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EARLY MATERNAL EMPLOYMENT AND FAMILY WELLBEING

Pinka Chatterji  
Sara Markowitz  
Jeanne Brooks-Gunn

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### **ABSTRACT**

This study uses longitudinal data from the NICHD Study on Early Child Care (SECC) to examine the effects of maternal employment on family well-being, measured by maternal mental and overall health, parenting stress, and parenting quality. First, we estimate the effects of maternal employment on these outcomes measured when children are 6 months old. Next, we use dynamic panel data models to examine the effects of maternal employment on family outcomes during the first 4.5 years of children's lives. Among mothers of six month old infants, maternal work hours are positively associated with depressive symptoms and self-reported parenting stress, and negatively associated with self-rated overall health among mothers. Compared to mothers who are on leave 3 months after childbirth, mothers who are working full-time score 22 percent higher on the CES-D scale of depressive symptoms. However, maternal employment is not associated with the quality of parenting at 6 months, based on trained assessors' observations of maternal sensitivity. Moreover, during the first 4.5 years of life as a whole, we find only weak evidence that maternal work hours are associated with maternal health, and no evidence that maternal employment is associated with parenting stress and quality. We find that unobserved heterogeneity is an important factor in modeling family outcomes.

Pinka Chatterji  
State University of New York at Albany  
Economics Department  
1400 Washington Avenue  
Albany, NY 12222  
and NBER  
p chatterji@albany.edu

Jeanne Brooks-Gunn  
Columbia University  
National Center for Children and Families  
525 West 120th Street, Box 39  
New York, NY 10027  
brooks-gunn@columbia.edu

Sara Markowitz  
Department of Economics  
Emory University  
1602 Fishburne Dr.  
Atlanta, GA 30322  
and NBER  
sara.markowitz@emory.edu

## **I. Introduction**

Maternal employment has been the norm in the US since the 1980's. As of 2008, 71 percent of mothers of children under age 18 participated in the labor force (US BLS, 2009). Rates of labor force participation in 2008 were somewhat lower, but still high, for mothers of young children and infants – 64 percent of mothers with children under 6 years old, and 56 percent of mothers of infants participated in the labor force in 2008 (US BLS, 2009). Child-rearing and market work are both time-intensive activities. Thus, there has been concern that maternal employment harms children by reducing the quantity and quality of time mothers spend with their families (Baum 2003; Ruhm, 2004; Cawley & Liu, 2007).

When mothers reallocate their time from home to market work, however, this shift potentially affects not just the health and wellbeing of children but also the health and well-being of the parents and the family as a whole (Bianchi 2000; Riggio, 2006). In the economics literature, previous research on the effects of maternal employment has focused on a narrow set of child outcomes - scores on cognitive tests and a single behavioral assessment, the Behavior Problems Index (BPI). However, because only child outcomes and not maternal or family outcomes are examined, we obtain an incomplete picture of the effects of maternal employment from these studies. To develop public policies that meet the needs of a society in which most mothers are employed, we need a broader knowledge base regarding how maternal employment affects families.

This study uses longitudinal data from Phases I and II of the NICHD Study on Early Child Care (SECC) to examine the effects of maternal employment on family well-being, measured by maternal mental and overall health, parenting stress, and parenting quality. First, we estimate the effects of maternal employment on these outcomes measured when children are 6

months old, a point at which child-rearing is particularly time-intensive and maternal employment may have its most important effects. Next, we take advantage of the longitudinal aspect of the SECC and use dynamic panel data models to examine the effects of maternal employment on family outcomes during the first 4.5 years of children's lives. Notably, these models account for both unobserved heterogeneity as well as state dependence in the maternal health and parenting outcomes. The primary contributions of this paper are: (1) we examine the effects of maternal employment on a broader set of family outcomes than most US-based studies have considered, including parenting quality assessed in a laboratory setting; (2) in addition to work hours, we consider effects of work characteristics such as job flexibility; (3) we draw on longitudinal data to gauge whether effects persist over early childhood; and (4) we use empirical methods that address the potential endogeneity of maternal work hours, as well as the dynamic nature of the relationship between maternal employment and family outcomes.

