRH: Single Mothers' Time Preference, Smoking, and Childcare

Keywords: Time allocation, time preference, childcare, smoking

JEL codes: J13, J22

Abstract: Previous research has shown that time preference affects individuals' market time allocation and own human capital investments. This paper uses data from the CPS Tobacco Use Supplements, the American Time Use Survey, and the PSID-Child Development Supplement to examine how time preference, as measured by smoking behavior, affects mothers' time investments in their children under age 13 and children's future test scores. Results indicate that single mothers who smoke spend significantly less time with their children in educational activities, such as reading and homework, and sharing meals with their children than non-smokers. Their children also have lower reading test scores.

INTRODUCTION

Previous research has shown that time preference affects individuals' market time allocation and own human capital investments [Becker 1975; Mincer 1974]. Recent research by Song [forthcoming] has shown that time preference, as measured by smoking behavior, may also affect an individual's activities on a daily basis. For example, women who smoke, and thus have a higher rate of time preference, spend more time on activities that provide immediate gratification, such as watching TV, while those who have never smoked spend more time on activities that incur current costs for the sake of future benefits, such as exercising and educational activities. This paper extends this line of research by examining how time preference, as measured by smoking, affects single mothers' time investments in their children who are under the age of 13. We pay particular attention to distinguishing effects on differential qualities of maternal childcare. We also examine whether children of mothers with a high rate of time preference score lower on several early cognitive tests.

This research is important because there is evidence that early childhood cognitive skills predict future cognitive skills, which are rewarded in the labor market [Ensminger and Slusarcick 1992; Katz and Murphy 1992]. Parents make time and monetary investments in their children's health and education [Becker 1981]. Leibowitz [1974] found a positive relationship between parental time with children and child outcomes later in life. Agee and Crocker [2002] showed that a higher discount rate on the investments that parents make in their children leads to lower cognitive skills in their children.

Using data from the Current Population Survey Tobacco Use Supplements, the American Time Use Survey, and the Panel Study of Income Dynamics-Child Development Supplement, this paper finds that, even after controlling for parental differences in income, employment, and

education, single mothers with a higher rate of time preference spend significantly less time with their children overall and slightly less time engaged with their young children in educational activities, such as reading and homework, and much less time sharing meals with their children. Their children also have lower scores on reading comprehension tests.

LITERATURE REVIEW ON SMOKING AND TIME PREFERENCE

Economists and psychologists have established a positive correlation between smoking behavior and an individual's rate of time preference, or discount rate, which is the premium that individuals place on present well-being over future well-being.¹ In seminal research by Fuchs [1982], he showed that smoking intensity increases with discount rates using a series of monetary time-preference questions. Since then, most researchers [Bickel, Odum, and Madden 1999; Lahiri and Song 2000; Odum, Madden, and Bickel 2002; Reynolds et al. 2004; Khwaja, Sloan, and Salm 2006] examining the relationship between discount rates for money and health outcomes have found that smokers are more impulsive than non-smokers in that they choose small but immediate rewards over large but delayed rewards.² Using a revealed preference approach based on actual labor market choices involving occupational fatality risks, Scharff and Viscusi [forthcoming] recently showed that smokers have much higher implicit discount rates with respect to years of life than non-smokers, even while controlling for educational differences.

Until recently, little research has addressed whether smoking causes a higher discount rate or having a higher discount rate leads people to smoke. Using the Health and Retirement Survey, Khwaja, Sloan, and Salm [2006] used fixed effects to establish that current smokers' present-orientedness is due to time-invariant innate characteristics rather than their smoking behavior. Recently, several economists have also documented that smoking status may be an

appropriate proxy for innate preferences when studying wage behavior. Using the National Longitudinal Survey of Youth 79, Munasinghe and Sicherman [2006] examined smoking and wage dynamics. They determined that smokers are likely to be more present-oriented than non-smokers and thus individual discount rates determine differences in starting wage and wage growth over the first decade of the respondent's career. Grafova and Stafford [2009] used the Panel Study of Income Dynamics to examine the wage gap between male smokers and male non-smokers. They found that there is a wage gap driven by persistent smokers, and concluded that there is likely a preference or behavior of persistent smokers that both reduces wages and leads to smoking and not being able to quit. Using self-reported health status measures, they rejected the hypothesis that smokers simply exhibit lower productivity because they are taking smoking breaks or call in sick more often.

Song [forthcoming] has shown that the effect of smoking on the time use activities of women is consistent with the notion of different time use due to different rates of time preference. In other words, women who smoke spend more time on activities that provide current utility and less time on activities where most of the rewards are in the future. For example, women who currently smoke spend more minutes per day watching television, fewer minutes per day on own education, and fewer minutes per day exercising than women who have never smoked.

To the extent that other factors, for which we cannot adequately control, affect both the likelihood of a mother smoking and the time she spends with her children, our estimates may be affected by unobserved heterogeneity bias. For example, it may be particularly important to control for a mother's health status. If a mother has poor health as a result of smoking, then she may not be able to spend much time playing sports with her children as a result of her health

rather than her placing less value on the future benefits she expects for her children. However, her poor health would be less likely to affect time spent in educational activities, such as reading to her children or helping with homework. In addition, many of the negative health consequences of smoking happen after decades of smoking, while our sample includes new mothers who are relatively younger than the general population.

Previous researchers [e.g. Gruber and Köszegi 2001; Sloan and Wang 2008] have suggested that smokers may be myopic with respect to the health risks of smoking and the addictive nature of smoking, although empirical evidence is mixed. If this general myopic trait leads smokers to be at the same time more uncertain about the benefits of time spent with children on certain educational activities, our findings would be overestimated.

Smokers may be risk tolerant, again evidence is mixed [Viscusi and Hersch 2001; Compton 2009]. However, given that risk preference is not associated with the number of years of schooling—an important component of human capital investment [Barsky et al. 1997], it is unlikely that risk preference should affect time spent with children, which also has a strong investment component [Kimmel and Connelly 2007].

Lastly, some researchers have suggested that discount rates may change over the life cycle or over time [Blaylock et al. 1999; Parker 2000]. This paper takes the position that current smoking status represents current preferences and can therefore affect parents' current decisions regarding their children. These decisions may have a long-term effect on children's outcomes even if their parents' discount rate later changes.

HOW TIME PREFERENCE AFFECTS TIME WITH CHILDREN

We start by presenting a Becker-style model of time allocation to explain how the rate of time preference can affect time investments in children. We consider a household with a single

altruistic parent. Assume that she derives utility from the consumption of a good in the current period, X , and childfree leisure, T_L , and the present value of the quality of her children in the next period, $C(T_C)$, which is a function of the time invested in her children.

$$U = \alpha(X) + \eta(T_L) + \frac{1}{1+r} C(T_c) \quad (1)$$

where α , η , and C are twice differentiable and concave and r is the discount rate. The higher the discount rate, the less importance the parent places today on the quality of her children in the next period. T_L and T_C are choice variables. The time T_C can be thought of as time in enriching activities that the parent believes will produce higher quality children. We assume in this model that all time with children is investment, which is in line with the findings in the recent literature that childcare time is quite distinct from leisure and home production and has a strong investment component [Kimmel and Connelly 2007; Guryan, Hurst, and Kearney 2008]. Her total time is divided as $T = T_M + T_L + T_C$, where T_M is time spent on market work. Her budget constraint is $w T_M + I = X$, where w is her market wage and I is her nonlabor income. For simplicity, we assume that the price of X is one. Combining her time constraint and budget constraint yields

$$w(T - T_L - T_c) + I = X . \quad (2)$$

The maximization of the utility function (1) subject to equation (2) yields

$$\eta' = \frac{1}{1+r} C' , \quad (3)$$

which is simply that mothers will devote time to these activities until the marginal utility from time spent on childfree leisure equals the discounted marginal utility from time spent on future child quality.

Using the implicit function theorem, it can be shown that the effect of the discount rate on investment time with children is negative:

$$\frac{\partial T_c}{\partial r} = \frac{\left(\frac{1}{1+r}\right)^2 C'}{\frac{1}{1+r} C'' + \eta''} < 0 \quad (4)$$

and the effect of the discount rate on childfree leisure is positive:

$$\frac{\partial T_L}{\partial r} = \frac{\left(\frac{1}{1+r}\right)^2 C'}{-\frac{1}{1+r} C'' - \eta''} > 0. \quad (5)$$

We will empirically test equation (4) for the effect of the discount rate on time with children, using a mother's smoking status as a proxy for the discount rate.

AMERICAN TIME USE SURVEY

Data

We use several data sets to examine the effect of time preference on time with children. We obtain measures of time with children from two recent time use surveys: The American Time Use Survey (ATUS), which collected time diaries for individuals aged 15 or older, and the Panel Study of Income Dynamics (PSID)-Child Development Supplement (CDS), which collected child-time diaries. We also use the Current Population Survey (CPS)-Tobacco Use Supplements (TUS) to obtain information on smoking behavior for ATUS respondents.

In 2003, the ATUS began collecting time diaries for one respondent aged 15 and older per household from a random sample of households selected from the final outgoing rotation in the CPS (interviews occurred 2-5 months after the final rotation). Respondents were asked to sequentially report their own primary activities from 4:00 AM the day before the interview to 4:00 AM the day of the interview as well as who they were with and where they were during

each activity. Respondents were also asked about secondary childcare time when they were involved in an activity other than childcare but they had a child in their care. In addition, ATUS interviewers collected demographic data on household members and labor force information for the respondent and their spouse or unmarried partner. Interviews were conducted most days of the year, excluding major holidays.

