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MECHANISMS FOR THE ASSOCIATION BETWEEN MATERNAL EMPLOYMENT  
AND CHILD COGNITIVE DEVELOPMENT

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Mechanisms for the Association Between Maternal Employment and Child Cognitive Development  
John Cawley and Feng Liu  
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**ABSTRACT**

Recent research has found that maternal employment is associated with worse child performance on tests of cognitive ability. This paper explores mechanisms for that correlation. We estimate models of instrumental variables using a unique dataset, the American Time Use Survey, that measure the effect of maternal employment on the mother's allocation of time to activities related to child cognitive development. We find that employed women spend significantly less time reading to their children, helping with homework, and in educational activities in general. We find no evidence that these decreases in time are offset by increases in time by husbands and partners. These findings offer plausible mechanisms for the association of maternal employment with child cognitive development.

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## 1. Introduction and Context

Between 1975 and 2005, the labor force participation rate of mothers with children under age 18 rose from 47 to 71 percent (U.S. Department of Labor, 2006). This has led to a vast number of studies on the effects of maternal employment on various measures of child development including test scores, behavior problem indices, and physical health; see the reviews in Ruhm (2004a,b), Baum (2003), and Shonkoff and Phillips (2000).<sup>2</sup>

A subset of this literature, mostly in sociology and psychology, and to a lesser extent in economics, is concerned with the impact of maternal employment on child scores on tests of cognitive ability (e.g. Waldfogel et al. 2002; Baum 2003; Ruhm 2004a; Gregg et al. 2005; James-Burdumy 2005; Berger et al. 2005). Much of this literature examines data from the NLSY 1979 Cohort and their children. The results of these studies are mixed, but tend to find a negative association between maternal employment and child test scores.

Several of these studies conclude with a call for more research on the mechanisms by which maternal employment may affect child cognitive development (e.g. James-Burdumy 2005; Ruhm 2004a). For example, James-Burdumy (2005) concludes: “Finally, an investigation of the effects of maternal employment on child development using time-use information would be valuable to determine exactly how maternal employment affects the amount of time the mother spends with the child. Do working mothers spend less time with their children...do fathers compensate for the employment

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<sup>2</sup> A related literature studies how maternal work schedule (e.g. night shift work as opposed to working 9-5, or flexibility of work hours) affects child development (Shonkoff and Phillips 2000; Han 2006) but those studies are outside the scope of this paper.

of the mother by increasing the amount of time that they spend with their children...” (p. 207). This paper answers that call for research. The research questions of this paper are: What are the mechanisms through which maternal employment may affect child cognitive development? How does maternal employment affect the mother’s allocation of time to activities that are associated with child cognitive development? Do fathers with working wives allocate more time to these activities? This study exploits a unique dataset that has not previously been examined in this context: the American Time Use Surveys (ATUS) for 2003-2006. The ATUS is uniquely well-suited to answer these research questions; Hamermesh et al. (2005) praise the usefulness of the ATUS to study the “...inputs into parental investments in children and to analyze their determinants...” (p. 229).

The research questions of this paper are important for several reasons. First, it will shed light on possible unintended consequences of government policy to increase employment among women with children. For example, the 1996 Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) imposed work requirements for low-income single mothers to continue to receive cash assistance and set lifetime limits on receipt of federal cash assistance and thereby raised the labor force participation of low-income mothers (Blank, 2002). This paper will document how the employment of women with children results in changes in allocation of time that could have implications for the cognitive development of vulnerable children.

Likewise, this paper can inform the discussion on maternity leave policy. In many industrialized countries national laws guarantee paid maternity leave, while in the U.S. the Family and Medical Leave Act (FMLA) mandates unpaid maternity leave for

only about half of employed women; for the remainder, maternity leave is determined by state law and employer policy (Berger et al., 2005). Additional evidence that maternal employment may worsen child outcomes could strengthen the argument for expanding the FMLA to cover all employers.

The outline of the paper is as follows. In the next section we briefly discuss our conceptual framework and describe our empirical methods. In section 3 we describe our data, the American Time Use Survey. Empirical results are provided in section 4 and section 5 offers a variety of extensions and sensitivity analyses. Section 6 puts the findings in context and offers conclusions.