Our findings indicate that maternal employment is associated with reductions in family wellbeing when children are 6 months old. Among mothers of six month old infants, maternal work hours are positively associated with depressive symptoms and self-reported parenting stress, and negatively associated with self-rated overall health among mothers. Compared to mothers who are on leave 3 months after childbirth, mothers who are working full-time score 22 percent higher on the CES-D scale of depressive symptoms. However, maternal employment is not associated with the quality of parenting at 6 months, based on trained assessors' observations of maternal sensitivity. Moreover, during the first 4.5 years of life as a whole, we find only weak evidence that maternal work hours are associated with maternal health, and no evidence that maternal employment is associated with parenting stress and quality. We find that unobserved heterogeneity is an important factor in modeling family outcomes.

## **II. Effects of early maternal employment on family outcomes**

There is an extensive theoretical and empirical literature outside of economics that highlights the importance of the family environment, parenting, and maternal health in shaping children's health and developmental trajectories (National Research Council and Institute of Medicine, 2000; Belsky, 1988; Coleman, 1988; Bornstein, 2002). Parenting behaviors, such as nurturance, discipline, and teaching, as well as the home environment have powerful influence on children's wellbeing and development (Brooks-Gunn & Markman, 2005). Parenting and the home environment have been linked to cognitive and behavioral outcomes such as children's academic achievement, social functioning, and health (Bornstein, 2002; Collins et al., 2000; Steinberg, 2001; Steinberg & Sheffield-Morris, 2001). Specifically, parental hostility, low nurturance, parenting stress, physical discipline and other harsh parenting practices are associated with aggression, low self-control, higher levels of externalizing behavior problems, and other mental health problems in children (Feldman et al., 2000; Qi & Kaiser, 2003; Barry et al., 2005; Ispa et al. forthcoming).

Poor parental health also reduces the quality of time mothers spend with their children and is associated with adverse outcomes. Numerous studies show that clinical depression in mothers as well as self-reported depressive symptoms, anxiety, and psychological distress, are important risk factors for adverse emotional and cognitive outcomes in their children, particularly during the first few years of life (Gray et al. 2004; NICHD Early Child Care Research Network, 1999; Petterson & Albers, 2001). Depressed mothers of infants are less interactive with and less responsive to their children (Campbell et al. 1995), and are less likely to seek appropriate health care for their children (Minkovitz et al., 2005). Compared to infants of

healthy mothers, infants of depressed mothers are more negative and less playful (Cohn et al., 1986; Field, 1984), have more behavior problems during childhood (Field 1984; Barry et al., 2005; Essex et al., 2001; Lyons-Ruth et al., 1997; Hay et al., 2003), and they are more likely to eventually develop psychopathology during childhood and adulthood (Downey & Coyne, 1990; Kim-Cohen et al., 2005).

Despite the importance of maternal health and parenting outcomes, there has been little attention in the economics literature to the effects of maternal employment on outcomes of family members other than children. Most research focuses on the effects of maternal employment on children's academic and behavioral outcomes. Recent research indicates that early maternal employment increases the frequency of child behavior problems, and detracts from school readiness, verbal ability, and test scores (Berger et al., 2008; Berger et al., 2005; Brooks-Gunn et al., 2002; Hill et al., 2005; Waldfogel et al., 2002; Waldfogel, 2002; Ruhm, 2004; Ruhm 2008; Baum, 2003; James-Burdumy, 2005; Gregg et al., 2005 ). Full-time employment during the first eighteen months is particularly harmful for children's cognitive and behavioral outcomes (Gregg et al., 2005; Baum, 2003; Brooks-Gunn et al., 2002).

These effects of maternal employment on children vary by the characteristics of children (e.g., age, race/ethnicity, and gender of child) and families (e.g., SES), and also by child care quality (e.g., type of child care arrangement). The negative effects of maternal employment tend to be stronger for children from more advantaged, majority-race backgrounds (Ruhm, 2008; Berger et al., 2008; Gregg et al., 2005). Moreover, non-standard maternal work schedules during the child's first few years are associated with child behavior problems (Daniel et al., 2009; Han, 2005), and recent research based on the SECC shows that more hours of non-relative child care are associated with child behavior problems up to age 15 (Vandell et al., 2010).