Although the ATUS collects detailed information on time use, there is not enough information to tell whether a respondent is a smoker, because activities of short duration are less likely to be reported and smoking is likely to be a secondary activity, which would not be reported. However, in February, June, and November of 2003, a Tobacco Use Supplement (TUS-CPS) was administered to all CPS respondents, except for those whose Month in Sample was 4 or 8 in the February TUS. Respondents to the TUS-CPS were specifically asked “Have you smoked at least 100 cigarettes in your entire life?” If they replied yes, they were asked, “Do you now smoke cigarettes every day, some days, or not at all?” They were also asked to report for other household members over the age of 15. Based upon their answers, we classify individuals as smokers or non-smokers. Non-smokers include those who do not currently smoke, given that previous studies [Grafova and Stafford 2009] have found that former smokers are very similar to never-before smokers in key observables, such as education, occupation, and health status.³ In addition, Grafova and Stafford [2009] found that only current smoking status reduces wage growth. In our study, current smokers are those who now smoke every day or some days.

We use a pooled sample of 906 single mothers aged 19-65 from the ATUS who were interviewed from May 2003 to July 2005 and who have corresponding information on smoking behavior from the TUS-CPS (See Appendix Table A1 for a description of how the sample size was selected).⁴ Because the match on smoking status occurs with a 2-20 month lag, it is possible

that some of these smokers have quit by the time of their ATUS interview. As a result of this measurement error, ATUS estimates will be biased toward zero. We present results for single mothers because married parents with a higher discount rate may bargain with their spouses over time spent in childcare activities that provide delayed utility, such as helping with homework.⁵ We examine single-mother households with one or more own household children who are under the age of 13, because this is the criterion for selection into the PSID-CDS 1997 and because teens increasingly have a say in the time a parent spends with them. Approximately 25 percent of single mothers in the ATUS smoked some or all days. In Table 1, we compare the mean characteristics of smokers to non-smokers among single mothers with own children who are under the age of 13. We find that non-smokers are more educated than smokers (a higher percentage hold bachelor and advanced degrees). Non-smokers are more likely to be Hispanic and less likely to be non-Hispanic white than smokers. They are more likely to be employed, work in a white-collar occupation, and work more hours than smokers. There are no significant differences in the ages of the mothers or their children or income.

<<Table 1 here>>

We examine several measures of parental time with children. Reported childcare activities were coded into twenty-six different codes by ATUS interviewers. Any grouping of these coded activities is arbitrary.⁶ However, our aim is to try to distinguish educational childcare and enriching childcare that may have more significant effects on children's human capital from other childcare activities. "Total time with children" includes any time when a child is in the room with the parent regardless of whether the parent is directly engaged in an activity with the child. The parent's primary activity may be cooking dinner while the child is playing in the corner. ATUS codes only capture the primary activity.⁷ Thus, "total time with children" will

capture times when the parent is actively engaged in childcare and times when they are more passively involved but available for interaction with the child. We then examine several subgroups of childcare. “Routine childcare” includes physical care of children and time spent looking after them. “Educational childcare” is a narrow category of care that includes time reading and doing homework with children.⁸ “Meals with children” includes any time when the mother is eating or drinking and the child is in the room. We examine this category because recent research [QEV Analytics, Ltd. 2009] suggests that children in families who share meals together have higher grades and are less likely to participate in risky behaviors. In addition, educational experts suggest that give and take conversations over dinner about the child’s daily activities, including schooling activities, can have larger effects on children’s reading ability and future grades than the little time that parents on average spend reading aloud to their children [Spiegel 2008]. “Other enriching childcare” includes time playing (including sports) and talking with children – both of which are deemed important by developmental psychologists. This category also includes time socializing and attending events with children aged two and older, because parents record the time spent enjoying activities with children differently for younger and older children [Stewart 2010]. Although we investigated many different groupings of other enriching activities, our conclusions remained unchanged. “TV with children” includes any time when the parent is watching TV and the child is in the room. “Other primary childcare” includes all other times, not otherwise classified, that the respondent describes as caring for own household children as well as travel related to childcare (all travel time is coded separately in the ATUS). In all of these categories, we only include time when a child is actually present, as it may be possible that some childcare activities are done when the child is not present, such as drawing a bath or packing school bags.

We also consider the ratio of mothers' time spent with their children to mothers' non-work/non-sleep time (referred to interchangeably throughout as "discretionary time").⁹ This ratio will enable us to test whether or not mothers with a higher rate of time preference spend less of their discretionary time with their children as opposed to their not spending time with children because they are working more to fund their addictive habit or sleeping more because of adverse health effects caused by smoking.¹⁰ We also examine similar ratios for childcare subcategories, although we report only an educational time ratio, as this is our only significant result.

Table 2 reports the percentage of zero values recorded for each of our dependent variables. In the broader childcare category, total time with children, the majority of mothers reported time with their children. However, in some of the childcare subcategories, there are a significant number of zero values. Table 3 shows the average minutes per day, by smoking status, that parents spend doing these various childcare activities. All estimates in the paper have been weighted using survey weights. The means are a weighted average of weekend and weekday diary days. We find that smokers spend less total time with their children than do non-smokers, although the difference is not significant. Smokers also spend less time in educational childcare, meals with children, other enriching childcare, and watching TV with children than do non-smokers. Again, the differences in simple means are not significant.

<<Table 2 here>>

<<Table 3 here>>

Results

We next estimate ordinary least square regressions to examine the effect of being a current smoker on time in our broadest childcare activity of time with children while controlling for a

rich set of observable characteristics that may affect investments in children. Specifically, we estimate the following econometric model:

$$MinCare_i = \alpha + \beta \mathbf{X}_i + \gamma Smoke_i + \varepsilon_i \quad (6)$$

where $MinCare_i$ is the actual minutes per day that the mother spends with own household children under the age of 13; \mathbf{X}_i is a vector of individual and child characteristics; $Smoke_i$ is an indicator for whether the mother currently smokes cigarettes; α , β , and γ are parameters to be estimated; and ε_i is random error-term that follows a normal distribution. We also estimate an ordinary least square regression where the dependent variable is the ratio of time with children to mother's non-work/non-sleep time.¹¹ When examining the childcare subcategories, we estimate the following censored regression models via maximum likelihood in order to account for the high proportion of zero values recorded:¹²

$$MinCare_i^* = \alpha + \beta \mathbf{X}_i + \gamma Smoke_i + \varepsilon_i \quad (7)$$

and

$$MinCare_i = MinCare_i^* \text{ if } MinCare_i^* > 0 \quad (8)$$

$$MinCare_i = 0 \text{ otherwise}$$

where $MinCare_i^*$ is the latent variable measuring the minutes per day a parent desires to spend doing the activity; the other variables are as defined in equation (6).

The control variables in \mathbf{X}_i include continuous mother's age and age squared, and indicators for race and ethnicity (non-Hispanic black, other, and Hispanic), child gender (all boys or mixed), age of youngest household child, number of household children, child aged 13 or older in household, education category of respondent, household income categories, presence of another female relative in household, blue-collar worker, white-collar worker, usual weekly hours worked, divorced/separated status, currently attending school, region, SMSA, year, season,

and weekend/holiday.¹³ Some of these control variables, e.g. parental income, hours, and education, may be negatively correlated with the discount rate, and hours of work also determine the amount of time mothers have available to spend with their children. Without adequate controls in this case, our coefficient estimates on smoking status would be overestimated [Munasinghe and Sicherman 2006]. We include blue-collar and white-collar occupation controls, because certain jobs may make it more difficult to smoke while on the job than others because of the culture at work or lack of break times, thus affecting the decision to smoke. These socio-economic factors may also influence time investments in children.¹⁴ Table 4 presents the marginal effects and robust standard errors for our main effects of current smoking status on time use. Effects for additional important demographic control variables are in Appendix Table A3. For the censored regression models (ML), average marginal effects were calculated for the unconditional expected value.

<<Table 4 here>>

Results indicate that current smokers spend less time with their children overall than do non-smokers; however, effects are insignificant. More importantly, current smokers spend significantly less educational time with their children than do non-smokers (5 minutes). This effect is large relative to how few minutes single mothers spend each day on educational activities with their children. In regards to the tradeoff between time with children and mother's non-work/non-sleep time, we find that smoking mothers spend less of their discretionary time with their children engaged in educational activities than do non-smoking mothers. There are no significant differences by smoking status for routine childcare or watching TV with children. These results are consistent with our theoretical model.

PANEL STUDY OF INCOME DYNAMICS-CHILD DEVELOPMENT SUPPLEMENT

Data

The PSID is a longitudinal study of a nationally representative sample of U.S. families and individuals residing in these families that began in 1968. The PSID has collected detailed data on family composition changes, employment, and income. In 1997, the Child Development Supplement (CDS) of the PSID collected two time diaries for a randomly selected weekday and weekend day for up to two children between the ages of 0 and 12, along with assessments of these children's cognitive development. In 2002-03, additional diaries and data were collected from these same children. The time diaries, which were reported by the child's primary caregiver, with cooperation from the child when possible, recorded the child's activities over a 24-hour period beginning at midnight, as well as who was doing the activity with the child, and who was there but not directly participating in the activity. The report of "with whom" provides the extent of parents' involvement in children's time use. The CDS also collected the current smoking status of the child's primary caregiver, who was usually the mother.

