Mothers' Time with Children and the Social Reproduction of Cognitive Skills

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Abstract

Despite the theoretical importance mother's time with children plays in the literature on children's cognitive development, few studies have empirically examined this relationship. This study uses children's time diaries from the Child Development Supplement of the Panel Study of Income Dynamics to investigate the effect of maternal involvement during pre-school years on children's cognitive outcomes assessed at ages five to twelve (N = 1,008). I find a positive and persistent effect of the total quantity of time mothers' spend with children and the time they spend *playing* together on children's language development, but only among children who spend time with verbally skilled mothers. These results are present even after controlling for a range of individual and family characteristics that have not been previously examined—such as children's health and developmental problems, quality of learning environment and lagged test scores. The results suggest that women differ in their ability to successfully translate childcare time into positive cognitive outcomes. Taken together, this study is the first to identify time use as a mechanism for the social reproduction of cognitive skills—time with children is a pathway through which skilled mothers impart their skills and knowledge onto children.

Theories regarding child development contend that the time mothers devote to children is crucial to children's intellectual development. According to these theories, the time mothers spend with children, along with other financial and material resources, can be seen as investments into the production of child "quality" (Becker, 1991). Through repeated interactions children learn to trust their caregivers, build healthy social relations, and are exposed to intellectual stimulation (Coleman, 1988). These experiences help create social capital or the mechanism that facilitates the intergenerational transmission of knowledge, skills and human capital. Theories in developmental psychology also contend that long periods of separation can disrupt this process leaving mothers less sensitive and responsive to their children's needs and leaving children less exposed to the stimulation necessary for their cognitive development (Vaughn, Grove and Egeland, 1980; Belsky, 2001).

Despite the central role parents' time with children plays in the theoretical construct of child development and social reproduction, few studies have directly tested these theories. Even less is known about the specific aspects of maternal involvement that matter for children's achievement outcomes. For example, is it the total *quantity* of maternal time or *how* the time is used that has the most significant influence on children's cognitive development? Are all mothers as effective at translating the time they spend with children into positive achievement outcomes?

These questions are examined using time diary data and assessments of child cognitive skills from the Panel Study of Income Dynamics and its Child Development Supplement (PSID-CDS), the only nationally representative and longitudinal survey of individuals and households with children's time diary data, to examine the relationship between maternal involvement during children's pre-school years (e.g. age 0 to 5 years old) and their cognitive outcomes

assessed when they are 5 to 12 years old. Using extensive controls to account for differences among mothers and children, the results demonstrate that the total quantity of maternal care during pre-school years and the total time children spend playing with their mothers positively relates to children's language development, but only when children spend time with verbally skilled mothers. Furthermore, these relationships persist even after controlling for children's lagged test scores. More modest associations were found between the intensity of maternal engagement and test scores.

These findings contrast two previous studies that find non-significant or negative associations between the mothers' time with infants and children's cognitive test scores (Booth et al, 2002; Huston and Aronson, 2005). There are two main reasons for why I find positive and significant effects. First, previous studies do not address the possibility that certain mothers may be more effective at translating their time with children into positive cognitive outcomes by examining interactions between mother-child time and maternal characteristics such as mother's education and cognitive skills. Second, previous studies do not adequately control for child specific heterogeneity that biased estimates of maternal time.

Additionally, the paper extends the extensive literature on the effects of maternal employment on children's cognitive development. Several studies have suggested that children from socio-economically advantaged families are the most harmed by early maternal employment (Desai, Chase-Lansdale and Michael, 1989; Vandell and Ramanan. 1992; Harvey, 1999; Waldfogel, Han, and Brooks-Gunn. 2002; Hill et al., 2005), but none identify the mechanisms that bring about these effects. My findings suggest that maternal employment may differentially affect children because women differ in their ability to influence their children's cognitive development. Children's language development benefits more from exposure to

verbally skilled mothers than from exposure to less skilled mothers. This study is among the first to identify mothers' time with children as pathway for the social reproduction of cognitive skills.

PREVIOUS STUDIES

The literature on maternal care and children's cognitive development can be organized into three major areas. The first concentrates on identifying the effect of early maternal care on children's cognitive outcomes by using maternal employment as a proxy for quantity of care children receive. The second uses time diary data to describe the relationship between mothers' labor supply and the time they devote to children. The third and most recent area of research uses time diary data to examine the effect of maternal involvement on child outcomes. In the following section, I review the literature and discuss how my study may offer some important contributions to each of these three areas of research.

Maternal Employment and Children's Cognitive Outcomes

The literature on the effects of maternal employment on child cognitive outcomes is extensive (see Waldfogel, Han and Brooks-Gunn (2002) and Ruhm (2004) for a complete literature review). These studies all attempt to identify the influence of maternal time on children's cognitive development by using employment as a proxy for both the quantity and the quality of care children receive.

The majority of recent studies suggest that there are deleterious effects associated with employment during children's first year but that the influence of maternal employment after the first year is more ambiguous (Baydar and Brooks-Gunn, 1991; Blau and Grossberg, 1992; Harvey, 1991; Brooks-Gunn, Han and Waldfogel, 2002; Ruhm, 2004; James-Burdumy, 2005; Hill et al, 2005). Many studies also demonstrate that the influence of maternal employment

differs by the characteristics of mothers and families, suggesting that maternal employment may be more harmful for children from advantaged backgrounds—children from wealthier families, non-Hispanic white children and children from intact families. Desai, Chase-Lansdale and Michael analyze a sample of 503 NLSY children and find that maternal employment only negatively influences children from higher income families but not children from middle or low-income families (1989). Waldfogel, Han and Brooks-Gunn examine a sample of 1,872 NLSY children who were followed from birth to age 7 or 8 using both OLS and family fixed effects and find a persistent negative effect of first year employment on cognitive tests for non-Hispanic white children but not for African American or Hispanic children (2002). Other studies have also found that early maternal employment is associated with positive cognitive outcomes among low-income families (Vandell and Ramanan, 1992; Harvey, 1999) and female-headed households (Harvey, 1999).

Taken together, these studies suggest that there is a negative effect of maternal employment during children's first year but that the overall effect may differ by the characteristics of families. None, however, can identify the mechanism through which maternal employment affects child outcomes or explain why the effect of employment should vary across children and families.

Time Diary Studies of Mother's Time with Children

Several time diary studies show that increases in early maternal employment over the past several decades have also been accompanied by behavioral changes in how mothers spend their time outside of work (Bryant and Zick, 1996; Bianchi, 2000; Sandberg and Hofferth, 2001). This literature highlights the fact that there is not a one-to-one corresponding relationship

between the amount of time mothers spend at work and the amount of time they spend with children.

First, time use studies suggest differences in the amount of time employed and non-employed mothers devote to childcare are not as great as one might expect considering the amount of time employed women spend working. Analyses using the National Institute of Child Health and Development (NICHD) Study of Early Child Care to examine differences in maternal involvement among working and stay-at-home mothers with 7 month old infants—a time during which childcare responsibilities are arguably the most demanding—show that employed mothers spent only about 12 hours less per week with infants than their nonworking counterparts despite spending on average nearly 30 hours per week at work (Booth et al, 2002; Huston and Aronson, 2005).

Second, time diary studies also show that working mothers have changed *how* they spend their childcare time, suggesting that employment status poorly captures the type of maternal involvement children receive. An analysis of time diaries collected from 226 married couples with children from the 1981 Study of Time Use finds that much of the difference in childcare time between working and stay-at-home mothers is due to differences in the types of childcare activities that only involve children peripherally (Nock and Kingston, 1988). For example, non-employed women spend significantly more time involved in activities that require low levels of parent-child engagement such as doing housework while children play or watch television in another room. Other studies find that employed mothers spend a greater proportion of their time engaged in "social interaction" (i.e. talking, holding and other forms of interaction) rather than "instrumental care" (i.e. feeding, bathing, diapering, and providing physical care) (Booth et al,

2002; Huston and Aronson, 2005). Therefore, in addition to the quantity of care, the type of maternal care that children receive may differ by employment status.