A few recent studies focus on the effect of one aspect of maternal employment – the length of maternity leave – on maternal health, which is one of the measures of family wellbeing we consider in the present study. These studies offer mixed evidence that maternity leave is associated with maternal health. Based on Canadian data, Baker and Milligan (2008) evaluate a mandated increase in the number of weeks of maternity leave granted to new parents. They find that increasing paid leave benefits from a maximum of 25 weeks to 50 weeks has no influence on maternal health measured by self reported health status, a depression scale, an indicator of post partum depression and a count of post-partum physical problems. In the US context, Chatterji & Markowitz (2005, 2008) use data from the 1988 National Maternal and Infant Health Survey (NMIHS) and the Early Childhood Longitudinal Study – Birth Cohort (ECLS-B) to examine the association between maternity leave length and maternal health. The findings from these two papers suggest that longer maternity leave (paid and un-paid) is associated with lower levels of maternal depressive symptoms, a lower likelihood of the mother having frequent outpatient visits during the first six months after childbirth, and better self-reported overall health among mothers.

To our knowledge, only one recent study in economics has focused on the effects of maternal employment on the wellbeing of the family. Baker, Gruber & Milligan (2008) take advantage of a natural experiment in which one Canadian province (Quebec) introduced a comprehensive, highly subsidized child care system. This policy change led to a rise in child care usage, an increase in maternal employment, and an increase in children’s adverse health and developmental outcomes in Quebec relative to the rest of Canada. These negative effects on children are consistent with the US-based literature on the effects of maternal employment on child outcomes. Baker, Gruber & Milligan, however, also examine family outcomes which have

not been studied in the US context. These authors find that the policy change was associated with less effective parenting, less satisfaction with marital relationships, increases in maternal depressive symptoms, and decline in the overall self-assessed health of fathers (but not mothers). This study is notable in that the authors examine a range of family indicators of wellbeing, not just children's outcomes, and all effects suggest detrimental effects of child care and maternal employment on families.

We build on this recent paper by examining these types of effects in the US context where, compared to Canada and other industrialized countries, mothers return to work early and at best have limited access to paid leave and affordable, high quality child care. This paper contributes to the growing economics literature on the effects of maternal employment in three respects. First, it expands the range of outcomes considered by examining the effects of maternal employment on several measures of family wellbeing that are critical to young children's development -- maternal mental health, maternal overall health, parenting stress, and the quality of parenting.

Second, we use data from the SECC, the only national, longitudinal data set available that includes detailed information on maternal work hours as well as state-of-the-art measurement of family outcomes, including laboratory assessments of parenting behaviors. Using the SECC, we attempt to address the possibility that unmeasured factors confound an observed association between maternal employment and family outcomes by estimating models that include an unusually extensive set of controls, including measures of initial family wellbeing and maternal ability, and by estimating dynamic panel models which address unobserved heterogeneity as well as state dependence in the outcomes.



Third, we build on prior work by examining not only the effects of maternal work hours on family wellbeing, but also the effects of the characteristics of her work – specifically, whether the mother does some work at home, whether she has flexible hours, whether she travels overnight for work, and whether she works non-standard hours. By examining these characteristics in addition to hours of work, we gain a richer and more nuanced picture of how maternal employment affects families.

### **III. The NICHD Study of Early Child Care (SECC)**

The SECC is a longitudinal study designed to examine the relationship between child care and children’s development. In 1991, the SECC enrolled 1,364 healthy infants with English-speaking, adult mothers from ten sites across the United States.<sup>1</sup> The sampling plan ensured representation of mothers who planned to work or attend school full-time, as well as mothers who planned to work/attend school part-time and mothers who planned to be home full-time with their infants (see NICHD Early Child Care Research Network, 1994, for a detailed description of the study design). The SECC was conducted in three phases, following children and their families from birth until age 15. This paper is based on data from Phase I and Phase II of the study, which includes repeated assessments of children, parents, and caregivers, as well as multiple home and telephone interviews with parents, caregivers, and child care directors. We draw on data collected from the time children were 1 month old until children were 54 months or about 4.5 years old.