## **2. Conceptual Framework and Methods**

Our conception of how women make decisions about their allocation of time between employment and home production such as producing child quality is based on the models of Becker (1976, 1991) and Grossman (2000) adapted to this context by Ruhm (2004a,b). We do not reprint those models here but the basic intuition is that a mother allocates her time and budget to maximize her objective function, which includes, among other things, child outcomes. The fact that everyone faces a time constraint of 24 hours a day implies that all hours one spends working for pay are hours that cannot be devoted to other activities. While it is possible that working mothers rearrange their schedules so no less time is spent with children as a result of their employment, it is more likely that working leads to some reduction in women's time with their children. The goal of this study is not to naively test whether maternal employment results in any

decrease in time with children, but to measure the amount of decrease in time spent in specific activities that relate to child cognitive development.

Specifically, we study the following activities that specifically relate to cognitive development: reading to or with children, helping with children's homework, other activities related to children's education (such as meeting with teachers) and talking with children.<sup>3</sup> These are identified as key activities in child cognitive development in the National Academy of Sciences and Carnegie Task Force reports on child development (Carnegie Task Force on Meeting the Needs of Young Children 1994; Shonkoff and Phillips 2000). For example, parental behaviors like talking, telling children about things, and listening were found to be highly correlated with children's vocabulary growth and their IQ scores (Shonkoff and Phillips 2000). A National Research Council report finds that children whose parents read to them tend to have greater reading ability (Snow et al. 1998). More broadly, we also examine playing with children, supervising children, and total time spent with children. Children whose parents monitor and supervise them more closely may be more likely to read, do homework, or study; conversely, maternal employment is associated with children spending more time watching television (Fertig, Glomm, and Tchernis 2006; Crepinsek and Burstein, 2004).

We estimate two-part models (Jones, 2000; Cragg, 1971) of time devoted to specific activities, which is appropriate because a zero value of our dependent variable represents a genuine choice to spend zero minutes in that activity; i.e. it is not due to non-response. The first part of the model is a probit in which the dependent variable equals one if the respondent reports spending any time in that activity. The second part of the

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<sup>3</sup> Breastfeeding has been linked to improved child development (Shonkoff and Phillips 2000) but this activity is not separately classified by the ATUS.

model is an ordinary least squares regression in which the dependent variable is the log of the number of minutes spent in that activity, conditional on spending some time. The regressor of interest is an indicator variable that equals one if the woman works for pay. (In the Extensions section, we describe that the pattern of results are similar when weekly work hours are used instead of an indicator for employment.)

Identifying the causal effect of maternal employment is challenging because the mother's decision to work may be determined by unobserved factors that directly affect the outcomes of interest. For example, women with high levels of unobserved human capital may be more likely to work and may also (whether working or not) allocate their other time differently. Previous research has addressed the potential endogeneity of maternal employment in a variety of ways. Some studies seek to minimize the influence of unobserved heterogeneity by controlling for a rich set of maternal and family characteristics (e.g. Baum 2003; Ruhm 2004a; Gregg et al. 2005). Several (Waldfogel et al. 2002; Ruhm 2004a; James-Burdumy 2005) estimate sibling fixed effects models to eliminate the unobserved heterogeneity that is common to siblings. Berger et al. (2005) use propensity score matching and find results are similar to those from OLS models. Baum (2003) and James-Burdumy (2005) instrument for maternal employment using local labor market conditions or characteristics. The Hausman tests in Baum (2003) indicate an inability to reject the null hypothesis that maternal employment is exogenous in this context; those in James-Burdumy (2005) fail to reject the equality of sibling fixed effects and IV fixed effects models.

We follow Baum (2003) and estimate IV models in which maternal employment is instrumented using state unemployment rate (controlling for year fixed effects). In the

first stage regression, in which standard errors are clustered at the state level, the F statistic of the instrument is 16.6, which exceeds the generally-accepted minimum standard of  $F=10$  (Stock, Wright, and Yogo 2002).

Each of our regression models includes the following regressors: number of children in the household, age of youngest child, and indicator variables for mother's age category, education category, race and ethnicity, marital status, and whether the spouse (if any) is working full-time. Models also include indicator variables for day of the week, because maternal employment will affect the allocation of time differently by day depending on the work schedule, and for whether the day in question is a holiday. Models also include year fixed effects. We do not control for income because we wish to measure the full effect of maternal employment, part of which may work through income. In all regressions, the ATUS sampling weights are used and standard errors are clustered at individual level.