Time diaries show that women's entry into the labor force is associated with behavioral changes in time use that make employment status a poor proxy for maternal involvement. The question, however, still remains regarding whether these behavioral changes in time use—particularly in terms of differences in maternal engagement and in the types of activities performed together—relate to cognitive development.

Time Diaries and Children's Cognitive Outcomes

To date only two published studies have used direct measures of mother-child time from large, representative time diary surveys to examine the relationship between the maternal involvement and children's cognitive development. Both analyze time diaries administered to mothers with 7-month old infants from the NICHD Study of Early Child Care. Booth et al. examine a sub-sample of 326 married or cohabiting mothers and find that the amount of time mothers spend with their infants is not significantly correlated with measures of cognitive skills assessed when children are 15-months old (2002). Huston and Aronson analyze a more representative sample of mothers by including single mothers (N=1,053) and utilize tests of cognitive skills measured at 24 and 36 months (2005). Overall, they also find that maternal involvement does not significantly predict cognitive outcomes; in one case, they even find that involvement relates negatively to toddlers' expressive language skills.

These two studies provide an important first step towards directly identifying the effect of maternal time on children's cognitive development. However, they also present new avenues for future research. Neither study adequately controls for characteristics of children that may bias estimates of maternal time. For example, children may also differ in their initial endowments

such as innate cognitive ability, health and physical development. Mothers may respond to observed difficulties faced by children by spending more time with children with learning or health problems. In this case, the estimated effects of maternal time will be negatively biased (i.e. one will observe a negative relationship between maternal care and outcomes), if those aspects of initial ability are not considered. Failure to account for these characteristics may explain why Huston and Aronson (2005) find a negative relationship between maternal involvement and early language skills.

Additionally, neither study controls for mother's own cognitive skills nor examines interactions between maternal time and maternal characteristics. Previous studies find that the effect of maternal employment is particularly harmful for children from advantaged backgrounds, which suggest that certain mothers are better at translating the time they spend with children into positive cognitive outcomes (Desai, Chase-Lansdale and Michael, 1989; Vandell and Ramanan, 1992; Harvey, 1999). Examining interactions between maternal time, on one hand, and mothers' own human capital and cognitive skills, on the other, may provide insight into how cognitive skills are differentially reproduced across families.

Finally, both studies are limited because both utilize measures of cognitive skills that are assessed at very young ages (e.g. between 15 to 36 months). There is little evidence that suggests assessments of cognitive development that are measured at such early ages can accurately predict later outcomes. On the other hand, cognitive tests assessed as early as age seven have been shown to predict adult outcomes, such as educational attainment and labor market performance (Robertson and Symons, 1996; Currie and Thomas, 1999)[1].

[1] Both Huston and Aronson (2005) and Booth et al. (2002) are limited to examining the influence of maternal care for infants at 7-months. This study, on the other hand, expands the age range to examining mothers' time with children 5 years old and younger in 1997.

Integrating and Extending the Literature: Time Diaries and Child Outcomes

This study aims to integrate studies using proxies to examine the effect of maternal involvement on child outcomes and time diary studies describing mothers' time with children in order to use direct measures of maternal involvement to assess the effects of maternal care for children's cognitive outcomes. This study extends the maternal employment literature in several important ways. First, the study uses direct measures of maternal involvement using children's time diaries completed when children were between the ages of 0 and 5. Second, I explore alternative measures of maternal involvement and identify the particular aspects of maternal involvement that relate to cognitive test scores.

Third, this article extends Booth et al. (2002) and Huston and Aronson (2005) by better controlling for maternal and child characteristics that may bias estimates of maternal involvement by including controls for mother's cognitive skills, extensive controls for child developmental, health and behavioral problems during infancy, children's lagged test scores to account for initial differences among children in innate ability and quality of children's schooling environment. To determine whether cognitive skills are differentially transmitted from mothers to children, I investigate interactions between maternal time with measures of mother's own human capital and cognitive skills. Furthermore, I extend Booth et al. (2002) and Huston and Aronson (2005) by examining the influence of mother-child time during a wider age range (i.e. when children are between 0 to 5 years old) and utilizing measures of cognitive ability that are assessed at older ages, when children are between 5 and 12 years old.

DATA AND METHODS

The Sample

Panel Study of Income Dynamics (PSID) is a longitudinal study of a nationally representative sample of individuals and families in the United States, with over-samples of low-income and immigrant families. Starting in 1997, the PSID conducted the Child Development Supplement (CDS), which collected children's time diaries along with detailed assessments of children's cognitive development, for approximately 3,600 children between the ages of 0 and 12. In 2002, the PSID-CDS began re-contacting 2,907 of the original sample of children for a follow-up survey.

Because I am interested in examining how early pre-school experiences may influence children's later cognitive outcomes, my sample consists of 1,008 children who were five years old and younger in 1997. This represents 73% of the sample of children who completed both weekend and weekday time diaries. Of the original 1,388 children younger than five years old who were present in both waves of data, 227 children were dropped because they did not complete both weekday and weekend time diaries, and 15 children were dropped because of missing values in the time diary module. All measures of maternal involvement were taken from the 1997 PSID-CDS. All measures of children's outcomes are taken from the 2002 PSID-CDS.

Measures

I use an extensive set of explanatory variables to capture child-specific and family-specific characteristics that may influence both maternal time inputs and child outcomes. Previous studies have simply used birth weight and basic demographic variables such as gender and race/ethnicity to control for children's initial endowments. I exploit the richness of the PSID-CDS data to account for the aspects of child endowments that may be readily observable to parents at early ages and that may, in turn, also influence how parents respond to their children. In the next few paragraphs, main variables and control variables that are unique to this study are

discussed briefly. More detailed discussion of the full list of explanatory variables used in the analysis is presented in the Table A1 and A2.

Dependent Variables. Cognitive outcomes are measure by the Woodcock Johnson Revised Test of Achievement (WJ-R). The WJ-R is a widely recognized measure of intellectual development, reading and mathematical competence (PSID-CDS User's Guide, 2002). Cognitive assessment is composed of three subtests: applied problem solving, letter-word and passage comprehension. All assessments of cognitive ability are taken from the 2002 PSID-CDS, when children are between the ages of 5 and 12 years old. All three measures are age-standardized with a mean of 100.

Maternal Care. A unique aspect of the PSID-CDS is its children's time use module[2]. Detailed information on children's time use was collected for up to two children within each family. Like other time use surveys, information was collected on the type of activity performed and the amount of time spent on each activity over the duration of a specified 24-hour period. Unique to the PSID-CDS, additional questions such as "who was doing the activity with the child?" and "who (else) was there but not directly involved in the activity?" were also included in the questionnaire (PSID-CDS User's Guide, 1997). As a result, time use data from the PSID-CDS provides information on the duration and type of activity performed, as well as the degree

[2] Time diaries focus on capturing the chronology of events over a short period of time. This approach has been shown to be more reliable and less subject to social desirability bias than data collected from traditional, survey-based questions that ask individuals how much time they spend performing specific activities (PSID-CDS User Guide, 1997). While there are no baseline studies that have tested the consistency, validity, and reliability of time use reports from survey-based methods, substantial research has shown the time diary approach to be reliable and valid (Juster, 1985; Robinson, 1985).

of adult involvement associated with each activity. Diary for a random weekday and a random weekend were collected for each child[3].