In this section, we use a sample of 417 children who were living with single mothers aged 19-51 in 1997 and had completed both a weekday and weekend diary.¹⁵ The proportion of children whose mother is currently smoking is about 33 percent.¹⁶ In Table 5, we compare the mean characteristics of children and their mothers by mother's smoking status. In the CDS, non-smoking mothers are on average two years older than smokers (and thus, not surprisingly, more likely to have an older child in the household). Non-smokers are more likely to be black than smokers. Non-smokers are less likely to have dropped out of high school and more likely to be employed than smokers.

<<Table 5 here>>

In addition, unlike the CPS or ATUS, the PSID asked each household head and spouse for their self-reported health status. Mothers who smoke are less likely to report excellent health than non-smoking mothers. Because poor health may be correlated with smoking status and thus bias our estimates away from zero if health also affects the quantity or type of time mothers spend with their children, we include controls for mother's self-reported health status indicators in our regressions.¹⁷ Grafova and Stafford [2009] similarly controlled for the independent effects of health status in their paper on the effects of smoking on wage growth. They did find that health status was important but that smoking status was still an important negative predictor of wage growth.

Appendix Table A5 provides a detailed list of the 1997 CDS time-use codes included in our childcare measures. Because the time-use codes used in the PSID-CDS are not the same as those used in the ATUS, the childcare measures we use in this section are slightly different from those used in the previous section based on the ATUS. As described above, the CDS time diary collected information on children's time use, whereas the ATUS time diary collected information on mothers' time use. Thus, "Time with mother" includes any time when the mother is with the child and is the sum of "direct time" and "indirect time." A child's time with mother in the CDS is not directly comparable to mothers' time with child(ren) in the ATUS. Direct time includes any time when the mother is participating in the activity with the child. Indirect time is any time when the mother is present but not actively participating in the activity with the child.¹⁸ For example, if a child is performing in the class play and her mother is enjoying the performance, this time would be recorded as indirect time in CDS, although it would be coded as primary childcare in ATUS. We also examine six more detailed subcategories of direct time with mother. "Routine childcare" includes any time when the child is the passive recipient of personal care

from mother. “Educational childcare” includes time when the child is being read to or mother is helping with homework . “Meals” includes time when the child is eating a meal and the mother is eating with her/him. “Other enriching childcare” includes any time when the mother is playing and talking with the child, participating in active leisure with the child, or socializing with children aged two or older present. “TV with mother” is time when the mother and child are watching TV together. Finally, “other direct childcare” includes all other direct childcare time including all the travel and waiting time associated with these direct childcare activities. For comparison, we also present “TV without mother” and “meals without mother.” We do not have a measure of mother’s non-work/non-sleep time in the PSID-CDS, because only child-time diaries were collected.

Given that the CDS has two diary days (one weekday and one weekend day), we would expect to see more mothers participating in these childcare activities than on the single diary day in the ATUS if mothers optimize care over a longer time period. We present the percentage of zero values reported for each activity in Table 6. There are definitely fewer zeros in the broad childcare categories (less than 3%), suggesting that there was likely some measurement error in the ATUS. However, we still find a significant proportion of zeros in the childcare subcategories.

<<Table 6 here>>

Table 7 shows the average minutes per day that children spend with mothers doing these various activities by mothers’ smoking status. The means are a weighted average of weekend and weekday diary days. Smokers spend less overall time with their children (three-quarters of an hour less). This difference is mostly because smokers spend significantly less time directly engaged with their children than do non-smokers. Children of smokers spend less enriching and educational time with mothers than do children of non-smokers, but the differences are not

statistically significant. Children of smokers spend almost 15 fewer minutes sharing meals with their mothers and six more minutes eating without their mother than do children of non-smokers. Children of smokers also spend over 18 minutes more per day watching TV without their mother.

<<Table 7 here>>

Results

We again estimate ordinary least square regressions to examine the effect of being a current smoker on time in the broader childcare activities in the CDS, which includes time with mother, direct time and indirect time. We estimate censored regression models via maximum likelihood, when examining the childcare subcategories, in order to account for the large number of zero values recorded. Table 8 presents the marginal effects of current smoking status on time use, where the dependent variables are childcare activities measured in average minutes per day.¹⁹ Robust standard errors are adjusted for clustering on siblings. The effects in the CDS are per child. Our control variables include indicators for child gender and child age; mother's age and age squared, mother's usual weekly hours worked, indicators for mother's race and ethnicity (non-Hispanic black, other, Hispanic), education category, blue-collar worker, white-collar worker, divorced/separated status, depressed status²⁰, self-reported health, and mother currently in school; household indicators for income, presence of another female relative, number of household children, a child aged 13 and older in the household; and indicators for region and season.

<<Table 8 here>>

Table 8 also indicates that children of smoking mothers spend significantly less time with their mothers overall than do children of non-smoking mothers (over an hour), with most of this

time in direct engagement with their mothers (53 minutes). We examine subcategories of direct time with mother in order to explain where these differences in time may be spent and whether they are on activities that are likely to enhance child outcomes. Results from the CDS sample confirm the findings in the previous section based on the ATUS sample that children of smokers spend significantly less time on educational activities with their mothers (6 minutes) than do children of non-smoking mothers. Children of smoking mothers also spend substantially less time sharing meals with their mother than do children of non-smoking mothers (17 minutes). They also spend more time taking meals without their mothers. Surprisingly, we find smokers spend less time watching TV with their children than do non-smokers (11 minutes), although the effect is not quite significant at conventional levels. It may be that mothers watch TV shows with their children to control the content (e.g. censoring violent programming) and discuss the shows. We also find that children of smokers spend more time watching TV alone (20 minutes), which would be consistent with a story that smoking mothers are more likely to use the TV as a babysitter, perhaps to take a smoking break. Smokers may also be less concerned about the negative effects TV viewing can potentially have on development. We find no differences in the time smokers and non-smokers spend in the passive childcare categories of indirect time and routine childcare. These children's differences in the level of involvement with their mothers may be important for children's cognitive skill development.

THE RELATION BETWEEN SMOKING AND CHILDREN'S EARLY COGNITIVE OUTCOMES

The findings in the previous sections that single mothers with a higher discount rate (as proxied by smoking status) spend less time investing in their children's human capital inevitably raise the following question: how does this difference in discount rates affect children's

outcomes? Agee and Crocker [2002] showed that a higher discount rate, inferred from parents' willingness to pay for medical care to reduce their children's body burdens of lead, applied by parents to investments in their children leads to lower IQ scores for these children. In an effort to examine how a mother's time preference affects her children's early cognitive outcomes, we analyze three test outcome variables from the Woodcock-Johnson Revised Tests of Achievement [Woodcock and Johnson 1989] administered to children five years later in 2002 PSID-CDS: the letter-word identification, applied problems, and passage comprehension tests. The scores of these tests, which are standardized by child's age, are used in our analysis.

Table 9 reports the sample means of these child test scores by mother's 1997 smoking status. The sample size (N=272) is substantially smaller than the sample used in the time-use analysis because some students did not take the tests. We use 2002 child weights. Although children of smokers have slightly lower test scores on the letter-word identification and applied problems tests, the difference is not statistically significant.

<<Table 9 here>>

To control for additional factors that may affect a child's cognitive skills, we estimate OLS regressions including the following control variables: indicators for child gender, child's age, child had low birth weight (< 2500 grams)²¹, mother's age and age squared, race and ethnicity (non-Hispanic black, other, Hispanic) of mother, education category of mother, blue-collar status of mother, white-collar status of mother, mother's usual weekly hours worked, depressed status of mother, divorced/separated status of mother, mother's self-reported health indicators, mother's passage comprehension scores²², household income categories, presence of another female relative in household, number of household children, child aged 13 and older in household, and region. These control variables are all created from reports to the 1997 CDS.

We find a negative and significant relation between time preference and letter-word identification scores or passage comprehension scores (Table 10). Specifically, children of mothers who have a high discount rate have a 6 point lower score on each test. Thus, results provide some evidence that children of single mothers who have a high discount rate have lower cognitive outcomes.

<<Table 10 here>>

CONCLUSION AND DISCUSSION

In this paper, we used time use data from two surveys (the ATUS and PSID-CDS) and information on smoking behavior to examine whether single mothers who have a higher discount rate invest less in their children's human capital. We caution the reader that we do not draw any causal link between smoking and time with children, but simply use smoking as an indicator for having a higher discount rate. After controlling for parental differences in income, employment, and education, results from the CDS indicate that single mothers with a high discount rate spend less time with their children overall (more than an hour). Moreover, single mothers who have a high discount rate in both surveys spend fewer minutes per day directly engaged with their young children in important educational activities, such as helping with homework and reading. The 1997 CDS also indicates that they spend substantially less time sharing meals with their children, time that could be important for improving children's verbal skills. These results are consistent with the hypothesis that time preference affects the time investments that single mothers make in their children. The results from the ATUS are also consistent with this hypothesis but show fewer significant estimates, which could be due to the aforementioned measurement error in smoking status in the ATUS.