We do not estimate models of how paternal employment affects paternal time for two reasons. First, previous literature has found no conclusive relationship between paternal employment and child cognitive development (Ruhm 2004a). Second, our instrument of state monthly unemployment rate is not sufficiently predictive of paternal employment; i.e. it does not pass the generally-accepted threshold for power in IV models (Stock, Wright, and Yogo 2002).

### **3. Data: The American Time Use Survey (ATUS)**

The American Time Use Survey (ATUS) was first conducted in 2003 and has the goal of producing comprehensive information about how Americans spend their time.



The ATUS sample is drawn from the outgoing rotation groups of the Current Population Survey. One individual from each selected household is chosen to participate in the ATUS. In a computer-assisted telephone interview, the respondent is interviewed once about his or her time use in a single 24-hour period (specifically, from 4 am to 4 am, ending on the interview day). The respondent describes each activity undertaken, how much time was spent, and with whom (for example, did housework for 30 minutes and my children were with me). The survey does not record secondary activities. For example, a person might have primarily driven to work but secondarily eaten breakfast while driving; the ATUS will code that time as spent driving but not record that they were also eating. Even though secondary activities are not recorded, it is possible to calculate total time spent with children because respondents do list who was with them during each activity. The ATUS organizes the data so that researchers can account for every minute of the respondent's day. Sample weights are provided to facilitate generalizations to the U.S. population. For more detail on the ATUS and its methods, see Hamermesh et al. (2005).

There are some limitations to the ATUS data. The response rate of the ATUS is under 60 percent in each year. Abraham et al. (2006) find that non-contact accounts for 60 percent of that non-response. They find little evidence that busy people are less likely to respond but considerable evidence that people who are weakly integrated into their communities (e.g. renters, urban residents) are less likely to be contacted and therefore participate. Another limitation specific to our research question is that the ATUS does not include the test scores of the respondent's children. Despite its limitations, the ATUS

has been praised for its usefulness for economic research (Herz and Devens, 2001; Hamermesh et al. 2005).

The ATUS was conducted annually 2003-2006; data from all of these years are pooled for this analysis. We include in our sample female respondents to the ATUS who have at least one child under the age of 18 in their household. Our final sample size is 15,287. Summary statistics are presented in Table 1. Among women in the sample, 66 percent are employed (whether part-time or full-time) and the average number of typical weekly work hours among the employed is 36. The average number of children is 2 and the average age of youngest child is 7. Sixty-six percent of the ATUS sample of mothers is married, and 58 percent overall has a spouse working full time. Table 2 lists summary statistics for minutes spent on various activities for the sample as a whole as well as for non-working and working mothers. The unconditional means show that non-working mothers are more likely to spend any time reading to or with children, working with children on their homework, other educational activities, talking with children, playing with children, and supervising children. Among women who spend any time in these activities, the average number of minutes spent is consistently greater for non-working than for working mothers. For example, among women who read to or with their children, the average amount of time spent on the reference day was 35 minutes for those who did not work and 29.5 minutes for those who work. Among women who spend any time helping children with homework, those who did not work spent an average of 58 minutes and those who worked spent an average of 51 minutes. There was a large difference in average time spent on other educational activities (among those who spent any): 104 minutes for women who did not work versus 63 minutes for those who work.

Average time spent talking with children was 41 minutes among women who did not work and 36 minutes among those who work. There is also a large difference in average total time spent with children: 514 among those who did not work versus 344 minutes for those who work.

#### **4. Empirical Results**

Table 3 presents the results of two-part models of time allocated to specific activities. The cells of the table list the marginal effect of maternal employment (for the second part of the model, in which the dependent variable is the natural logarithm of the number of minutes, marginal effects are expressed in linear minutes). The table lists marginal effects only for the indicator for maternal employment but the models also control for the covariates listed in Table 1; the complete model results are available upon request.

Table 3 indicates that in the two part model that uses probit and OLS (i.e. does not instrument for maternal employment), maternal employment is consistently associated with less time spent on activities associated with human capital investments in children: reading with children, helping with homework, other educational activities, playing with children, supervising children, and total time spent with children. The magnitudes of the correlations are in some cases substantial. In the first part of the model, maternal employment is associated with a 2 percentage point lower probability of reading to children, 5 percentage point lower probability of helping with homework, 1 percentage point lower probability of other educational activities, 3 percentage point lower probability of talking with children, 5 percentage point lower probability of playing with

children, 3 percentage point lower probability of supervising children and a 4 percentage point lower probability that the mother spends any time with her children. Conditional on spending some time in these activities, working is associated with 5 fewer minutes reading to children, 6 fewer minutes helping with homework, 17 fewer minutes on other educational activities, 18 fewer minutes playing with children, 8 fewer minutes supervising children and 139 fewer minutes spent with the children overall.