Using the un-aggregated time diary module of the 1997 PSID-CDS, I create the following measures of maternal involvement: 1) quantity of care, 2) intensity of care and 3) activity specific-shared time. First, *quantity of care* is measured by the total hours per week children spend with their mothers. I use both weekday and weekend diaries to construct a representative week by multiplying weekday time use by 5 and weekend time use by 2. Second, I attempt to distinguish between the time children spend with mothers when they are only passively engaged with children and when they are actively engaged in one-on-one contact. Therefore, intensity of care is defined as the percentage of total care that is spent actively involved with mothers. Third, I distinguish between the different types of activities children perform with mothers. Specifically, I divide total care into the seven most commonly performed activities—total time together *reading, playing, watching tv/listening to music, traveling, doing housework, being the passive recipient of personal care,* and *eating meals*. Time spent in each of these seven activity types account for about 95% of total care. Table A1 provides details on how these categories were constructed.

Maternal Employment. Maternal employment is measured as a set of dummy variables indicating part-time or full-time employment in each of the first five years of a child's life. Part-time employment measures working between 1 to 34 hours per week. Full-time employment indicates working 35 hours or more per week.

[3] Approximately, 90% of the time diaries for children in the sample were completed by mothers alonee or mothers with their children. Therefore, children's time diary reports can be considered as mothers' own reports of the time she spends with children.

Child Specific Characteristics. Whereas previous most previous studies have only accounted for the very basic set of child-specific characteristics like birth weight, age and sex, this study includes a exhaustive set of controls for the full range of cognitive, health, and behavioral problems children may have experienced during early childhood. For example, a series of dummy variables measure if any development problems were experienced during infancy, if ever hospitalized for a serious illness, along with other comprehensive controls for physical and mental health (see Appendix A2 for detailed description). Additionally, the PSID-CDS also administered letter word and applied problem solving tests for all children age 3 and older in 1997. Thus, lagged test scores are also available for a subset of children in the sample and are included in some regressions. Finally, I control for the standard set of demographic characteristics commonly examined in the child development literature, such as child's gender, race, age at time diary assessment, age at cognitive test, and number of siblings.

Quality of children's learning environment. This study is also unique in accounting for the quality of children's learning environment. To account for the cultural capital in the home environment, I control for the number of books in the household. To account for stability of children's non-parental childcare arrangements, I include measures of the total number of different non-parental childcare arrangements used on a regular basis from child's birth to kindergarten. Finally, by the time of the 2002 PSID-CDS assessments, all children will have entered school. It may be important to control for the quality of children's schooling environment since it is likely to influence test scores. Thus, I use for pupil-teacher ratios in children's school district to proxy for quality of schooling experience.

Maternal Characteristics. Mother's verbal aptitude is measured by her passage comprehension score and is treated as a continuous variable. Mother's education is measured as

a continuous variable signifying the total years of completed schooling[4]. Other maternal and household characteristics include mother's language proficiency indicating whether English is her first language, mothers' age at child's birth, marital status, household income and sibship size.

RESULTS

The following paragraphs discuss the results of the analyses. Table 1 presents select sample statistics and Table 2 presents patterns of mother-child involvement by mother's employment status and human capital. Table 3 presents the results of multivariate regressions of test scores on total maternal care. Next, Table 4 examines the influence of intensity of maternal involvement on test scores. Finally, Table 5 examines the relationship between the types of activities children and mothers spend performing together and children's later cognitive development.

How do the characteristics among children and mothers differ?

One of the major sources of bias in the maternal employment literature is that women are positively selected into employment. Specifically, several studies find that women who work tend to be better educated than women who do not (Waldfogel et al., 2002; Ruhm, 2005). Table 1 partially confirms this, showing that working mothers are better educated than nonworking mothers. They are not, however, significantly different from non-employed mothers with respect to their cognitive skills.

Children's test scores do not significantly differ by maternal employment status but they do differ by mothers' verbal ability and education level. Better educated and more verbally

[4] Alternative regressions were estimated using different specifications of maternal education and verbal ability, including linear splines and dummy variables. The results were not substantitively different from the results using linear specifications of mother's education and verbal aptitude.

skilled mothers tend to have children with higher test scores. Additionally, mother's education and verbal skills are positively correlated with age, household income and marital status—characteristics often associated with socio-economic advantage. Additionally, mother's verbal skills are positively related to her education level, but there is a great deal of variability in verbal skills within each educational category. For example, there is as much variation in verbal skills among those who did not graduate from high school as there is variation in the verbal skills among mothers who received some post-high school education. This result suggests that mother's verbal test scores may be measuring an alternative dimension of human capital that is not captured by years of education such as the quality of schooling.

How do patterns of maternal involvement vary?

Whereas women tend to be positively selected into employment status, Table 2 shows that mothers who spend more time with their children do not systematically differ from those who devote less time to their children with respect to maternal characteristics that may be associated with better parenting skills—like higher verbal aptitude and greater years of education. The quantity and intensity of maternal involvement, however, does differ by employment status. Working mothers spend significantly less time with children and dedicate less time to active care than non-working mothers. Children of non-employed mothers receive about 10 hours more maternal care per week than children of mothers employed on a part-time basis and 20 hours more maternal care per week than children of mothers working full-time.

Consistent with past research, Table 2 also shows that much of the difference in total care is due to differences in the level of maternal engagement. In particular, children of stay-at-home mothers only receive about 2 hour more per week of active maternal care than children of mothers who work on a part-time basis and about 8 hours more of active care per week than

children of mothers working full-time. As a result, employed women spend a greater proportion of their total childcare time in active, one-on-one involvement than non-employed women.

Table 2 also demonstrates that the types of activities mothers and children perform together varies both by employment status and mothers' human capital. Children of non-employed women spend significantly more shared time *playing, traveling to obtain goods and services*, and *being the passive recipient of personal care* but not significantly more time *reading, eating meals together, or watching television/listening to music*. Children of more verbally skilled mothers and better educated mothers spend more time with mothers *reading* and *being the passive recipient of personal care* and less time performing housework relative to their respective counterparts. Children of more verbally skilled mothers also spend more time *playing* with mothers than children of less verbally skilled mothers.

Does quantity of maternal care relate to children's test scores?

Table 3 presents ordinary least square estimations for each of the three tests of children's cognitive outcomes, successively controlling for individual and family characteristics. In the first column, regressions only control for child's age. The second column includes all controls for children and mothers. The third column includes interactions between maternal care and mother's verbal skills and interactions between maternal care and mother's years of education. Finally, the fourth column includes assessments of children's lagged test scores. As described earlier, the fourth model is estimated only on the sub-sample of children who were tested in both 1997 and 2002. The "cluster" function in STATA was used to address the issue of non-independence of the error terms among siblings.

Columns 1 and 2 show that the total time mothers dedicate to children is not significantly associated with any of the three measures of cognitive outcomes. Once interactions are

introduced in Column 3, the estimated relationship between maternal care and both measures of children's verbal aptitude increases in magnitude and becomes statistically significant. This relationship persists even after controlling for children's initial cognitive skills in Column 4, suggesting that the time verbally skilled mothers invest in their children during early childhood has a lasting influence on their children's language development.

To facilitate interpretation of the multiple interaction terms, parameter estimates from Model 3 are used to graph predicted values of children's letter-word and passage comprehension scores by the hours per week mothers spend with children and by mother's verbal aptitude in Figure 1 and 2, respectively. Predicted values were generated by evaluating each variable at its sample mean. Both figures suggest that the relationship between test scores and time with mothers is positive only among children with mothers at the top of the verbal skill distribution. For mothers at the bottom and middle of the verbal test distribution, the relationship is largely insignificant.

In Column 3, we see that children's verbal aptitude is positively correlated with spending time with verbally skilled mothers but analytical reasoning, however, is not. Additionally, the estimated relationship between maternal care and test scores does not significantly vary by mother's years of education. Once lagged test scores are introduced in Column 4, however, these interactions become statistically significant.