Compared to the NLSY79 and other similar surveys used in prior work, measurement of maternal and child outcome variables is much more extensive in SECC. Data were collected

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<sup>1</sup> Little Rock, AR; Irvine, CA; Lawrence, KS; Boston, MA; Philadelphia, PA; Pittsburgh, PA; Charlottesville, VA; Morganton, NC; Seattle, WA; Madison, WI

from children and their families in a variety of settings, including the child's home, the child care setting (if used), a laboratory playroom, and through telephone contacts with a parent. Outcomes are measured using a variety of methods including use of trained observers, interviewers, questionnaires, and testing (NICHD SECC website, 2011). Interviewers visited mothers and children in their homes when children were 1, 6, 15, 24, 36, and 54 months old. Families also participated in telephone interviews between home visits that were conducted at 3, 9, 12, 18, 21, 27, 30, 33, 42, 46 and 50 months. During the home visits, mothers completed a variety of instruments designed to measure depression, parenting stress, relationship quality, social support, and their attitudes towards work and child-rearing. Mothers also provided extensive information about socio-demographic characteristics, employment, and child care during the home visits. During the home visits, trained interviewers observed mothers' interactions with children and the state of the household environment. Information on household composition, employment, child care and some health measures were updated every 3 to 4 months through the telephone contacts. Beginning with the 15-month interview, certain mother/child assessments were conducted in a laboratory setting.

In our first set of analyses, we analyze effects of maternal work on family outcomes measured when children are 6 months old. Our 6-month sample includes 1,198 mother/child pairs who have available information on all measures used in the analysis, with the exception of maternal occupation prior to childbirth, maternal reading score, and maternal smoking during pregnancy. For these latter three measures (described below), we replaced missing values with sample means and included in all models a dummy variable indicating that an imputed value was used.

In our second set of analyses, we use a pooled sample which includes repeated observations on children and mothers. When analyzing effects of maternal employment on maternal overall health, we pool data from all telephone and home interviews from 1 month until 54 months, yielding potentially 16 assessment time points for each mother (we are not able to use the 1 month assessment as a time point since we use this interview for lagged values of the dependent variable for the 3 month interview, as described below). In these models, maternal overall health and maternal employment are measured about every 3 months. We run analyses with an unbalanced panel of 18,655 observations which includes observations with available data on maternal health, employment, a standard set of time-invariant characteristics.

When analyzing maternal depression and parenting quality, we pool data from the 6, 15, 24, 36 and 54 month interviews. For the depression outcomes, we run analyses on a sample limited to 5,618 observations with available data; for parenting quality, the sample size is 4,371. When analyzing parenting stress, we pool data from the 6, 15, 24 and 36 month interviews, since parenting stress is not assessed at the 54 month interview – the sample size for these analyses is 4,573. Results are discussed below.

*a. Family Outcomes*

Depressive symptoms: We measure maternal depression using the 20-item Center for Epidemiologic Studies Depression Scale (CES-D), which is used to measure depressive symptoms in the past week in non-clinical populations. Mothers completed CES-D instruments during the 1, 6, 15, 24, 36, and 54 month home interviews. The CES-D is one of the most widely used psychiatric scales and captures mood, somatic problems, problems in interactions with others, and issues with motor functioning, such as “I felt lonely,” “my sleep was restless,” and “I could not get going.” The respondent is asked to respond to each item according to a 4-point

Likert scale, with higher values corresponding to higher frequency of the item in the past week. For example, for the item “I felt lonely,” mothers responded either “less than 1 day” (zero points), “1-2 days” (1 point), 3-4 days (2 points), or 5-7 days (3 points). Scores range from 0 to 60, and a score of 16 or higher is suggestive of clinically defined depressive disorder. The CES-D scale, however, does not correspond to a DSM-IV diagnosis of major depression. It is used primarily as a screening tool for depression, not as a diagnostic tool (Eaton et al. 2003).