We also find evidence that a mother's discount rate in a child's formative years is negatively correlated with children's cognitive standardized test scores five years later. These early differences in cognitive skills may have lasting effects on children's future educational, health, and labor market outcomes. Thus, differences in time preference can help to explain some of the inequality we observe in child outcomes. Results also provide additional evidence that at least some childcare time is an investment in human capital instead of a chore or pure leisure, suggesting it should not be modeled lumped together with housework time or leisure time.

Acknowledgements

All views expressed in this paper are those of the authors and do not necessarily reflect the views or policies of the U.S. Bureau of Labor Statistics. The authors would like to thank Larry Rosenblum, Victor Jennings, Laura Descha, Jeff DeSimone, Michael Giandrea, Leo Sveikauskas, and Cindy Zoghi for useful comments and suggestions.

NOTES

¹ Economists have also explored the relationship between other risky behaviors and individual discount rates. For example, Borghans and Golsteyn [2006] found a correlation between individual discount rates and BMI.

² An exception is Khwaja, Silverman, and Sloan [2007]. Using a sample of adults aged 50-70 drawn from the Survey on Smoking, they concluded that it is *inappropriate* to proxy time discount rates with measures of smoking behavior. However, Sloan and Wang [2008] pointed out that the findings in Khwaja, Silverman, and Sloan [2007] may differ from those of previous researchers because of a disproportionate share of deaths among time-impatient smokers before reaching late middle age.

³ We did run some specifications with an additional dummy for former smokers, but results for current smokers were very similar. We present specifications with only current smoking status, because this information is available in both the ATUS and PSID-CDS.

⁴ We exclude most teen mothers, because their behavior is significantly different in other research and also because the legal smoking age in some states is 19.

⁵ For married parents in the ATUS, we did examine the effects of smoking on childcare time while also controlling for the spouse's smoking status. For example, if the mother has a higher rate of time preference than the father, we might expect that the mother would do even less enriching care than if the mother and father had similar rates of time preference. We do not find any significant effects for mothers who smoke when their spouse does not smoke; however, we did find that married mothers who smoked and whose spouse also smoked (i.e., has a similarly high discount rate) spent 45 minutes less time overall with their children than do non-smoking married mothers living with a non-smoking spouse. In addition, we find that non-smoking married mothers whose spouse smokes spend 18 more minutes in routine care than non-smoking married mothers with a non-smoking spouse. Non-resident fathers may also provide some care in single mother households; however, previous research from the child diaries in the PSID-CDS 1997 indicates that this time is very limited [Lundberg, Pablonia, and Ward-Batts 2008].

⁶ See the data appendix Table A2 for a detailed list of ATUS codes included in each type of care. Our identification of routine versus enriching activities is similar to Stewart [2010].

⁷ One exception is that ATUS collects time on secondary childcare for any household children under the age of 13. Secondary childcare includes any time where the respondent is responsible for the child. They may or may not be in the same room as the respondent.

⁸ It also includes time spent homeschooling children. There is only one respondent who reports homeschooling and excluding this time produces identical results.

⁹ Specifically, we divide "Total time with children" by the sum of 1440 – total minutes worked by mother – total minutes slept by mother.

¹⁰ However, we find no difference in mean sleep time between smokers and non-smokers in our sample.

¹¹ We also ran specifications where the denominator in these ratios included all non-work time. Results were similar.

¹² Zero time spent in an activity may be because a mother never participates in that activity, or because the mother participates in the activity on some days but not others. If all mothers spend time in the activities at some point, but the time use is randomly observed, then OLS will provide consistent estimates. We think that this is more likely to be the case among single mothers than married mothers, although even they may substitute certain activities with substitute caregivers. However, if some mothers do not spend time in a particular activity over the period over which they optimize, then OLS estimates may be biased [Lundberg, Pablonia, and Ward-Batts 2008]. Foster and Kalenkoski [2010] recently compared the number of zeros in parents' childcare time use data collected over a 48-hour window to those reported in a 24-hour period. Although there was some degree of measurement error in childcare over the 24-hour period, they found that there were still even more true zeros remaining over the 48-hour period, suggesting that a censored regression model would be more appropriate than OLS. Our qualitative

conclusions about the effects of time preference on single mothers' childcare time are the same regardless of whether we use a censored regression or OLS (not reported here) model.

¹³ It is especially important to control for parental income and education, as Guryan, Hurst, and Kearney [2008] find that parents with higher levels of both spend more time in activities where childcare is reported as the main activity. Means in Table 1 show that these parents are also less likely to smoke. Child gender controls include all boys and mixed gender siblings. Lundberg, Pabilonia, and Ward-Batts [2008] found that single mothers spent significantly less time with sons than daughters, especially on educational childcare activities.

¹⁴ We ran regressions with more detailed occupations, but results were similar for occupations within these groupings.

¹⁵ See Appendix Table A4 for additional sample selection criteria. Samples excluded respondents who have more than 180 minutes of unaccounted time on either diary day to match the "quality" criteria that ATUS imposes on diary inclusion in the sample.

¹⁶ Although the percentage is higher in PSID than ATUS, it is consistent with trends in smoking rates for women falling over these years [Center for Disease Control 2003; 2005].

¹⁷ The reliability of the self-reported health status as an accurate predictor of mortality has been substantiated in a survey piece by Idler and Benyamini [1997]. However, results still hold if health status is excluded, suggesting that any correlation that may exist in general is weak in our sample of young mothers and that our ATUS results are not biased due to omitted controls for health status.

¹⁸ For a small number of activities, child's time was reported with both the mother actively and passively participating. In those cases, we recoded the time as only direct time and not also indirect time so the two would sum to total time with mother. Results are similar regardless of how this time is classified.

¹⁹ Average minutes are a weighted average of weekend and weekday diary minutes, i.e. $(5 \times \text{weekday minutes} + 2 \times \text{weekend minutes}) / 7$.

²⁰ Note that the simple correlation between smoking status and depressed status is statistically insignificant.

²¹ It is especially important to control for low birth weight, given that smoking during pregnancy has a negative effect upon birth weight [Lien and Evans 2005], which can lead to poorer educational outcomes [Behrman and Rosenzweig 2004].

²² The mother's passage comprehension score on the Woodcock-Johnson Test of Basic Achievement measures the mother's verbal skill. Hsin [2007] found that mothers' passage comprehension scores were significantly correlated with children's test scores.

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Table 1. Single Mothers' Mean Characteristics, by Smoking Status (ATUS)

Variables	Definition of Variables	Smoker	Non-smoker
White	Dummy variable = 1 if mother is non-Hispanic white, = 0 otherwise	0.54	0.38
Black	Dummy variable = 1 if mother is non-Hispanic black, = 0 otherwise	0.31	0.35
Other race	Dummy variable = 1 if mother is non-Hispanic other race, = 0 otherwise	0.04	0.03
Hispanic	Dummy variable = 1 if mother is Hispanic, = 0 otherwise	0.11	0.24
Age	Continuous variable for mother's age	33.02	32.95
No high school degree	Dummy variable = 1 if mother does not have a high school degree, = 0 otherwise	0.16	0.17
High school graduate	Dummy variable = 1 if mother has high school degree, = 0 otherwise	0.44	0.40
Some college	Dummy variable = 1 if mother attended college but didn't receive bachelor's degree, = 0 otherwise	0.34	0.26
Bachelor degree	Dummy variable = 1 if mother has bachelor's degree, = 0 otherwise	0.05	0.12
Advanced degree	Dummy variable = 1 if mother has an advanced degree, = 0 otherwise	0.01	0.05
Currently attending school	Dummy variable = 1 if mother is in school, = 0 otherwise	0.03	0.03
Income missing	Dummy variable = 1 if household income is missing, = 0 otherwise	0.11	0.10
Income <20K	Dummy variable = 1 if household income is less than \$20K, = 0 otherwise	0.41	0.40
Income 20–40K	Dummy variable = 1 if household income is between \$20 and \$40K, = 0 otherwise	0.27	0.27
Income 40–75K	Dummy variable = 1 if household income is between \$40 and \$75K, = 0 otherwise	0.13	0.17
Income >75K	Dummy variable = 1 if household income is greater than \$75K, = 0 otherwise	0.08	0.06
Not employed	Dummy variable = 1 if mother is not currently working, = 0 otherwise	0.37	0.24
Blue-collar worker	Dummy variable = 1 if mother has one of the following occupations: craft and kindred workers, operatives, laborers, transport operatives and service workers.	0.25	0.25

Table 1. Continued

Variable	Definition of Variable	Smoker	Non-smoker
White-collar worker	Dummy variable = 1 if mother has one of the following occupations: managers and administrators, professional and technical workers, clerical workers, and sales workers.	0.38	0.50
Usual hours worked	Continuous variable based on mother's usual weekly hours worked	23.83	29.59
Female relative	Dummy variable = 1 if adult female relative mother in household, = 0 otherwise	0.22	0.22
Never married	Dummy variable = 1 if mother is never married, = 0 otherwise	0.58	0.53
Divorced/separated	Dummy variable = 1 if mother is divorced or separated, = 0 otherwise	0.42	0.47
All girls	Dummy variable = 1 if mother has only girls, = 0 otherwise	0.41	0.38
All boys	Dummy variable = 1 if mother has only boys, = 0 otherwise	0.34	0.38
Mixed gender	Dummy variable = 1 if mother has boys and girls, = 0 otherwise	0.25	0.24
One-child in household	Dummy variable = 1 if only one household child, = 0 otherwise	0.33	0.38
Two children in household	Dummy variable = 1 if two children in household, = 0 otherwise	0.34	0.36
Three or more children in household	Dummy variable = 1 if three or more children in household, = 0 otherwise	0.32	0.24
Youngest child infant	Dummy variable = 1 if mother's youngest child is aged 0-2, = 0 otherwise	0.25	0.23
Youngest child preschool-aged	Dummy variable = 1 if mother's youngest child is aged 3-5, = 0 otherwise	0.26	0.29
Youngest child elementary-school aged	Dummy variable = 1 if mother's youngest child is aged 6-12, = 0 otherwise	0.49	0.48
Older child in household	Dummy variable = 1 if child between ages of 13-17 in household or older own child in household, = 0 otherwise	0.32	0.28
Number of observations		229	677

Notes: Average minutes per day based on weighted average of weekday and weekend diaries. Survey weights are used. Means in bold are significantly different at the 5% level.