We also estimate IV versions of the two part models in order to address the endogeneity of maternal employment. This results in a large increase in standard errors. The results of Hausman tests indicate that we cannot reject the null hypothesis that employment status is exogenous; in other words, the benefits of IV are not worth their costs and the non-IV versions of the model are preferred. This failure to reject the exogeneity of maternal employment in this context is consistent with the previous study to estimate IV models in this context (Baum 2003).

## **5. Extensions and Sensitivity Analyses**

We conduct four extensions to our basic model: 1) re-estimate the model using hours worked instead of an indicator for maternal employment as the regressor of interest; 2) test for differences across household income; 3) re-estimate our models for mothers of young children (age 3 and under); and 4) examine whether fathers whose wives work spend more time on the same activities.

We re-estimate our models using hours worked instead of an indicator for maternal employment as the regressor of interest. Results are provided in Table 4. The hours worked variable is expressed in individual hours, the mean of which is 36. On the

whole, the pattern of results for hours worked (Table 4) is similar to those for an indicator for employment (Table 3). In Table 4, the basic (non-IV) model implies that a higher number of typical hours worked per week is associated with a lower probability of spending any time in each activity examined: reading to children, helping with homework, other educational activities, talking with children, playing with children, supervising children, and any time with children overall. In most cases there are also significant differences on the intensive margin. On the whole, the magnitudes are similar to those in Table 3; for example, in the basic (non-IV) version of the second part of the model for total time spent with children, an additional hour worked per week is associated with 3.5 fewer minutes spent with children among mothers who spend any time with children. The mean number of weekly hours worked is 36, and so moving from zero hours worked to mean hours worked is associated with 3.5 times 36, or 126 fewer minutes spent with children, which is similar to the estimate in Table 3 that moving from not employed to employed is associated with 139 fewer minutes spent with children overall. The F-statistic of the instrument, state monthly unemployment rate, in the first stage of the IV model is 12.5, which again passes the minimum threshold for power (Stock, Wright, and Yogo 2002).<sup>4</sup> Hausman tests again indicate that we cannot reject the null hypothesis that work hours are exogenous in this context. For this reason the basic (non-IV) model is preferred to the IV model. On the whole, the estimates of models that use number of work hours are very similar to those of models that use an indicator for maternal employment.

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<sup>4</sup> As before, the first stage includes indicator variables for year, and the standard errors are clustered by state.

Previous research suggests that maternal employment may be associated with improved cognitive outcomes among low-income children (Shonkoff and Phillips 2000). For this reason, we estimate our initial models (i.e. those that use an indicator variable for maternal employment) separately by whether the income of the household is above or below \$50,000 (results available upon request). We fail to reject equality of coefficients between the two samples. In summary, we find that maternal employment results in less maternal time spent in educational activities even in low-income families. If maternal employment does raise scores on tests of cognitive ability for low-income children, it must operate through a different mechanism.

A subset of previous research has examined the impacts of maternal employment on children as young as age 3 or 4 (e.g. Berger et al. 2005; Brooks-Gunn et al. 2002). The initial models of this paper were estimated using a sample of mothers with children under age 18 years in their household. It is possible that mothers of teenagers decrease time devoted to educational activities, but that mothers with young children do not. Moreover, maternal allocation of time to educational activities during young ages is of special interest because the impacts of human capital formation at those ages can yield enormous benefits in later life (Carnegie Task Force on Meeting the Needs of Young Children 1994; Heckman 2000). For these reasons, we re-estimate our models for mothers whose age of youngest child is three years or younger. In results available upon request, we find very similar point estimates to those for our sample as a whole. In summary, even mothers of young children appear to decrease time spent on educational activities in response to employment.