We create two measures of depression from the CES-D scale, a continuous measure of symptoms and a dichotomous indicator of depression. Because the CES-D is skewed to the right in these data, we use the natural log of the total CES-D score as the continuous measure.<sup>2</sup> The dichotomous measure is a dummy variable indicating whether or not the respondent’s CES-D score is equal to or exceeds 16. This dummy variable is not equivalent to a psychiatric diagnosis of depression, but it does capture respondents who are experiencing many symptoms of depression, or several symptoms with high frequency, in the past week (Eaton et al. 2003).

The sample average CES-D score at the 6-month interview is 8.9, and 17 percent of the sample is depressed at the time of the 6-month interview (Table 1). It is notable that mothers who are employed at 6 months have appreciably lower CES-D scores and rates of depression at both the 1 month and 6 month interviews compared to mothers who are not employed at 6 months (Table 2). The rate of depression among full-time employed mothers at 6 months is 15 percent versus 22 percent among mothers who were not employed at 6 months (Table 2).

Overall health: Every three months, SECC mothers rated their own health in the past 3 months, compared to other women their age. Mothers can report their health as poor (1), fair (2), good (3) or excellent (4). We combine the poor and fair rankings since the number of mothers reporting poor health was small. We use this rating as an outcome measure, as well as a

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<sup>2</sup> In this variable and in others where log values are used, the zeros are replaced with a value of 0.5.

dichotomous indicator that equals one if the mother reports her health in general is fair or poor. Since the question does not specify physical or emotional health, these variables may capture both physical and mental illness.

Mothers reported on their health through home and telephone interviews every 3-4 months from the 1 month until the 54 month interview. At the 6-month interview, 12 percent of mothers report poor or fair health (Table 1). Employed mothers at 6 months have much lower rates of poor/fair health at the 1 month and at the 6 month interviews compared to mothers who are not employed at 6 months – for example, 9 percent of full-time employed mothers report poor or fair health at 6 months compared to 18 percent of mothers who are not employed at 6 months (Table 2).

Parenting Stress: To measure parenting stress, we draw on two scales completed by SECC mothers during the home interviews. At the 1 month and 6 month interviews, mothers completed a 30-item version of the Abidin Parenting Stress Index, which is designed to measure parent-child relationship stress and risk for adverse parenting and child behavioral outcomes. The index includes items such as “I feel trapped by my responsibilities as a parent”, “I enjoy being a parent” and “I feel capable and on top of things when caring for my baby.” At the 15, 24 and 36-month interviews, mothers were administered a 20 item adapted form of the Parent Role Quality Scale, which is appropriate to measure parenting stress among parents of toddlers and pre-school age children. Mothers are presented with ten potential concerns and ten potential rewards of child-rearing, and are asked to rate how much these concerns and rewards reflect their own experiences in parenting. The scale includes concerns such as “feeling tied down because of the children” and “the unending responsibilities” and rewards such as “the love your child shows” and “seeing your child grow and change.” For both measures of parenting stress, higher

scores indicate a greater degree of parenting stress. Table 2 shows that employed mothers at 6 months report lower rates of parenting stress than mothers who were not employed at 6 months. This is true of parenting stress measured at the 1 month interview as well.

Maternal Sensitivity: Maternal sensitivity is measured using trained observers' ratings of videotapes of mothers' behavior toward their children in semi-structured play situations. At 6 and 15 months, mother/child interactions were observed in the child's home, while at 24, 36, and 54 months these observations were conducted in the laboratory. These interactions are designed to demonstrate the degree to which the mother responds in a sensitive way to the child's nondistress, intrusiveness (reverse scored), and positive regard (at the 6, 15, and 25 month assessments), and the mother's supportive presence, hostility (reverse scored) and respect for autonomy (at 36 and 54 months). Higher scores indicate higher degree of sensitivity to the child. Table 2 shows that although employed mothers report better mental and overall health and lower parenting stress than mothers who are not employed at 6 months, full-time employed mothers are not different from mothers who are not working at 6 months in maternal sensitivity. Part-time working mothers have slightly higher sensitivity ratings compared to mothers who are not working at 6 months.