Parameter estimates from models that condition of lagged test scores were used to generate predicted values for letter-word scores by mothers' education levels and predicted values for applied problem solving scores by mothers' verbal skills in Figure 3 and 4, respectively. Figure 3 suggests a positive relationship between maternal care and letter-word scores at all education levels. Figure 3 suggests that the relationship is strongest among children

with the least educated mothers but this estimated relationship should also be interpreted with the most caution. Among children who were tested in both 1997 and 2002, only 49 children have mothers with less than a high school education whereas there are 198 children with mother with more than 12 years and 143 children with mothers with exactly 12 years of education.

Figure 4 suggests similar patterns of associations seen in Figures 1 and 2, namely that maternal care is only positively correlated with cognitive outcomes when children spend time with skilled mothers. Figure 4 also suggests that time spend with mothers at the bottom of the skill distribution is negatively related to children's applied problem solving scores.

Does level of maternal engagement relate to children's test scores?

Table 4 presents the results of ordinary least square estimations of child cognitive outcomes on the intensity of maternal care which is defined as the percentage of total mother-child time that is spent on active, one-on-one interaction. The findings suggest only modest associations between the intensity of care and cognitive outcomes. Only children's letter-word scores are significantly associated with intensity of care at the 95% confidence level and suggest that greater intensity of care is associated with higher letter-word scores. The relationship does not persist once lagged test scores are introduced in Column 4.

Does the type of activity performed together relate to children's test scores?

Next, I regress time spent in the seven types of activities children perform with mothers on each of the three test scores, successively controlling for individual and family characteristics. Table 5 and 6 present the results for children's letter-word scores and passage comprehension scores, respectively. Table 7 presents the results for applied problem solving scores. In all tables, the basic estimations presented in Column 1 show that the types of activities children perform with mothers during early childhood are highly predictive of cognitive outcomes. For

example, the basic correlations show that time spent reading together is positively correlated with all three test scores whereas the time spent watching television together is negatively correlated with all three test scores as well.

Few correlations, however, remain statistically significant once characteristics of families and children are considered. Only the time children spend being the passive recipient of personal care remains significantly related to applied problem solving skills once background characteristics are controlled for in Column2 of Table 7.

The correlation between letter word scores and the time spent playing together is the only estimated relationship that is robust across both the interactive model and lagged scores model. In Table 5, Column 3 and 4 both show that time spent playing together is positively correlated with children's letter-word scores and that children who spend time in play activities with skilled mothers benefit the most in terms for their own language development. Column 4 in Table 6 also suggest that play time with verbally skilled mothers significantly predicts children's passage comprehension once I condition of children's initial cognitive ability.

Both Table 5 and 6 also show that watching television together is less deleterious for children's verbal development when children watch television with verbally skilled mothers. These relationships, however, does not persist for either measure of children's verbal scores once lagged test scores are introduced.

DISCUSSION

The present study investigates the effect of maternal involvement during children's pre-school years on children's cognitive outcomes, using time diary data from the Child Development Supplement of the Panel Study of Income Dynamics. First, I examine the relationship between children's test scores and the quantity of time mothers spend with children.

Next, I explore different ways of specifying maternal involvement and examine how these alternative specifications may relate to cognitive development. Namely, I examine how the intensity of maternal care and the types of activities mothers and children perform together may influence cognitive outcomes. Finally, I examine how maternal characteristics, such as education and verbal skills, may differentially influence the effect of mother-child time.

I find that the time mothers spend with children has a positive and persistent effect on cognitive outcomes but only among children with verbally skilled mothers. Additionally, the time children spend with verbally skilled mothers seems to more consistently predict children's verbal test scores and not problem solving scores. This finding suggests that the mechanism through which mothers influence their children's cognitive development occurs through specific pathways. Length of exposure to verbal stimulation may influence children's language development but not necessarily other dimensions of children's intellectual development such as analytical skills. When I examine the types of shared activities that are associated with positive cognitive outcomes, play-time is the only activity type that is consistently related with children's verbal scores across different specifications. The time mothers spend playing with children during their early years has a positive and persistent effect on children's language development, with children of verbally skilled mothers benefiting the most. The effects of intensity of maternal care, however, are more modest and are not robust across different estimations.

Taken together, these findings suggest that children's time with mothers is an important mechanism for the social reproduction of verbal skills. Several studies have documented how class-based differences in adult language use (Hoff-Ginsberg, 1991; Hoff, 2003) translates into differences in how mothers communicate with their children (Hoff-Ginsberg, 1991; Lareau, 2003), with higher-income parents sustaining longer periods of conversation with children, being

more encouraging of child-directed conversation, and using richer vocabulary. This paper demonstrates that length of exposure to verbally skilled mothers has a positive and lasting influence on children's language development. These findings point to the significance of maternal time investments as an important social mechanism in the stratification process.

My study offers several important contributions to the literature. First, I argue that my estimates are less biased than previous studies because I better control for sources of child-specific and mother-specific heterogeneity that may also be associated with child outcomes. Specifically, I control for child and maternal characteristics that have not been accounted for in previous studies, including children's health and developmental problems during infancy, lagged test scores and mothers' verbal skills.

Second, my findings speak to both the literature on maternal employment and the literature on mothers' time use. My findings show that in spite of recent findings that suggest that working mothers have re-allocated their time in ways to prevent work from interfering with childcare, employed mothers, particularly those working full-time, are not able to devote as much time to the dimensions of childcare that are correlated with cognitive outcomes—total quantity of involvement and play time—compared to their non-employed counterparts. Thus, my findings suggest that the quantity of maternal involvement is an important mechanism through which early maternal employment exerts its effect on children's cognitive outcomes.

Third, several studies find that children from more socio-economically advantaged families suffer the most from maternal employment but none identify the mechanism that bring about these differential effects. I argue that one possible mechanism is that mothers differ in their ability to successfully translate the time they spend with children into positive cognitive

outcomes. In particular, women differ in their verbal skills—characteristics that are correlated with socioeconomic advantage.

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Table 1. Descriptive Statistics of Select Maternal and Child Characteristics