Table 2. Percentage of Observations Recorded as Zero among Single Mothers in the ATUS

Dependent Variables	Percent
Total time with children	12
Routine childcare	36
Educational childcare	81
Meals with children	34
Other enriching childcare	42
TV with children	54
Other primary childcare	62
Total number of observations	906

Table 3. Single Mother's Minutes per Day, by Childcare Activity and Smoking Status (ATUS)

	Means		Difference	P-value
	Smoker	Non-smoker		
Total time with children	331.25	337.60	-6.35	0.79
Ratio of time with children/mother's non-work and non-sleep time	0.45	0.46	-0.01	0.81
Routine childcare	59.84	51.82	8.02	0.34
Educational childcare	9.08	12.84	-3.76	0.20
Ratio of educational care/mother's non-work and non-sleep time	0.01	0.02	-0.01	0.17
Meals with children	26.69	30.95	-4.26	0.25
Other enriching childcare	83.93	62.97	20.96	0.07
TV with children	59.69	62.49	-2.31	0.78
Other primary childcare	19.63	17.97	1.66	0.69
Number of Observations	229	677		

Table 4. ATUS Estimates of the Effect of Smoking Status on Single Mothers' Minutes Spent per Day on Own Children Under Age 13's Activities (N=906)

	OLS	OLS	ML	ML	ML	ML	ML	ML	ML
	Total time with children	Ratio of total time/ mother's non-work and non- sleep time	Routine childcare	Educational childcare	Ratio of educational care/ mother's non- work and non- sleep time	Meals with children	Other Enriching childcare	TV with children	Other primary childcare
smoker	-19.661	-0.009	3.881	-5.023**	-0.007**	-3.606	7.037	1.643	2.066
	(20.648)	(0.026)	(5.754)	(2.200)	(0.003)	(3.151)	(9.102)	(8.493)	(2.970)
R-squared	0.258	0.185							
Pseudo R-Squared			0.047	0.069	0.775	0.024	0.024	0.023	0.039

Note: Robust standard errors are in parentheses. Average marginal effects for the discrete change in smoking status and the unconditional expected value are presented for the censored regression models. Survey weights used. *** significant at 1%; ** significant at 5%; * significant at 10%. Control variables include continuous mother's age and age squared, and indicators for race and ethnicity (non-Hispanic black, other, Hispanic), child gender (all boys or mixed), age of youngest child, number of household children, child older than 13 in household, education category of respondent, household income categories, presence of another female relative in household, blue-collar worker, white-collar worker, usual weekly hours worked, divorced/separated status, currently attending school, region, SMSA, year, season, and weekend/holiday.

Table 5. Mean Characteristics of Children and their Single Mothers, by Mothers' Smoking Status (1997 PSID-CDS)

Variables	Definition of Variables	Smoker	Non-smoker
<i>Children's characteristics</i>			
Female	Dummy variable = 1 if child is female, = 0 otherwise	0.40	0.43
Infant	Dummy variable = 1 if child is aged 0-2, = 0 otherwise	0.18	0.10
Preschool aged	Dummy variable = 1 if child is aged 3-5, = 0 otherwise	0.24	0.25
Elementary-school aged	Dummy variable = 1 if child is aged 6-12, = 0 otherwise	0.58	0.65
<i>Mother's characteristics</i>			
White	Dummy variable = 1 if mother is non-Hispanic white, = 0 otherwise	0.65	0.44
Black	Dummy variable = 1 if mother is non-Hispanic black, = 0 otherwise	0.27	0.46
Other race	Dummy variable = 1 if mother is non-Hispanic other race, = 0 otherwise	0.03	0.05
Hispanic	Dummy variable = 1 if mother is Latino origin or descent, = 0 otherwise	0.05	0.06
Age	Continuous variable for mother's age	31.63	33.66
Education missing	Dummy variable = 1 if mother's education is missing, = 0 otherwise	0.07	0.04
No high school degree	Dummy variable = 1 if mother does not have a high school degree, = 0 otherwise	0.35	0.15
High school graduate	Dummy variable = 1 if mother has high school degree, = 0 otherwise	0.30	0.37
Some college	Dummy variable = 1 if mother attended college but didn't receive bachelor's degree, = 0 otherwise	0.22	0.30
Bachelor degree	Dummy variable = 1 if mother has bachelor's degree, = 0 otherwise	0.02	0.10
Advanced degree	Dummy variable = 1 if mother has advanced degree, = 0 otherwise	0.04	0.04
Currently attending school	Dummy variable = 1 if mother is in school, = 0 otherwise	0.16	0.16
Income <20K	Dummy variable = 1 if household income is less than \$20K, = 0 otherwise	0.61	0.60
Income 20-40K	Dummy variable = 1 if household income is between \$20 and \$40K, = 0 otherwise	0.29	0.29
Income 40-75K	Dummy variable = 1 if household income is between \$40 and \$75K, = 0 otherwise	0.07	0.10

Table 5. Continued

Variables	Definition of Variables	Smoker	Non-smoker
Income >75K	Dummy variable = 1 if household income is greater than \$75K, = 0 otherwise	0.04	0.01
Not employed	Dummy variable = 1 if mother is not currently working, = 0 otherwise	0.40	0.20
Blue-collar worker	Dummy variable = 1 if mother has one of the following occupations: craft and kindred workers, operatives, laborers, transport operatives and service workers	0.22	0.28
White-collar worker	Dummy variable = 1 if mother has one of the following occupations: managers and administrators, professional and technical workers, clerical workers, and sales workers	0.38	0.52
Usual hours worked	Continuous variable based on mother's usual weekly hours worked	24.47	29.42
Female relative	Dummy variable = 1 if adult female relative mother in household, = 0 otherwise	0.001	0.01
Not married	Dummy variable = 1 if mother is never married or widowed, = 0 otherwise	0.43	0.45
Divorced/separated	Dummy variable = 1 if mother is divorced or separated, = 0 otherwise	0.57	0.55
Depressed	Dummy variable = 1 if mother feels depressed, = 0 otherwise	0.08	0.04
Health status excellent	Dummy variable = 1 if mother self-reports excellent health, = 0 otherwise	0.11	0.23
Health status very good	Dummy variable = 1 if mother self-reports very good health, = 0 otherwise	0.39	0.34
Health status good	Dummy variable = 1 if mother self-reports good health, = 0 otherwise	0.42	0.34
Health status fair or poor	Dummy variable = 1 if mother self-reports fair or good health, = 0 otherwise	0.08	0.09
Older child in household	Dummy variable = 1 if child between ages of 13-17 in household or older own child in household, = 0 otherwise	0.21	0.42
Number of observations		135	282

Notes: Average minutes per day based on weighted average of weekday and weekend diaries. Survey weights are used. Means in bold are significantly different at the 5% level.