#### ***b. Maternal employment***

Mothers provided employment information during each home interview (1, 6, 15, 24, 36 and 54 months) and most this information was updated during intervening telephone contacts every 3 to 4 months. For each of these potentially 16 time points, we created several measures of lagged maternal employment. As described in the next section, we use lagged measures to avoid problems with reverse causality. The measures are: (1) the number of hours worked per week measured at the home or telephone interview that was conducted 3 months prior (hours worked

at last interview); (2) the average of weekly hours prior two assessments conducted 3 and 6 months ago (average hours worked over past 2 waves); and (3) the average weekly hours the mother worked up to and including the most recent prior assessment point (average hours worked in child's life). Based on these continuous measures of work hours, we also created three dummy indicators for: (1) worked 1 to 20 hours per week at last interview; (2) worked 21 to 39 hours per week at last interview; and (3) worked at least 40 hours per week at last interview. When we estimate models using the full sample, the baseline category combines mothers who are not employed with mothers who are employed but are on leave at 3 months. When we estimate models using a sample limited to employed mothers (defined as mothers who report that they are employed and working or employed and on leave at the 1 month interview), the baseline category is limited to mothers who are employed but are still on leave at the 3 month interview.

In addition to work hours, employed SECC mothers provided information regarding the characteristics of their jobs. In all home and telephone interviews from 3 to 54 months, mothers were asked the number of hours they could work at home, and the time of day of their work hours (daytime, evening, night or varying shifts). From this information, we created a dummy variable indicating the mother could work at least 10 hours a week from home, and a dummy variable indicating the mother worked a non-daytime shift. During the 6, 15, 24 and 36 month interviews, mothers also reported whether their job required overnight travel (never, less than once a month, more than once a month) and whether their work hours were not at all flexible, a little flexible (can leave in an emergency), fairly flexible, and completely flexible. From this information, we created dummy variables indicating whether the mother's job requires any overnight travel (either less than once a month or more than once a month) and whether the

mother's job is either fairly or completely flexible. When work characteristics are of interest, we limit the sample to employed mothers.

At the 6-month interview, 64 percent of mothers were employed or on leave, and the average weekly hours among employed mothers was about 33 (Table 1). Among employed mothers at the 6-month interview, 64 percent reported flexible hours, 22 percent worked alternate shifts, 18 percent had overnight travel, and 12 percent worked from home at least 10 hours per week (Table 1).

*c. Other covariates*

To adjust for other factors that may confound an association between maternal employment and family outcomes, we estimate models that include extensive sets of controls for family socio-economic status, the mother's education and ability, the mother's attitudes towards employment, and the initial health endowment of the child. All models include the following measures: mother's age in years, number of years of education, size of household measured at 1-month interview, maternal race/ethnicity (dummy indicators for African-American and Other race with white as the baseline, dummy indicator for Hispanic), child's gender (dummy indicator for female), dummy indicator for child's birth order (second, third, fourth, or higher with firstborn as the baseline); dummy indicators of birth month of the child (all were born in 2001); dummy indicator for low birth-weight child (2500 grams or less); dummy indicator for premature child (born before 37 weeks gestation); dummy indicator for whether mother smoked at all during pregnancy; dummy indicator for any pregnancy complications; mother's standardized score on PPVT reading test administered at 36 month interview, and dummy indicators for each SECC site.



Some models also include the following measures: dummy indicators for mother's occupation in the year prior to childbirth,<sup>3</sup> family income in the year prior to childbirth, current family income, mother's score on scale measuring progressivity of child-rearing beliefs measured at 1-month interview, mother's score on scale measuring work commitment administered at 1-month interview, mother's score on scale measuring benefits of maternal employment administered at 1-month interview, dummy indicators for family structure at 1-month (single parent/other family structure, live-in partner with married as the baseline, dummy indicator for child's father does not live in HH), and dummy indicators for whether the child spends at least 10 hours a week in six types of child care arrangements (daycare center, child care home, father, grandparent, in-home caregiver, multiple arrangements).<sup>4</sup>

#### **IV. Empirical Approach**

##### **A. Effects of maternal employment on 6-month family outcomes**

We begin by estimating Eq. 1 using outcomes measured when children are 6 months old (t=6 in Equation 1).