		Weekly Work Hours			Mother's Verbal Aptitude			Mother's Education (yrs)		
	Full Sample	0	1-34	>=35	Bottom 30%	Middle 30%	Top 30%	<12	12	>12
Cognitive Outcomes										
Letter Word	106.20	107.41	105.84	106.28	99.83	106.09	112.38 *	100.02	103.39	110.36 *
	(16.64)	(17.15)	(17.00)	(15.36)	(102.58)	(15.58)	(15.22)	(16.88)	(15.13)	(16.41)
Passage Comprehension	108.40	107.78	108.68	108.31	102.58	108.55	113.76 *	103.42	106.42	111.53 *
	(14.45)	(13.87)	(15.22)	(12.92)	(14.86)	(13.28)	(13.00)	(15.25)	(14.01)	(13.72)
Applied Problem	104.80	103.11	104.99	105.65	98.78	104.20	111.17 *	96.88	102.10	109.54 *
	(17.13)	(16.22)	(17.78)	(16.07)	(15.47)	(16.80)	(16.77)	(15.17)	(14.78)	(17.77)
Mother's Characteristics										
Verbal Aptitude	31.30	31.17	31.43	31.30	25.23	31.54	36.53 *	27.87	29.96	33.55 *
	(5.16)	(4.84)	(5.29)	(4.31)	(3.70)	(1.11)	(2.26)	(4.84)	(5.82)	(4.62)
Education (yrs)	12.93	12.27	12.98	13.31 *	11.66	12.86	14.21 *	9.51	12.00	14.84 *
	(2.42)	(2.63)	(2.46)	(1.97)	(2.25)	(2.31)	(1.96)	(1.88)	(0.00)	(1.39)
Age	26.80	27.39	26.36	27.68	25.56	26.67	28.26 *	22.77	26.01	28.96 *
	(6.00)	(5.86)	(6.11)	(5.69)	(6.11)	(6.03)	(5.55)2	(6.12)	(5.82)	(5.07)
Logged Income	10.30	9.81	10.21	10.61 *	9.66	10.31	10.73 *	9.21	10.06	10.76 *
	(1.4)	(1.97)	(1.33)	(0.74)	(1.71)	(1.29)	(0.77)	(2.04)	(1.20)	(0.82)
Married (%)	69.0	75.0	67.0	67.9	45.0	76.0	83.0 *	42.0	60.0	84.0 *
	(0.45)	(0.42)	(0.46)	(0.46)	(0.49)	(0.422)	(0.36)	(0.49)	(0.48)	(0.35)
Child's Characteristics										
Cognitive Problems (%)	2.5	2.9	2.7	1.6	3.0	1.0	3.0	2.0	2.0	3.0
	(0.16)	(0.17)	(0.16)	(0.13)	(0.16)	(0.12)	(0.17)	(0.15)	(0.13)	(0.17)
Bad Health (%)	8.2	7.0	9.3	6.4	10.0	7.8	6.8	10.0	9.2	6.8
	(0.28)	(0.26)	(0.29)	(0.25)	(0.30)	(0.27)	(0.25)	(0.30)	(0.28)	(0.25)
Birth Weight	6.90	7.01	6.91	6.74 **	6.63	6.97	7.03 *	6.82	6.74	6.99 **
	(1.4)	(1.36)	(1.37)	(1.47)	(1.47)	(1.33)	(1.33)	(1.31)	(1.44)	(1.39)
Black (%)	32.0	23.4	30.6	41.3 *	59.0	28.0	11 *	38.2	42.3	22.98 *
	(0.47)	(0.42)	(0.46)	(0.49)	(0.49)	(0.45)	(0.31)	(0.49)	(0.49)	(0.42)
Latino (%)	8.0	16.4	5.3	8.4 **	15.0	7.0	2.0 *	23.7	5.2	3.83 *
	(0.27)	(0.37)	(0.22)	(0.28)	(0.36)	(0.25)	(0.14)	(0.43)	(0.22)	(0.19)
N	1008	171	588	249	325	334	349	186	326	496

Note: Standard deviations are shown in parantheses.

* $p < 0.01$; ** $p < 0.05$

Table 2. Total Maternal Care, Level of Engagement and Maternal Care by Activity Type by Mother's Employment Status, Verbal Abilty and Education

		Weekly Work Hours			Mother's Verbal Aptitude			Mother's Education (yrs)		
	Full Sample	0	1-34	>=35	Bottom 30%	Middle 30%	Top 30%	<12	12	>12
Total Maternal Care	52.0	63.27	52.46	43.2 *	51.33	51.61	53.01	54.38	51.59	51.4
	(20.8)	(19.96)	(20.01)	(19.28)	(20.95)	(20.53)	(20.96)	(21.08)	(21.18)	(20.44)
Level of Engagement										
Active Care	31.5	34.68	32.83	26.31 *	30.72	31.83	32.01	33.55	30.47	31.5
	(16.7)	(18.71)	(16.29)	(15.20)	(17.38)	(16.60)	(16.28)	(19.05)	(16.86)	(15.83)
Passive Care	20.5	28.59	19.62	16.91 *	20.6	19.78	21.02	20.81	21.11	19.92
	(15.5)	(16.98)	(14.94)	(13.84)	(16.52)	(14.78)	(15.25)	(16.86)	(16.37)	(14.39)
Maternal Care by Activity Type										
Reading	1.10	1.22	1.12	0.95	0.76	1.12	1.39 *	0.60	0.81	1.48 *
	(1.84)	(2.09)	(1.88)	(1.58)	(1.53)	(1.96)	(1.93)	(1.42)	(1.64)	(2.01)
Playing games and sports, arts and crafts	14.13	20.38	13.78	10.64 *	13.08	14.40	14.85 **	14.98	14.56	13.52
	(11.44)	(14.19)	(10.60)	(9.37)	(11.81)	(11.34)	(11.13)	(13.56)	(11.83)	(10.24)
T.V., radio, music	0.60	0.62	0.58	0.66	0.58	0.64	0.60	0.58	0.58	0.63
	(1.99)	(2.23)	(1.97)	1.85	(2.14)	(1.90)	(1.94)	(2.25)	(1.88)	(1.96)
Traveling, obtaining goods and services	1.69	2.27	1.78	1.1 *	1.81	1.71	1.57	1.28	1.91	1.71
	(3.40)	(4.06)	(3.46)	(2.57)	(3.76)	(3.43)	(2.98)	(3.13)	(3.86)	(3.14)
Housework	8.93	9.76	8.87	8.49	11.05	7.99	7.85 *	12.14	9.51	7.34 *
	(8.67)	(9.53)	(8.92)	(7.35)	(9.89)	(7.78)	(7.91)	(10.45)	(9.30)	(7.00)
Recipient of personal care	7.29	7.58	7.69	6.13 **	6.42	7.65	7.75 **	5.79	7.12	7.97 *
	(6.90)	(7.37)	(7.22)	(5.56)	(6.74)	(7.21)	(6.69)	(6.97)	(6.98)	(6.74)
Meals	0.61	0.63	0.66	0.47	0.63	0.56	0.64	0.66	0.56	0.61
	(2.12)	(1.97)	(2.32)	(1.71)	(2.70)	(1.62)	(1.95)	(2.10)	(2.72)	(1.64)
N	1008	171	588	249	325	334	349	186	326	496

Note: Standard deviations are shown in parantheses.

* $p < 0.01$; ** $p < 0.05$

Table 3. Regression Estimates of Total Maternal Care on Child Cognitive Development

	(1)	(2)	(3)	(4)
Dependent Variable: Letter Word Score				
Total Care (Hrs/Wk)	0.031	0.003	-0.346	-0.305
	(0.03)	(0.03)	(0.156)**	(0.20)
Total Care x Mom's PC Score			0.017	0.023
			(0.005)*	(0.006)*
Total Care x education (yrs.)			-0.014	-0.033
			(0.01)	(0.016)**
R-squared	0.038	0.224	0.235	0.421
Dependent Variable: Passage Comprehension Score				
Total Care (Hrs/Wk)	0.02	0.007	-0.337	-0.46
	(0.02)	(0.02)	(0.143)**	(0.161)*
Total Care x Mom's PC Score			0.015	0.019
			(0.004)*	(0.005)*
Total Care x education (yrs.)			-0.011	-0.013
			(0.01)	(0.01)
R-squared	0.066	0.254	0.265	0.504
Dependent Variable: Applied Problem Solving Score				
Total Care (Hrs/Wk)	0.004	-0.016	0.003	-0.333
	(0.03)	(0.03)	(0.16)	(0.22)
Total Care x Mom's PC Score			0.008	0.017
			(0.01)	(0.007)**
Total Care x education (yrs.)			-0.02	-0.024
			(0.01)	(0.02)
R-squared	0.044	0.252	0.256	0.492
Additional Regressors	Age Only	B	B, I	B, I, L

Note: Coefficients for OLS regressions of specified tests are presented. Standardize errors are shwon in paraentheses. All test scores are assessed in 1997 when children are between the ages of 0 to 5. The categories of additional regressors are "Basic" Child, Maternal, and Household Characteristics (B), interactions between maternal care and mother's verbal scores and between care and mother's education (I), and lagged scores for letter word and applied problem solving tests assessed in 1997 (L). Detailed descriptions of all variables included in the analysis are presented in the appendix (Table A1). The sample sizes in first three columns are 934, 872, and 932 for the Letter Word Scores, Passage Comprehension, and Applied Problem Solving scores, respectively. In column 4, the sample size is 389, 388, and 387 for the Letter Word Scores, Passage Comprehension, and Applied Problem Solving scores, respectively, because only children 3 years old or older in 1997 where tests in 1997. Therefore, only a subsample of children have both 1997 and 2002 assessments of cognitive ability.