Table 6. Percentage of Observations Recorded as Zero Over Both Diary Days Among Children with Single Mothers in the PSID-CDS

Dependent Variables	Percent
Time with mother	0
Indirect time	3
Direct time	2
Routine childcare	50
Educational childcare	73
Meals	11
Other enriching childcare	50
TV with mother	44
Other direct childcare	15
TV without mother	56
Meals without mother	50
Total number of observations	417

Table 7. Children's Time with Mother, Minutes per Day, by Childcare Activity and Mothers' Smoking Status (1997 PSID-CDS)

	Means		Difference	P-value
	Smoker	Non-smoker		
Time with mother	340.80	386.03	-45.23	0.11
Indirect time with mother	180.55	182.78	-2.23	0.92
Direct time with mother	160.25	203.25	-43.00	0.03
Routine childcare	19.21	15.93	3.28	0.47
Educational childcare	5.19	8.47	-3.28	0.26
Meals	34.40	49.08	-14.68	0.03
Other enriching childcare	23.34	25.73	-2.40	0.69
TV with mother	28.20	38.12	-9.92	0.15
Other direct childcare	49.91	65.92	-16.01	0.13
TV without mother	40.65	22.47	18.18	0.02
Meals without mother	19.38	12.68	6.70	0.06
Number of observations	135	282		

Table 8. 1997 PSID-CDS Estimates of the Effect of Single Mothers' Smoking Status on Children's Average Activity Minutes Spent per Day with Mother (N=417)

	OLS	OLS	OLS	Direct time subcategories							
				ML	ML	ML	ML	ML	ML	ML	ML
	Total time with mother	Indirect time	Direct time	Routine childcare	Educational childcare	Meals with mother	Other enriching childcare	TV with mother	Other direct childcare	TV without mother	Meals without mother
smoker	-65.700*** (25.287)	-12.661 (21.109)	-53.039*** (18.034)	-1.684 (2.270)	-5.569*** (2.124)	-17.354*** (4.450)	-3.379 (4.556)	-11.400 (7.141)	-8.210 (8.046)	19.560*** (7.229)	8.919*** (3.315)
R-squared	0.390	0.302	0.387								
Pseudo R-squared				0.152	0.092	0.050	0.069	0.045	0.049	0.067	0.060

Note: Robust standard errors are in parentheses. Average marginal effects for the discrete change in smoking status and the unconditional expected value are presented for the censored regression models. Standard errors are clustered on siblings. Child weights are used. *** significant at 1%; ** significant at 5%; * significant at 10%. Controls include indicators for child gender and child age; age and age squared of mother, mother's usual weekly hours worked, indicators for mother's race and ethnicity (non-Hispanic black, other, Hispanic), education category, blue-collar worker, white-collar worker, divorced/separated status, depression status, self-reported health, and mother currently in school; household indicators for income, presence of another female relative, number of children, a child aged 13 and older; and indicators for region and season.

Table 9. Children's 2002 Test Scores, by Mothers' Smoking Status in 1997 (PSID-CDS)

	Means		Difference	P-value	N
	Smoker	Non-smoker			
Letter-word identification score	101.29	101.79	-0.50	0.92	272
Applied problems score	101.50	102.84	-1.34	0.72	272
Passage comprehension score	102.08	101.91	0.17	0.97	272

Note: Child weights used.

Table 10. PSID-CDS OLS Estimates of the Effect of Mothers' Smoking Status on Children's 2002 Test Scores

	Letter-word identification	Applied problems	Passage comprehension
Smoker	-6.124* (3.271)	-3.082 (2.356)	-6.052** (2.346)
R-squared	0.482	0.548	0.509
Number of observations	272	272	272

Notes: Standard errors in parentheses. Standard errors are clustered on siblings. Child weights are used. ** significant at 5%; * significant at 10%. Control variables include indicators for child gender, child's age in 1997 indicators, child had low birth weight; mother's 1997 age and age squared, and mother's 1997 indicators for race and ethnicity (non-Hispanic black, other, Hispanic), education category, blue-collar worker, white-collar worker, depression status, divorced/separated status, mother's passage comprehension scores, self-reported health indicators; household indicators for income, presence of another female relative, number of children, child aged 13 and older; and region.

APPENDIX

Table A1. Number of Single Mothers between the ATUS and the TUS-CPS and the Final Sample Size

	Total
2003-2005 ATUS single mothers with own household children under the age of 18 in household	2,950
Matched to CPS Tobacco Use Supplement in either February, June, or November 2003	1,235
Matched with sex, race, and age verified	1,196
Dropped mothers aged <19 or >65	1,186
Drop those without own children under the age of 13 in the household	926
Drop those missing usual hours worked	906

Table A2. Time Use Variables created from the ATUS

Variable	Definition
Time with child(ren)	Time in any activity when child(ren) is(are) in the room
Routine childcare	
030101	Physical care of household children
030109	Looking after children as a primary activity
030301	Providing medical care to household children
Educational childcare	
030102	Reading to/with household children
030201	Helping with homework
030203	Homeschooling of household children
Meals with children	
110101	Eating and drinking
Other enriching childcare (children of all ages)	
030103	Playing with household children, not sports
030104	Arts and crafts with household children
030105	Playing sports with household children
030106	Talking with/listening to household children
030107	Helping/teaching household children (not related to education)
Other enriching childcare (children aged 2+)	
1201	Socializing and communicating
120307	Playing games
120309	Arts and crafts as a hobby
120310	Collecting as a hobby
120311	Hobbies, except arts & crafts and collecting
120401	Attending performances
120402	Attending museums
120403	Attending movies/films
1301	Participating in sports
1302	Attending sporting events
TV with children	
120303	Television and movies (not religious)
Other childcare	
030108	Organization and planning for household children
030110	Attending household children's events
030111	Waiting for/with household children
030112	Picking up/dropping off household children
030199	Caring for and helping household children, not elsewhere classified
030202	Meetings and school conferences
030204	Waiting associated with household children's education
030299	Activities related to household children's education, not elsewhere classified
030302	Obtaining medical care for household children
030303	Waiting associated with household children's health
030399	Activities related to household children's health, not elsewhere classified
170301	Travel related to caring for and helping household children
180301	Travel related to caring for and helping household children
180302	Travel related to household children's education
180303	Travel related to household children's health

Notes: Times with children refer to own household children under age 13.

Table A3. Marginal Effects of Select Mother and Household Characteristics on Single Mother's Time with Own Children (ATUS: N=906)

	OLS	OLS	ML	ML	ML	ML	ML	ML	ML
	Total time with children	Ratio of total time/ mother's non-work and non-sleeptime	Routine childcare	Educational childcare	Ratio of educational care/ mother's non-work and non-sleep time	Meals with children	Other enriching childcare	TV with children	Other primary childcare
Age	6.137 (9.724)	0.004 (0.011)	0.940 (1.865)	0.512 (0.994)	0.001 (0.001)	-0.526 (1.239)	-5.105 (3.431)	-1.368 (4.094)	1.786 (1.219)
Age squared	-8.169 (12.939)	-0.006 (0.015)	-1.329 (2.305)	-0.642 (1.339)	-0.001 (0.002)	0.914 (1.598)	7.286* (4.405)	1.576 (5.461)	-2.627 (1.613)
Black	-2.199 (24.521)	0.002 (0.030)	-7.888 (5.865)	-1.147 (2.529)	-0.001 (0.004)	-2.864 (3.561)	-21.921** (9.160)	15.868 (10.816)	-2.626 (3.244)
Other race	25.527 (44.056)	0.080 (0.054)	0.131 (10.561)	5.180 (3.259)	-0.007 (0.005)	8.398 (7.422)	-2.977 (17.502)	6.866 (18.103)	-3.301 (5.287)
Hispanic	38.962 (30.724)	0.038 (0.039)	-3.444 (6.565)	-3.061 (2.699)	-0.005 (0.004)	10.565** (4.900)	-5.599 (11.472)	34.387** (15.233)	-4.665 (3.468)
High school grad	52.428 (32.914)	0.051 (0.043)	6.253 (7.866)	4.790 (4.329)	0.007 (0.006)	2.768 (4.981)	35.763*** (13.332)	8.898 (13.459)	-6.946 (4.818)
Some college	51.617 (33.583)	0.053 (0.045)	-0.083 (9.026)	4.031 (4.464)	0.006 (0.006)	2.360 (4.954)	30.507** (14.661)	0.570 (13.813)	-0.568 (5.263)
Bachelor degree	52.753 (39.185)	0.066 (0.052)	-0.716 (10.128)	2.398 (5.321)	0.004 (0.008)	7.921 (7.018)	39.815** (20.000)	-17.427 (13.690)	-2.526 (5.793)
Advanced degree	38.511 (45.282)	0.026 (0.057)	5.782 (12.153)	-3.658 (4.491)	-0.006 (0.006)	10.087 (8.486)	37.140 (23.110)	-11.551 (18.055)	-4.447 (6.259)
Currently attending school	-110.319* (64.821)	-0.170** (0.068)	-28.209*** (8.919)	3.620 (5.716)	0.005 (0.007)	4.285 (8.159)	-7.374 (15.475)	-10.116 (22.834)	4.905 (6.807)
Income missing	75.057*** (34.443)	0.054 (0.040)	20.904** (8.882)	6.654 (4.311)	0.010 (0.006)	11.892** (4.794)	-1.464 (12.089)	-9.858 (11.791)	8.615** (4.380)
Income 20–40K	-41.561* (25.048)	-0.052* (0.031)	-5.622 (5.990)	-6.503*** (2.244)	-0.009*** (0.003)	-2.424 (3.648)	-7.805 (9.593)	-19.336** (8.658)	-0.869 (3.950)
Income 40–75K	-55.926* (33.299)	-0.056 (0.041)	6.037 (7.046)	3.396 (3.495)	0.007 (0.005)	4.023 (5.217)	-22.545** (11.102)	-25.502** (10.381)	1.299 (4.007)