Some of the decreases in time by the mother may be offset by increases in time by the father; in general, time allocation decisions may be made jointly to maximize the household's objective function (Becker 1976, 1991). The ATUS includes only one adult per household so we are unable to observe time allocation by both adults in a union, but we are able to conduct two tests that shed some light on this issue. First, we examine whether the changes in activity time associated with employment are greater for women who have a husband or partner present in the household than for single mothers. We fail to reject the hypothesis that the impact of working on time allocation is the same for single mothers as for mothers with a spouse or partner present; the only exception concerns whether the mother spends any time with her children: for single mothers, working is associated with just a one percentage point decrease in the probability she spends any time with her children (and that is not statistically significant even at the 10 percent level); in contrast, among mothers with a husband or partner present, working is associated with a 4 percentage point decrease in the probability of spending any time with her children on the reference day.

We also examine whether men in the ATUS with a working wife report more time spent in these activities than men whose wife does not work (controlling for the man's employment). Results are presented in Table 5. We find that, among ATUS men with children, those whose wife is employed are no more likely to read to their children, help with homework, participate in other educational activities, talk with their children, or play with their children (relative to men with children whose wives do not work). Fathers with working spouses are, however, more likely to supervise children and to spend some time with children. On the intensive margin, men who play with their children tend to

spend 7.5 more minutes playing with them if their spouse is employed. However, men with working spouses also spend *less* time in other activities: 43 fewer minutes on educational activities other than homework, and 3 fewer minutes talking with children. On net, an employed spouse is associated with fathers spending 13 more minutes with their children (across all activities). This suggests that husbands and partners take up some of the slack created by maternal employment, but the magnitude of the increase by fathers is much less than the decrease by mothers so on net less time is spent on these activities. For example, working is associated with mothers spending 139 fewer minutes with children overall (among those who spend any), but having a wife who is employed is associated with fathers spending only 13 more minutes with children overall (again, among those who spend any).

## **6. Discussion**

A recent *Journal of Labor Economics* article called for study of time-use data to find mechanisms that explain the negative effect of maternal employment on childrens' scores on cognitive tests (James-Burdumy, 2005). This paper is a response to that call, and measures how maternal employment affects the allocation of time to a variety of activities related to child cognitive development, using data uniquely well suited to answer such questions (Hamermesh et al., 2005).

Exploring time use data for 2003-2006, we find plausible mechanisms for the correlation of maternal employment with child cognitive development. We find that maternal employment is associated with a lower probability of, and reductions in time spent, reading to children, helping children with homework, and other activities related to



the child's education. More broadly, maternal employment is also associated with a lower probability of, and reductions in time spent, playing with children, supervising children, and total time with children. This is consistent with earlier findings that children of working mothers spend more hours watching television (Fertig, Glomm, and Tchernis 2006; Crepinsek and Burstein, 2004).

This study has limitations. Although the results of the Hausman test suggest that the OLS estimates are preferred to the IV estimates, it is appropriate to discuss what is being measured in the IV models. Ideally we would estimate the average treatment effect (ATE) of maternal employment for all women with children, but our IV estimates reflect only the impact of maternal employment for women whose labor force participation is affected by state unemployment rate. These women may differ from the average woman; for example, they may be less attached to the labor force or less educated. If so, our IV results measure a Local Average Treatment Effect (LATE) rather than the ATE and caution should be used when generalizing to the entire population of women (Imbens and Angrist, 1994). Another possible aspect in which the LATE may differ from the ATE is that our variation in maternal employment may be due to involuntary unemployment caused by macroeconomic fluctuations, and sudden or involuntary unemployment may result in disequilibrium in time allocation. Still, this LATE is of interest; Hamermesh et al. (2005) note that the ATUS is promising to study "how shocks ... result in substitution between market and nonmarket work...how different types of household production activities vary over the business cycle" (p. 228).

Maternal employment involves a tradeoff: less time in the household in exchange for more income. We acknowledge that the additional earned income yields benefits for

the household, benefits that are not measured or discussed in this paper. To clarify, our intent is not to calculate the net benefits of maternal employment, but to identify possible mechanisms that explain the observed correlation between maternal employment and child cognitive development.

The ATUS records primary, but not secondary, activities, so if employment causes mothers to switch some child-centered activities (e.g. talking with children) from primary to secondary in nature, then the models of this paper overstate the reductions in time due to employment.

ATUS includes only one respondent per household, so we are unable to examine allocation of time by both spouses, but we find that husbands and partners with working spouses spend more time on some of these activities, but this offsets only a small percentage of the decrease associated with maternal employment. Finally, child test scores are not recorded by the ATUS. Despite these limitations, this study contributes to the recent literature on maternal employment and child cognitive development by demonstrating several plausible mechanisms for the association.