Table 4. Regression Estimates of Intensity of Maternal Care on Child Cognitive Development

	(1)	(2)	(3)	(4)
Dependent Variable: Letter Word Score				
Intensity of Care (% of Time in Active Care)	-0.008	-0.019	0.315	-0.036
	(0.03)	(0.02)	(0.144)**	(0.23)
Intensity of Care x Mom's PC Score			-0.007	0.022
			(0.01)	(0.02)
Intensity of Care x education (yrs.)			-0.008	-0.009
			(0.01)	(0.01)
R-squared	0.023	0.225	0.231	0.405
Dependent Variable: Passage Comprehension Score				
Intensity of Care	-0.009	-0.022	0.081	-0.005
	(0.02)	(0.02)	(0.14)	(0.16)
Intensity of Care x Mom's PC Score			-0.005	0.000
			(0.01)	(0.02)
Intensity of Care x education (yrs.)			-0.001	-0.001
			(0.01)	(0.01)
R-squared	0.062	0.255	0.256	0.492
Dependent Variable: Applied Problem Solving Score				
Intensity of Care	-0.015	-0.019	-0.03	0.095
	(0.03)	(0.02)	(0.14)	(0.19)
Intensity of Care x Mom's PC Score			-0.01	-0.024
			(0.01)	(0.02)
Intensity of Care x education (yrs.)			0.004	0.007
			(0.01)	(0.01)
R-squared	0.025	0.253	0.254	0.467
Additional Regressors	Age Only	B	B, I	B, I, L

Note: Coefficients for OLS regressions of specified tests are presented. Standardize errors are shwon in paraentheses. All test scores are assessed in 1997 when children are between the ages of 0 to 5. The categories of additional regressors are "Basic" Child, Maternal, and Household Characteristics (B), interactions between maternal care and mother's verbal scores and between care and mother's education (I), and lagged scores for letter word and applied problem solving tests assessed in 1997 (L). Detailed descriptions of all variables included in the analysis are presented in the appendix (Table A1). Sample sizes are 934, 872, and 932 for the Letter Word Scores, Passage Comprehension, and Applied Problem Solving scores, respectively.

Table 5. Regression Estimates of Children's Letter Word Scores on Maternal Care by Activity Types (N = 934)

	(1)	(2)	(3)	(4)
Reading	1.116	0.233	-0.454	-1.471
	(0.333)*	(0.31)	(2.00)	(2.74)
Playing	0.095	0.084	-0.26	-0.136
	(0.05)	(0.05)	(0.30)	(0.50)
TV, radio, music	-0.163	-0.044	-0.367	-0.191
	(0.067)**	(0.07)	(0.36)	(0.52)
Traveling, obtaining goods and services	0.139	0.015	-0.519	0.316
	(0.08)	(0.07)	(0.48)	(0.98)
Housework	0.001	-0.274	-0.833	-1.838
	(0.23)	(0.22)	(1.70)	(2.11)
Recipient of personal care	-0.41	-0.202	-0.829	-1.833
	(0.198)**	(0.19)	(1.17)	(1.71)
Meals	0.068	-0.007	-0.205	-0.354
	(0.13)	(0.12)	(0.76)	(1.46)
Reading x Mom's PC Score			0.083	0.141
			(0.06)	(0.08)
Playing x Mom's PC Score			0.023	0.044
			(0.009)**	(0.016)*
TV x Mom's PC Score			0.031	-0.003
			(0.013)**	(0.02)
Traveling x Mom's PC Score			0.027	0.022
			(0.02)	(0.04)
Housework x Mom's PC Score			0.016	-0.095
			(0.06)	(0.07)
Personal Care x Mom's PC Score			-0.002	0.047
			(0.03)	(0.04)
Meals x Mom's PC Score			-0.003	-0.013
			(0.02)	(0.04)
Reading x Education			-0.143	-0.225
			(0.14)	(0.21)
Playing x Education			-0.03	-0.092
			(0.02)	(0.05)
TV x Education			-0.051	0.015
			(0.03)	(0.05)
Traveling x Education			-0.024	-0.067
			(0.04)	(0.07)
Housework x Education			0.008	0.346
			(0.10)	(0.146)**
Personal Care x Education			0.055	0.009
			(0.07)	(0.12)
Meals x Education			0.022	0.038
			(0.04)	(0.11)
R-squared	0.074	0.231	0.246	0.443
Additional Regressors	Age Only	B	B, I	B, I, L

Note: Coefficients for OLS regressions of specified tests are presented. Standardize errors are shwon in paraentheses. All test scores are assessed in 1997 when children are between the ages of 0 to 5. The categories of additional regressors are "Basic" Child, Maternal, and Household Characteristics (B), interactions between maternal care and mother's verbal scores and between care and mother's education (I), and lagged scores for letter word and applied problem solving tests assessed in 1997 (L). Detailed descriptions of all variables included in the analysis are presented in the appendix (Table A1).

* $p < 0.01$; ** $p < 0.05$

Table 6. Regression Estimates of Children's Passage Comprehensive Scores on Maternal Care by Activity Types (N = 872)

	(1)	(2)	(3)	(4)
Reading	0.961	0.244	-0.582	-0.725
	(0.268)*	(0.26)	(1.77)	(2.33)
Playing	0.022	0.016	-0.238	-0.381
	(0.05)	(0.05)	(0.29)	(0.38)
TV, radio, music	-0.127	-0.02	-0.517	-0.716
	(0.062)**	(0.06)	(0.38)	(0.37)
Traveling, obtaining goods and services	0.143	0.012	-0.233	-0.686
	(0.069)**	(0.07)	(0.49)	(0.65)
Housework	0.487	0.222	-0.974	-2.212
	(0.206)**	(0.19)	(1.49)	(1.71)
Recipient of personal care	-0.212	-0.005	-2.038	-1.512
	(0.19)	(0.17)	(1.12)	(1.43)
Meals	-0.044	-0.092	-0.357	-0.124
	(0.12)	(0.12)	(0.70)	(1.10)
Reading x Mom's PC Score			0.045	-0.011
			(0.05)	(0.06)
Playing x Mom's PC Score			0.015	0.026
			(0.01)	(0.012)**
TV x Mom's PC Score			0.037	0.026
			(0.014)*	(0.02)
Traveling x Mom's PC Score			0.018	0.029
			(0.02)	(0.02)
Housework x Mom's PC Score			0.024	-0.017
			(0.04)	(0.05)
Personal Care x Mom's PC Score			0.041	0.047
			(0.03)	(0.04)
Meals x Mom's PC Score			0.002	-0.004
			(0.02)	(0.03)
Reading x Education			-0.043	0.07
			(0.11)	(0.16)
Playing x Education			-0.017	-0.031
			(0.02)	(0.04)
TV x Education			-0.05	-0.018
			(0.03)	(0.03)
Traveling x Education			-0.025	-0.025
			(0.03)	(0.04)
Housework x Education			0.037	0.219
			(0.10)	(0.12)
Personal Care x Education			0.059	-0.004
			(0.07)	(0.11)
Meals x Education			0.015	0.006
			(0.04)	(0.08)
R-squared	0.104	0.255	0.274	0.519
Additional Regressors	Age Only	B	B, I	B, I, L

Note: Coefficients for OLS regressions of specified tests are presented. Standardize errors are shwon in paraentheses. All test scores are assessed in 1997 when children are between the ages of 0 to 5. The categories of additional regressors are "Basic" Child, Maternal, and Household Characteristics (B), interactions between maternal care and mother's verbal scores and between care and mother's education (I), and lagged scores for letter word and applied problem solving tests assessed in 1997 (L). Detailed descriptions of all variables included in the analysis are presented in the appendix (Table A1).