Table A3. Continued

	OLS	OLS	ML	ML	ML	ML	ML	ML	ML
	Total time with children	Ratio of total time/ mother's non-work and non-sleep time	Routine childcare	Educational childcare	Ratio of educational care/ mother's non-work and non-sleep time	Meals with children	Other enriching childcare	TV with children	Other primary childcare
Income >75K	1.997 (43.096)	-0.040 (0.050)	3.406 (11.540)	-0.541 (4.056)	-0.002 (0.006)	6.501 (9.824)	-20.378 (14.345)	2.209 (19.468)	0.134 (5.500)
Blue-collar worker	-43.137 (59.029)	0.008 (0.059)	-9.731 (11.179)	-2.302 (4.792)	-0.002 (0.006)	1.124 (7.881)	48.922** (22.215)	-7.218 (17.222)	15.817** (6.709)
White-collar worker	-43.448 (58.423)	0.010 (0.059)	-0.549 (11.783)	3.242 (5.457)	0.006 (0.007)	7.656 (7.752)	37.295** (17.678)	-2.975 (17.558)	19.779*** (5.852)
Usual hours worked	-1.815 (1.533)	-0.001 (0.001)	-0.087 (0.292)	-0.098 (0.125)	—	-0.296 (0.194)	-1.522*** (0.423)	-0.348 (0.400)	-0.263** (0.129)
Female relative	-57.667* (30.705)	-0.075** (0.038)	-1.875 (7.121)	3.002 (3.040)	0.003 (0.004)	-9.042** (4.200)	8.588 (12.781)	-8.940 (11.769)	-6.338** (2.817)
Divorced	36.727* (20.842)	0.029 (0.027)	1.493 (4.520)	-0.462 (2.412)	-0.001 (0.003)	2.956 (3.208)	-6.148 (8.847)	9.997 (8.930)	5.822** (2.668)
All boys	-9.587 (20.496)	-0.009 (0.026)	-10.719** (5.042)	-2.969 (2.271)	-0.004 (0.003)	3.338 (3.068)	1.432 (8.415)	12.859 (8.940)	0.190 (2.623)
Mixed gender	66.519** (29.286)	0.062* (0.034)	-1.693 (6.599)	0.628 (3.412)	—	18.647*** (5.419)	20.278 (13.460)	15.973 (13.619)	7.709* (4.373)
Two children	-58.903** (25.193)	-0.055* (0.029)	4.100 (6.768)	2.339 (3.131)	0.004 (0.004)	-3.853 (3.714)	-31.687*** (9.908)	0.249 (10.495)	2.145 (3.326)
Three or more Children	-50.804 (35.712)	-0.051 (0.045)	9.882 (8.733)	3.797 (4.409)	0.005 (0.006)	-8.632* (4.978)	-21.414* (12.491)	-11.095 (14.003)	4.128 (5.206)
Child aged 13 or older in household	17.591 (28.609)	0.025 (0.033)	-4.077 (6.810)	-2.795 (3.119)	-0.004 (0.004)	2.140 (4.526)	16.277 (12.204)	-1.575 (12.682)	-1.657 (3.910)

Notes: Average marginal effects for the unconditional expected value are presented for the censored regression models. For indicator variables, the marginal effects are the discrete first differences from the base category. Robust standard errors in parentheses. Survey weights used. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table A4. Number of Single Mothers in PSID and the Final Sample Size

	Total
1997 PSID-CDS single mothers with own household children under the age of 18 in household	469
Dropped mothers aged <19	464
Dropped those mothers missing depression status	458
Dropped those mothers missing current school attendance status	449
Dropped those mothers missing self-reported health status	447
Dropped those mothers missing usual hours worked	443
Dropped those whose diaries had more than 180 minutes of unaccounted for time on either diary day	417
Sample size without missing 2002 test scores	272

Table A5. Time Use Variables created from 1997 PSID-CDS

Variable	Definition
Time with mother	Time in any activity when mother is with child (=direct + indirect time)
Indirect time	Child time in any activity when mother is present, but not participating
Direct time	Child time in any activity when mother is participating in the activity
Routine childcare	
488	Receiving child care; child is passive recipient of personal care
Educational childcare	
943	Being read to, listening to a story
549	Homework (non-computer related), studying, research, reading, related to classes or profession, except for current job
504	Using the computer for homework, studying, research, reading related to classes or profession
Meals	
439	Meals at home
448	Meals away from home eaten at a friend's/relative's home
449	Meals away from home; eating at restaurants
Other enriching childcare (all ages)	
866	Pretend, dressup, played house, played fireman
871	Playing card games (bridge, poker)
872	Playing board games (Monopoly, Yahtzee, etc), Bingo
873	Playing social games (scavenger hunts); jump rope, handclap games
874	Puzzles/word or educational games
875	Played with toys
876	Unspecified play outdoors
877	Unspecified playing indoors; getting into stuff, making a mess
878	Unspecified playing games, "played a game."
879	Electronic video games (Nintendo, Sony, Game Boy, Sega)
882	Watching another person do active leisure activities
889	Other active leisure.
851	Sculpture, painting, potting, drawing, coloring
831	Photography
832	Working on cars—not necessary to their running; customizing, painting
833	Working on or repairing leisure time equipment (repairing the boat, sorting out fishing tackle)
834	Collections, scrapbooks
835	Carpentry and woodworking (as a hobby)
801	Football, basketball, baseball, volleyball, hockey, soccer, field hockey
802	Tennis, squash, racquetball, paddleball
803	Golf, miniature golf
804	Swimming, waterskiing
805	Skiing, ice skating, sledding, roller skating
806	Bowling; pool, ping-pong, pinball
807	Frisbee, catch
808	Exercises, yoga
809	Judo, boxing, wrestling
810	Weight lifting
865	Gymnastics
811	Hunting
812	Fishing
813	Boating, sailing, canoeing
814	Camping, at the beach

815	Snowmobiling, dune-buggies
816	Gliding, ballooning, leaping off high buildings, flying
817	Excursions, pleasure drives (no destination), rides with the family
818	Picnicking
821	Walking for pleasure, crawling (for babies)
822	Hiking
823	Jogging, running
824	Bicycling
825	Motorcycling
826	Horseback riding
961	Phone conversations
962	Other talking/conversations; face-to-face conversations
862	Singing
Other enriching childcare (children aged 2+)	
502	Playing computer games
709	Attending sports events
729	Attending movies
739	Attending theatre, opera, concert, ballet
749	Attending museums
719	Attending events not elsewhere classified
861	Playing a musical instrument, whistling
752	Socializing – visiting with others
TV with mom	
919	TV
Other direct childcare	Direct time – routine time – educational time – meals – other enriching time – TV time

Table A6. Marginal Effects of Select Child, Mother, and Household Characteristics on a Child's Average Activity Minutes with Mother (PSID-CDS: N =417)

VARIABLES	OLS Total time with mother	OLS Indirect time	OLS Direct time	ML Routine childcare	ML Educational childcare	ML Meals with mother	ML Other enriching childcare	ML TV with mother	ML Other direct childcare	ML TV without mother	ML Meals without mother
Child's female	-4.462 (17.962)	-31.513** (15.592)	27.051 (16.789)	1.477 (2.645)	-0.480 (1.766)	-3.937 (5.217)	6.996* (3.672)	12.125* (6.620)	9.845 (7.284)	-5.923 (5.544)	-1.361 (2.174)
Mother's age	-15.043 (14.491)	-20.421* (11.502)	5.379 (10.496)	-0.395 (1.248)	2.226** (1.050)	-1.337 (2.722)	2.764 (2.362)	-3.048 (4.191)	2.441 (5.133)	-2.911 (4.010)	-0.037 (1.470)
Mother's age squared	0.214 (0.200)	0.309** (0.156)	-0.095 (0.149)	0.010 (0.019)	-0.027* (0.016)	0.015 (0.042)	-0.042 (0.034)	0.029 (0.060)	-0.038 (0.074)	0.038 (0.055)	-0.004 (0.021)
Mother black	7.265 (27.300)	6.993 (24.362)	0.272 (17.973)	-1.349 (2.347)	3.491 (2.677)	3.252 (5.487)	4.876 (5.460)	-0.787 (7.169)	-7.688 (7.033)	-9.098 (7.041)	-4.448 (3.001)
Mother other race	-48.984 (58.188)	-42.851 (42.213)	-6.133 (56.768)	-7.163* (3.818)	-4.975** (2.336)	4.989 (10.149)	24.327 (15.505)	0.440 (20.399)	-3.383 (13.021)	1.326 (16.513)	14.639* (8.849)
Mother Hispanic	64.126 (62.036)	2.973 (42.481)	61.153 (71.922)	0.279 (5.105)	1.348 (4.983)	12.134 (16.071)	9.304 (9.623)	-28.930*** (8.620)	77.258 (54.400)	-9.661 (13.465)	-1.790 (4.874)
Mother high school grad	-3.783 (28.639)	-9.341 (23.422)	5.558 (22.611)	-1.200 (2.945)	-7.086*** (2.425)	-8.552 (5.475)	5.157 (6.972)	-1.219 (9.537)	22.019** (10.239)	-3.826 (7.378)	4.622 (3.326)
Mother some college	6.746 (31.956)	-27.052 (26.482)	33.799 (25.091)	5.186 (3.341)	-6.557** (2.622)	-3.842 (7.197)	-5.638 (6.770)	-11.449 (8.561)	51.380*** (12.235)	9.440 (10.226)	6.020 (4.928)
Mother bachelor degree	-57.249 (53.125)	-99.463*** (43.751)	42.213 (40.901)	-6.014 (4.380)	-5.438 (3.412)	-5.307 (10.444)	4.091 (10.326)	1.507 (15.475)	59.949*** (20.226)	-6.480 (12.069)	8.342 (8.785)
Mother advanced degree	-7.347 (55.095)	-68.021 (60.204)	60.674* (34.364)	-2.056 (5.367)	11.132 (8.864)	-9.364 (12.413)	44.531*** (15.913)	-26.293*** (7.416)	58.466** (25.732)	-10.807 (10.350)	11.770 (10.551)
Mother's education missing	-14.935 (49.303)	-38.102 (37.699)	23.166 (38.387)	-2.379 (4.044)	-5.526** (2.415)	-7.767 (8.725)	2.582 (10.834)	-19.275** (8.788)	45.470** (19.081)	18.116 (14.797)	16.066** (7.997)
Mother currently attending school	-3.494 (29.641)	8.006 (23.796)	-11.500 (21.285)	5.567* (3.076)	-0.675 (2.794)	2.989 (5.404)	-6.024 (5.796)	8.595 (8.518)	-5.477 (10.488)	6.253 (9.020)	-5.208* (3.085)
Household income 20-40K	47.395 (33.299)	42.248 (27.969)	5.147 (23.288)	-1.936 (2.193)	3.711 (2.968)	-3.700 (5.783)	7.136 (5.983)	-8.352 (6.620)	10.500 (9.979)	5.508 (7.836)	-3.491 (3.475)
Household income 40-75K	70.161** (32.442)	104.845*** (38.335)	-34.684 (32.460)	-1.054 (4.136)	-2.441 (3.018)	0.482 (8.164)	-17.947*** (5.675)	-0.233 (10.292)	-7.007 (12.543)	-2.956 (9.635)	-9.375*** (3.475)
Household income >75K	2.583 (74.889)	123.488* (68.628)	-120.906** (48.283)	-4.139 (6.215)	-4.530 (4.307)	-10.179 (14.462)	-14.986** (7.418)	-15.948 (14.586)	-64.970*** (6.968)	44.507 (28.513)	8.836 (12.633)