This paper raises several questions for future research. First, what exactly are children doing instead of reading with, talking to, or doing homework with, their mother? Studies of this issue using time-use data for children would complement the findings of this paper that are based on time-use data for adults. In addition to knowing what children do, it would also be helpful to know where they do it and with whom. For example, do children of working mothers spend more time in formal child care settings, and if so, do specific aspects of the child care environment fail to promote child development?

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**Table 1: Summary Statistics**  
**American Time Use Surveys, 2003-2006**  
**N=15,287**

<b>Variable</b>	<b>Percent of Sample or Mean Value</b>
<b>Respondent employed</b>	65.87%
<b>Working hours per week</b>	35.96
<b>Age</b>	
- 18-24	14.52%
- 25-34	29.61%
- 35-44	35.27%
- 45-54	15.73%
- 55+	4.87%
<b>Education</b>	
- less than high school	15.31%
- high school	30.17%
- some college	28.70%
- college +	25.82%
<b>Race</b>	
- white	62.27%
- black	14.11%
- Hispanic	18.38%
- other	5.24%
<b>Marital status</b>	
- Married	65.79%
- Divorced, separated or widowed	14.37%
- Never married	19.84%
<b>Age of youngest child &lt;18</b>	7
<b>Number of children</b>	2
<b>Spouse working full-time</b>	57.57%
<b>Holiday</b>	1.85%
<b>Weekday</b>	
- Sunday	14.31%
- Monday	14.25%
- Tuesday	14.17%
- Wednesday	14.33%
- Thursday	13.87%
- Friday	14.82%
- Saturday	14.25%
<b>Year</b>	
- 2003	24.71%
- 2004	24.92%
- 2005	25.14%
- 2006	25.23%

Note: sample is restricted to women who have at least one child under the age of 18 years in their household.

**Table 2**  
**Allocation of Time**

Activity	All women		Non-working women		Working women	
	Percentage Reporting any Time on this Activity	# Minutes Spent on Activity if >0	Percentage Reporting any Time on this Activity	# Minutes Spent on Activity if >0	Percentage Reporting any Time on this Activity	# Minutes Spent on Activity if >0
Reading to/with children	9.70%	31.73	11.47%	35.04	8.79%	29.50
Activities related to children's homework	12.05%	53.11	15.06%	57.94	10.49%	51.42
Other activities related to children's education	2.02%	81.75	2.75%	103.75	1.64%	62.60
Talking to/with children	11.69%	37.57	12.90%	40.78	11.07%	35.64
Playing with children	16.58%	100.61	22.52%	110.97	13.51%	91.65
Supervising child	7.89%	66.72	10.70%	77.03	6.44%	57.84
Total time spent with children	80.64%	401.83	80.71%	513.94	80.60%	343.66
Sample size	15287		4880		10407	

Data: American Time Use Surveys, 2003-2006

**Table 3**  
**Maternal Employment and Allocation of Time**  
**to Activities Associated with Child Academic Development**

Activity	Part One: Whether report any time spent on this activity		Part Two: Time spent on this activity (conditional on spending some)	
	Probit	Probit IV	OLS	2SLS
Reading to/with children	-0.02*** (-4.70)	0.16 (1.25)	-5.34*** (-4.92)	-14.25 (-0.22)
Activities related to children's homework	-0.05*** (-6.80)	-0.15 (-1.03)	-5.71*** (-2.76)	-580.42 (-0.77)
Other activities related to children's education	-0.01*** (-4.53)	0.09 (1.37)	-17.23** (-2.31)	-78.26 (-1.09)
Talking to/with children	-0.03*** (-4.68)	-0.16 (-1.05)	-2.22 (-1.47)	-89.65 (-0.42)
Playing with children	-0.05*** (-8.42)	0.04 (0.27)	-18.07*** (-6.01)	-17.61 (-0.22)
Supervising child	-0.03*** (-5.32)	0.17 (1.45)	-8.48*** (-2.72)	-138.34 (-1.57)
Total time spent with children	-0.04*** (-4.71)	-0.08 (-0.45)	-139.06*** (-20.81)	-184.26 (-1.13)

Notes:

- 1) Data: American Time Use Surveys, 2003-2006. Sample size 15,287.
- 2) Cells list marginal effects associated with maternal employment, with t-statistics are in parentheses. Statistical significance (based on a two-tailed test) is indicated with asterisks: \*\*\* P<0.01, \*\* P<0.05, \* P<0.1.
- 3) Table reports marginal effects only for indicator variable for employment (=1 if employed, 0 if unemployed). Models also control for all variables listed in Table 1; complete model results are available upon request.
- 4) In all regressions, sampling weights are applied and standard errors are clustered at individual level.
- 5) The dependent variable in time spent model is log minutes. Marginal effects are transformed back to minutes.
- 6) In the IV model, the instrumental variable is state monthly unemployment rate. In the first-stage regression (with standard errors are clustered at state level) the F statistic of the instrument is 16.58.

**Table 4**  
**Maternal Working Hours and Allocation of Time**  
**to Activities Associated with Child Academic Development**

Activity	Part One: Whether report any time spent on this activity		Part Two: Time spent on this activity (conditional on spending some)	
	Probit	Probit IV	OLS	2SLS
Reading to children	-0.001*** (-5.54)	0.004 (1.07)	-0.150*** (-5.18)	-0.443 (-0.33)
Activities related to children's homework	-0.001*** (-7.55)	-0.005 (-1.18)	-0.078 (-1.52)	-5.023 (-0.68)
Other activities related to children's education	-0.0002*** (-5.71)	0.002 (1.15)	-0.222 (-1.25)	-2.297 (-0.83)
Talking to children	-0.001*** (-6.04)	-0.004 (-1.02)	-0.092** (-2.54)	-2.377 (-0.35)
Playing with children	-0.001*** (-9.28)	0.000 (0.09)	-0.546*** (-7.25)	-0.626 (-0.30)
Supervising child	-0.001*** (-6.32)	0.004 (1.37)	-0.219*** (-2.81)	-3.238 (-1.46)
Total time spent with children	-0.001*** (-4.42)	-0.002 (-0.43)	-3.488*** (-21.16)	-3.546 (-0.93)

Notes:

- 1) Data: American Time Use Surveys, 2003-2006. Sample size: 14884
- 2) Cells list marginal effects associated with maternal working hours, with t-statistics are in parentheses. Statistical significance (based on a two-tailed test) is indicated with asterisks: \*\*\* P<0.01, \*\* P<0.05, \* P<0.1.
- 3) Table reports marginal effects only for usual working hours per week (0 if not working). Models also control for all variables listed in Table 1; complete model results are available upon request.
- 4) In all regressions, sampling weights are applied and standard errors are clustered at individual level.
- 5) The dependent variable in time spent model is log minutes. Marginal effects are transformed back to minutes.
- 6) In the IV model, the instrumental variable is state monthly unemployment rate. In the first-stage regression (with standard errors are clustered at state level) the F statistic of the instrument is 12.47.



**Table 5**  
**Paternal Time Spent with Children**

Activity	Part One: Whether report any time spent on this activity	Part Two: Number of minutes spent on activity if >0
	Probit	OLS
Reading to children	0.003 (1.01)	-1.10 (-0.68)
Activities related to children's homework	0.007 (1.39)	3.47 (0.91)
Other activities related to children's education	-0.000 (-0.00)	-43.33** (-2.11)
Talking to children	0.007 (1.51)	-2.81** (-1.18)
Playing with children	0.000 (0.56)	7.53* (1.91)
Supervising child	0.013*** (2.64)	4.95 (0.63)
Total time spent with children	0.027** (2.35)	13.31** (1.98)

Notes:

- 1) Data: American Time Use Surveys, 2003-2006. The sample is restricted to men with a spouse or unmarried partner present. The sample size is 9116.
- 2) Cells list marginal effects associated with spousal employment, with t-statistics are in parentheses. Statistical significance (based on a two-tailed test) is indicated with asterisks: \*\*\* P<0.01, \*\* P<0.05, \* P<0.1.
- 3) Table reports marginal effects only for indicator variable for spousal employment (=1 if employed, 0 if not). Models also control for paternal employment and all variables listed in Table 1; complete model results are available upon request.
- 4) In all regressions, sampling weights are applied and standard errors are clustered at individual level.
- 5) The dependent variable in time spent model is log minutes. Marginal effects are transformed back to minutes.