$$(1) \quad y_{i6} = \mathbf{X}_{i6}\alpha + \mathbf{W}_{i3}\beta + v_i + \varepsilon_{i6}$$

In equation 1,  $y_{i6}$  represents the  $i$ th family's health or parenting outcome at the 6-month interview,  $\mathbf{X}$  is a vector of covariates,  $\mathbf{W}$  is a vector of lagged measures of maternal employment measured at the 3-month interview,  $v$  represents unmeasured family/maternal characteristics that affect  $y$ ,  $\varepsilon$  is a random error term, and  $\alpha$  and  $\beta$  are parameters to be estimated. As discussed below, lagged employment is used to help reduce the possibility of bias resulting from reverse

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<sup>3</sup> Professional; technician or related support; sales; administrative support or clerical; private household; protective service; service; farm operation or management; mechanic or repairer; construction or other trade; machine operator, assembler, or inspector; transportation or material moving; handler, equipment cleaner, helper, or laborer; with executive, administrative or managerial as the baseline.

<sup>4</sup> Children who did not use any of these child care arrangements for 10 or more hours per week were considered to be exclusively in the care of the mother. At 6 months, about 14% of employed mothers were using exclusive maternal care.

causality. For continuous outcomes (e.g., depressive symptoms, parenting quality, parenting stress), we use OLS for estimation of Equation 1, while we use standard probit models for binary outcomes (e.g. poor/fair health, depressed) and an ordered probit model for self-assessed health rating (e.g., 1 = fair/poor health, 2 = good health, 3 = excellent health). We estimate Huber-White standard errors adjusted for clustering on site.

The causal effect of maternal employment on family wellbeing,  $\beta$ , may be positive or negative. Maternal employment may detract from family wellbeing by reducing the amount of time mothers spend investing in their families and in their own health and wellbeing. Prior research indicates that employed mothers spend less time with their children than non-employed mothers (Cawley & Liu, 2007).<sup>5</sup> On the other hand, maternal employment brings more income that can be used to purchase market goods that benefit the family and the mothers themselves.

Estimation of  $\beta$  is complicated by several potential problems. First, if families/mothers have unmeasured characteristics ( $v$ ) that are correlated with both family outcomes ( $y$ ) and maternal work hours ( $W$ ), the estimate of  $\beta$  will be biased. As Ruhm (2004), Gregg et al. (2005), and others have noted, this bias could operate in either direction. Mothers who are relatively resistant to stress and depression may be more likely to work, and also more likely to have positive family outcomes, compared to less resistant mothers. This case would suggest that  $\beta$  is biased upwards, since the coefficient captures both the causal effect of employment on outcomes as well as the unmeasured resilience of mothers.

On the other hand, if mothers select into employment along unmeasured characteristics that detract from family outcomes, the estimate of  $\beta$  would be biased downwards. For example,

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<sup>5</sup> Cawley & Liu (2007), using 2003-2006 data from the American Time Use Survey, find that conditional on spending some time with children, employed mothers spend 139 fewer minutes (on the reference day) with their children than stay-at-home mothers, controlling for maternal race/ethnicity, age, education, marital status and other factors (Cawley & Liu, 2007). Bianchi (2000) notes that employed mothers sleep fewer hours and spend less time in self-care and leisure time activities compared to non-employed mothers.

if mothers experiencing difficult adjustment to parenthood are more likely to return to work and more likely to have adverse outcomes,  $\beta$  will capture both the effects of employment and this poor adjustment effect. In our sample, employed mothers at 6 months tend to be healthier at baseline and generally more advantaged than non-employed mothers (Table 2). This fact suggests, but does not definitively imply, that employed mothers also may have unobserved characteristics that pre-dispose them to favorable family outcomes compared to non-employed mothers (Altonji et al., 2005).