Table A6. Continued

VARIABLES	OLS	OLS	OLS	ML	ML	ML	ML	ML	ML	ML	ML
	Total time with mother	Indirect time	Direct time	Routine childcare	Educational childcare	Meals with mother	Other enriching childcare	TV with mother	Other direct childcare	TV without mother	Meals without mother
Blue-collar worker	-78.327 (46.045)	-8.829 (43.952)	-69.498* (40.536)	-8.608 (6.226)	3.083 (5.625)	-9.896 (9.116)	1.567 (9.344)	-16.249 (13.387)	-33.516** (16.673)	39.210** (18.783)	10.099 (7.209)
White-collar worker	-133.749 (48.936)	-36.749 (47.540)	-97.000*** (32.146)	-12.449* (6.548)	-1.843 (4.366)	-19.238** (9.577)	5.003 (8.398)	-27.204* (14.931)	-28.559** (13.831)	36.545*** (13.849)	5.934 (6.824)
Usual hours worked	-0.435 (1.051)	-0.757 (0.973)	0.323 (0.765)	0.090 (0.142)	-0.003 (0.104)	0.115 (0.240)	-0.615*** (0.179)	0.453 (0.333)	0.395 (0.323)	-0.496* (0.280)	-0.053 (0.145)
Female relative	11.893 (61.863)	14.593 (38.726)	-2.701 (56.316)	-0.214 (10.650)	0.243 (5.579)	-4.973 (10.976)	-11.838 (8.514)	24.936 (28.643)	-4.879 (18.116)	-7.514 (18.437)	-0.113 (7.953)
Mother divorced/separated	-23.227 (25.816)	-25.342 (19.043)	2.116 (18.215)	-3.414 (2.276)	-3.756 (2.480)	-4.081 (4.812)	5.939 (5.410)	-14.514** (6.947)	18.096** (7.832)	4.411 (6.890)	1.142 (2.816)
Two household children	-14.158 (35.324)	72.128*** (26.254)	-86.286*** (25.156)	-1.556 (2.660)	-1.800 (2.751)	-11.172 (7.256)	-13.292*** (5.010)	-22.116*** (7.463)	-31.367*** (8.127)	12.942 (9.031)	3.205 (4.564)
Three or more household children	-35.267 (37.925)	47.392 (30.896)	-82.659*** (29.291)	-5.034 (2.897)	-4.319 (3.496)	-12.094 (7.579)	-18.910*** (5.182)	-27.165*** (7.557)	-20.724** (9.977)	23.401** (10.474)	2.805 (4.429)
Older child in household	40.007 (31.834)	8.880 (22.419)	31.128 (25.646)	-4.760 (2.649)	-2.901 (2.646)	2.523 (7.084)	10.387 (7.616)	15.869 (9.686)	6.008 (10.031)	7.333 (9.522)	3.855 (3.679)
Depressed	19.678 (30.611)	-30.230 (35.391)	49.908 (37.584)	-2.755 (3.496)	-2.392 (2.804)	5.692 (6.687)	20.684 (13.359)	6.505 (13.599)	24.737 (18.746)	-9.553 (7.696)	-3.795 (3.575)
Health status excellent	73.956 (46.208)	30.060 (32.527)	43.896 (31.065)	3.568 (4.471)	4.152 (4.391)	-9.076 (9.766)	35.005** (17.202)	1.059 (11.986)	19.242 (12.804)	-23.967*** (7.965)	-5.376 (4.786)
Health status very good	86.176** (42.766)	34.530 (28.783)	51.646 (32.776)	5.289 (4.530)	5.017 (3.911)	-5.213 (10.415)	37.606** (14.828)	3.324 (11.992)	22.511* (11.995)	-14.986 (11.149)	-5.161 (5.004)
Health status good	48.304 (38.329)	32.978 (29.996)	15.326 (27.960)	-0.677 (4.172)	2.139 (3.224)	-5.173 (9.053)	18.432 (12.757)	9.924 (11.270)	6.208 (10.011)	-18.424* (10.097)	-6.407 (4.758)

Notes: Average marginal effects for the unconditional expected value are presented for the censored regression models. For indicator variables, the marginal effects are the discrete first differences from the base category. Robust standard errors in parentheses. Survey weights used. ***significant at 1%; **significant at 5%; *significant at 10%.

Table A7. OLS Estimates of the Effect of Select 1997 Child, Mother, and Household Characteristics on Children's 2002 Test Scores (PSID-CDS: N =272)

VARIABLES	Letter-word identification	Applied problems	Passage comprehension
Child female	-0.445 (2.667)	-5.173*** (1.820)	-1.128 (1.868)
Child has low birth weight	3.159 (4.334)	-4.042 (3.290)	0.426 (3.875)
Mother's age	4.487** (2.004)	2.050 (1.376)	4.158** (1.750)
Mother's age squared	-0.058** (0.029)	-0.020 (0.020)	-0.050* (0.026)
Mother black	-7.765* (4.412)	-8.792*** (3.146)	-7.905** (3.494)
Mother other race	17.008** (7.607)	16.805** (6.735)	9.800 (9.205)
Mother Hispanic	-6.841 (9.018)	-7.948 (8.332)	-4.629 (8.197)
Mother high school grad	3.027 (4.019)	4.592 (3.325)	2.382 (2.977)
Mother some college	7.554 (5.200)	7.822** (3.945)	3.633 (4.229)
Mother bachelor degree	5.614 (10.440)	12.503** (5.735)	2.357 (7.792)
Mother advanced degree	3.195 (12.306)	9.808 (8.631)	0.956 (10.585)
Mother education missing	8.517 (7.928)	12.112** (5.291)	6.585 (6.120)
Mother attending school	1.194 (4.735)	5.992* (3.175)	0.199 (3.551)
Income 20-40K	-4.860 (3.768)	-8.193*** (2.972)	-5.339* (3.120)

Table A7. Continued

VARIABLES	Letter-word comprehension	Applied problems	Passage comprehension
Income 40-75K	0.320 (8.160)	-6.325 (4.763)	-14.669*** (5.454)
Income >75K	-10.768 (14.404)	-13.702 (10.716)	-4.711 (12.136)
Blue-collar worker	-18.037** (8.379)	-11.683* (5.974)	-15.316** (6.560)
White-collar worker	-18.494 (11.484)	-8.241 (6.515)	-16.163* (8.311)
Usual hours worked	0.601** (0.268)	0.337** (0.155)	0.443** (0.201)
Female relative	5.272 (12.405)	-2.915 (10.314)	-0.080 (12.438)
Mother divorced/separated	2.603 (4.144)	-0.153 (2.850)	-1.588 (2.974)
Two household children	-0.084 (5.253)	3.048 (3.181)	3.137 (4.183)
Three or more household children	-1.692 (4.437)	1.352 (3.272)	-0.615 (3.856)
Older child in household	-7.864 (4.986)	-10.871*** (4.125)	-8.116** (4.067)
Depressed	-0.043 (6.166)	-6.449* (3.862)	-5.571 (4.961)
Health status excellent	3.469 (6.508)	-0.560 (4.620)	2.989 (4.783)
Health status very good	6.953 (5.558)	-1.771 (3.655)	6.187* (3.428)
Health status good	1.052 (4.950)	-2.482 (3.687)	-1.534 (3.825)
Mom passage comprehension score	0.473 (0.333)	-0.106 (0.275)	0.427 (0.327)

Notes: Robust standard errors in parentheses. Survey weights used. ***significant at 1%; **significant at 5%; *significant at 10%.