* $p < 0.01$; ** $p < 0.05$

Table 7. Regression Estimates of Children's Applied Problem Solving Scores on Maternal Care by Activity Types (N = 932)

	(1)	(2)	(3)	(4)
Reading	1.103	0.224	0.606	3.258
	(0.340)*	(0.33)	(2.48)	(3.14)
Playing	0.007	0.025	0.053	0.104
	(0.05)	(0.05)	(0.30)	(0.52)
TV, radio, music	-0.178	-0.042	0.035	-0.851
	(0.072)**	(0.07)	(0.36)	(0.53)
Traveling, obtaining goods and services	0.155	0.009	-0.128	-1.503
	(0.08)	(0.07)	(0.48)	(0.79)
Housework	0.118	-0.093	-1.809	-1.725
	(0.26)	(0.22)	(1.75)	(2.13)
Recipient of personal care	-0.594	-0.364	-1.419	-0.085
	(0.188)*	(0.170)**	(1.05)	(1.63)
Meals	0.097	-0.033	0.863	-0.144
	(0.15)	(0.14)	(0.83)	(1.54)
Reading x Mom's PC Score			0.022	-0.013
			(0.06)	(0.10)
Playing x Mom's PC Score			0.000	0.003
			(0.01)	(0.02)
TV x Mom's PC Score			0.008	0.021
			(0.01)	(0.02)
Traveling x Mom's PC Score			0.01	0.049
			(0.02)	(0.03)
Housework x Mom's PC Score			0.066	0.018
			(0.06)	(0.07)
Personal Care x Mom's PC Score			-0.002	0.014
			(0.03)	(0.05)
Meals x Mom's PC Score			0.016	0.041
			(0.03)	(0.04)
Reading x Education			-0.074	-0.173
			(0.15)	(0.23)
Playing x Education			-0.003	-0.02
			(0.02)	(0.04)
TV x Education			-0.026	0.007
			(0.03)	(0.06)
Traveling x Education			-0.012	-0.003
			(0.03)	(0.07)
Housework x Education			-0.023	0.064
			(0.10)	(0.16)
Personal Care x Education			0.087	-0.07
			(0.06)	(0.14)
Meals x Education			-0.109	-0.119
			(0.042)*	(0.11)
R-squared	0.082	0.257	0.266	0.511
Additional Regressors	Age Only	B	B, I	B, I, L

Note: Coefficients for OLS regressions of specified tests are presented. Standardize errors are shwon in paraentheses. All test scores are assessed in 1997 when children are between the ages of 0 to 5. The categories of additional regressors are "Basic" Child, Maternal, and Household Characteristics (B), interactions between maternal care and mother's verbal scores and between care and mother's education (I), and lagged scores for letter word and applied problem solving tests assessed in 1997 (L). Detailed descriptions of all variables included in the analysis are presented in the appendix (Table A1).

* $p < 0.01$; ** $p < 0.05$

Figure 1. Predicted Letter Word Scores by Mother's Verbal Aptitude and Maternal Care

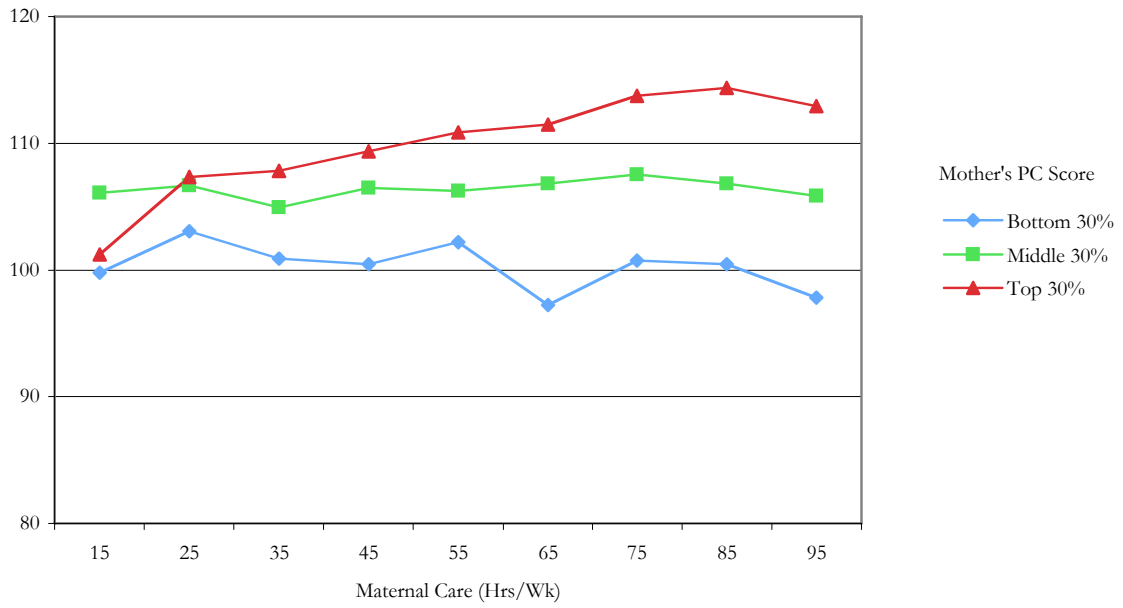

Figure 2. Predicted Passage Comprehension Scores by Mother's Verbal Aptitude and Maternal Care

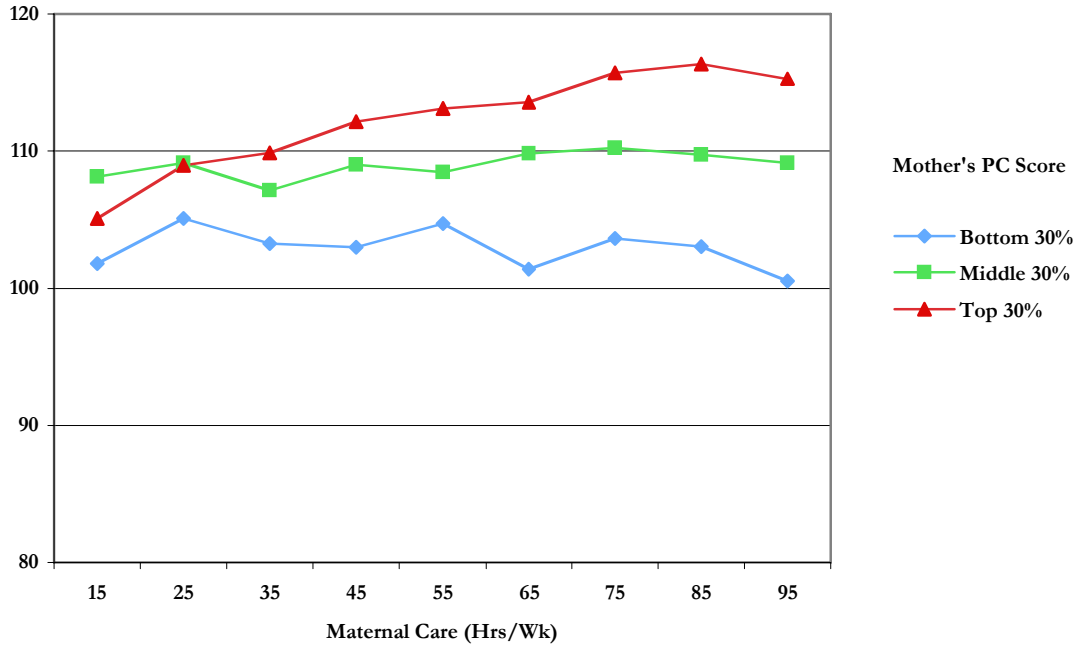

Figure 3. Predicted Lettter Word Scores by Mother's Education and Maternal Care, Controlling for Lagged Test Scores

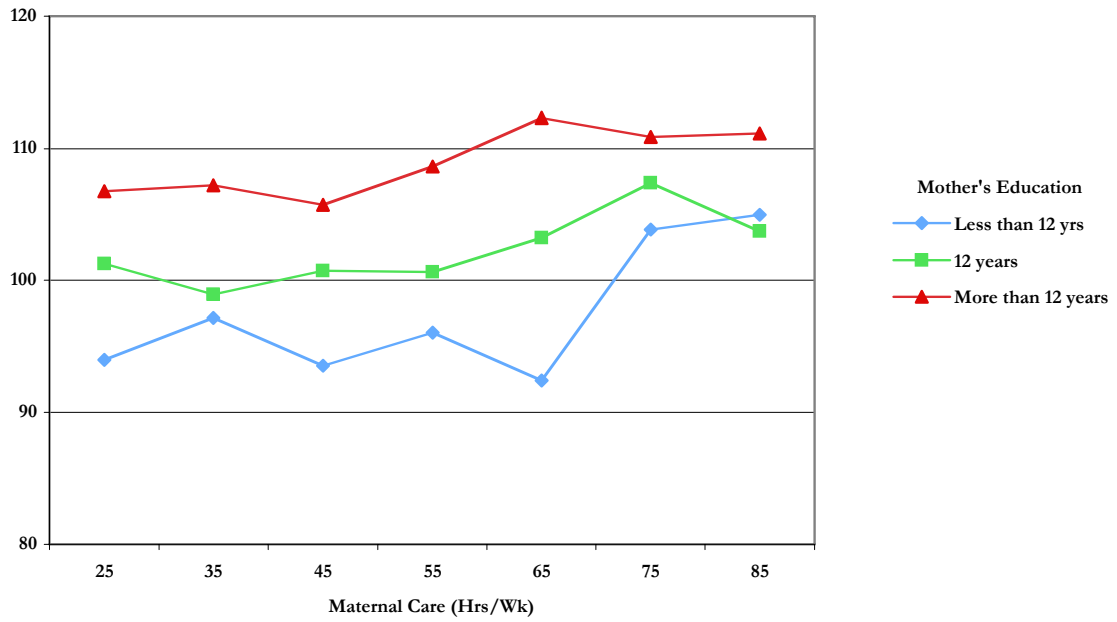

Figure 4. Predicted Applied Problem Solving Scores by Mother's Verbal Aptitude and Maternal Care, Controlling for Lagged Test Scores

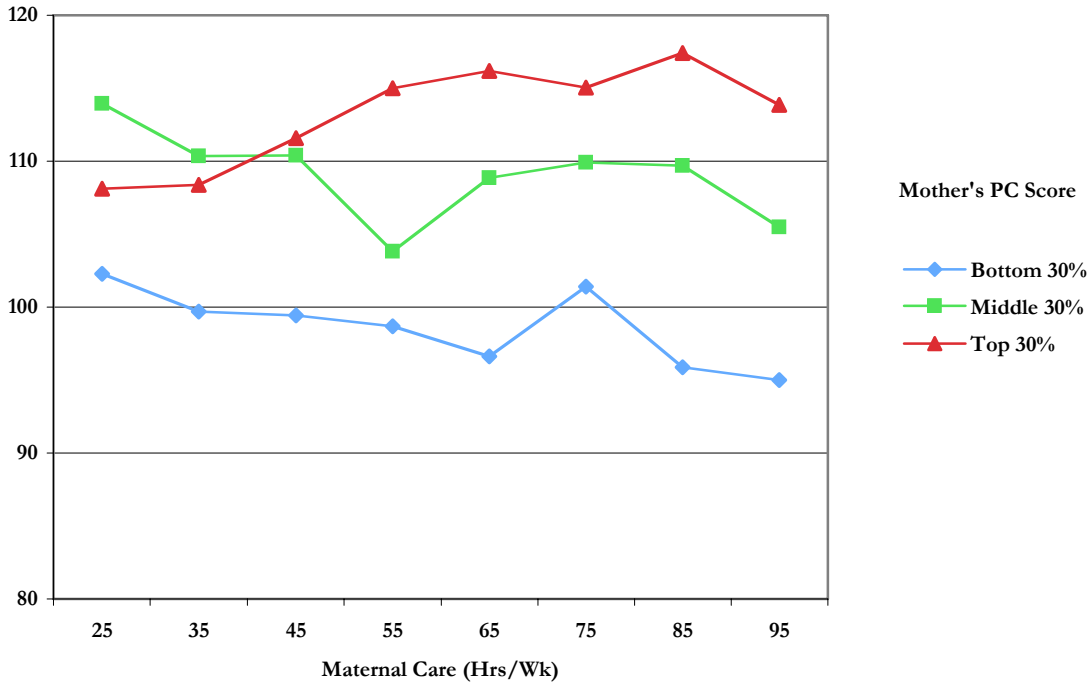

Table A1. Description of Activity Specific Share Time

Variables	Description
Reading	Reading books, magazines, newspaper, being read to
Playing games and sports, arts and crafts	Playing/games (pretend, dress up, board games, toys or dolls, etc.), doing arts and crafts, playing sports, outdoor activities (e.g. fishing, bicycling, camping, walking, hiking, etc.)
T.V., radio, music	Watching television, listening to the radio or to music
Traveling	All travel related activities, including traveling to obtain goods and services
Housework	Household activities (e.g. preparing meals, laundry, cleaning and chores, repairs and home improvement, etc.)
Recipient of personal care	Passively recieving care (e.g. Recieving personal care, medical care, being held or comforted by mother)
Meals	Sharing meals or snacks together either at home or way from home

Table A2. Description of Variables Used in Analysis

Variables	Description
Type of Care (in 1997)	
Total Care	Hours per week mothers spend with child
Intensity of Care	% of total care actively engaged with mother
Activity-Specific Care	See Table A1
Cognitive Outcomes (in 2002)	
Letter Word (LC)	Woodcock Johnason-Revised Letter Word Scores assessed when children are between 5-12 years old
Passage Comprehension (PC)	Woodcock Johnason-Revised Passage Comprehension Scores assess when children are between 5-12 years old
Applied Problem (AP)	Woodcock Johnason-Revised Applied Problem Solving Scores assess when children are between 5-12 years old
Maternal Characteristics	
Mother's PC Score	Mother's Passage Comprehension Scores assessed in 1997
Mother's Education	Years of education
Mother's Age	Mother's age at birth of child in years
Logged Income	Logged income at birth of child
Married (%)	Marital Status at birth of child
Sibship size	Total number of siblings living in the household
Language skills	If English is mother's first language (d.v.)
Maternal employment	
Full time Work	If worked >=35 hours per week during each of the first 5 years of child's life (five d.v.'s)
Part-time Work	If worked between 0-34 hours per week during each of the first 5 years of child's life (five d.v.'s)
Not working	If did not work during each of the first 5 years of child's life (five d.v.'s)
Quality of Learning environment	
Books	Number of books in the household
Cultural capital at home	Number of books in home environment
Childcare Arrangement	Number of Non-parental care arrangement from birth to kindergarten
Quality of School	Student-teacher ratio of child's school in 2002
Child Characteristics	
Cognitive Problems	Experienced cognitive problems at birth (d.v.)
Physical Problems	Experienced physical problems at birth (d.v.)
Behavioral Problems	Experienced behavioral problems at birth (d.v.)
General health at birth	Child health is worse than average at birth (d.v.)
General health in 1997	If child health is fair or poor in 1997
Birth weight	Birth weight
Hospitalization	If ever hospitalized overnight as of 1997
Mental health	If ever seen a psychiatrist, psychologist, or mental health professional as of 1997
Race/Ethnicity	Child is Black or Latino (two d.v.'s)
Male	Child is male (d.v.)
Age in 1997 survey	Child's age in 1997 (five d.v.'s)
Age in 2002 survey	Child's age at time of 2002 assessment date
Lagged Test Scores	Child's Letter Word and Applied Problem Solving Scores assessed in 1997, only implemented for children aged 3-5 in 1997