In order to reduce the possibility of bias from unmeasured factors, we estimate models with unusually rich and extensive sets of control variables. We begin with a specification that includes only pre-determined variables – maternal age, maternal race/ethnicity, total household size, maternal education, maternal reading test score (a proxy for ability), pregnancy complications, mother smoked during pregnancy, low birth weight child, premature child, child gender, birth order of child, birth month of child, site fixed effects, and lagged maternal health and parenting (measured by maternal depression, maternal overall health and maternal parenting stress at the 1-month interview). Notably, our baseline model adjusts extensively for the family’s initial state of health and wellbeing, as well as for maternal ability, which are perhaps the two most likely confounding factors.<sup>6</sup>

Next, we estimate richer specifications to gauge the degree of selection along observed characteristics of the family. We incrementally add controls for (1) maternal occupation prior to the child’s birth and family income prior to the child’s birth; and (2) family structure, maternal beliefs about the benefits of employment, work commitment, and beliefs about child-rearing

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<sup>6</sup> Although it is possible that maternal employment already has affected family outcomes by the 1 month interview, this is unlikely. In our sample, 135 mothers are employed at the 1-month interview, but only 31 of these mothers have returned to work full-time, and 104 of these mothers report having fairly or completely flexible hours.

measured when the child was 1 month old.<sup>7</sup> We also re-estimate all of these models after limiting the sample to mothers who are employed (either working or on leave) at the 1 month interview. Limiting the sample this way may further reduce unobserved heterogeneity, although it comes at the cost of a reduction in power.

In addition to unobserved heterogeneity, a second potential problem that arises in estimating  $\beta$  is reverse causality. Although we seek to estimate the effect of maternal employment on family wellbeing, causation may run the other way, with mothers changing their employment decisions in response to their own and their family's health and wellbeing. For example, a mother may cut back on her work hours if she feels that employment interferes with her parenting or causes stress for the family. To address the possibility of reverse causality, we use a lagged measure, maternal employment at 3 month interview, in all 6-month models.

A third empirical issue is the interpretation of the estimate of  $\beta$ . Our interest is in the total effect of maternal employment on family outcomes (Gregg et al., 2005). For example, if maternal employment leads to usage of child care and an increase in family income, these changes may affect families, and our intention is to capture both types of effects through the coefficient on maternal employment. This focus affects what right hand side variables we include in the model. Although we include an extensive set of controls to reduce unobserved heterogeneity, we avoid including variables that may capture mechanisms through which maternal employment affects families.

In particular, in our main specifications, we do not include current family income or current child care arrangements as right hand side variables since these factors may be critical mechanisms through which maternal employment affects family outcomes. In alternative

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<sup>7</sup> These latter two sets of variables, particularly those measured when the child is 1 month old, may be endogenous to the return-to-work decision. Thus, we interpret findings from these two models with caution.

specifications, however, we do include these variables in order to gauge how much of the effect of employment on family outcomes is operating through income and child care arrangements. Income is likely to be the primary route (although probably is not the only route) through which maternal employment improves family outcomes; including a control for family income thus may exacerbate any negative effects of maternal employment that may exist. In the case of child care, one possibility is that the use of child care improves family outcomes, if child care is a positive experience for children and their parents – in this case, including controls for child care would, like income, worsen any negative effects of maternal employment that may exist. If child care causes stress and difficulties for children and parents, however, including controls for child care may actually reduce any estimated negative effects of maternal employment on outcomes.

A fourth empirical issue is the possibility that the effect of maternal employment varies by family characteristics. Following the literature on maternal employment and children, we estimate models on the following sub-samples: mothers who are living in poverty at baseline vs. mothers who are not; mothers with less than 16 years of education vs. college educated mothers; mothers living in poverty at baseline vs. mothers not living in poverty at baseline; and married vs. unmarried mothers. Since the SECC did not over-sample disadvantaged or minority populations, our samples sizes are small for some of these analyses, and we cannot examine effects for racial/ethnic sub-samples.

#### **B. Effects of maternal employment on family outcomes during the first 4.5 years of life**

Next, we move to examining whether the effects of maternal employment on family outcomes persist during early childhood. To do so, we use pooled data from Phases I and II of the SECC, which include information collected when the children were 1 month to 54 months

old. Here, we examine effects of lagged maternal work hours only, and do not consider other work characteristics, due to data availability.

We estimate dynamic panel data models which account for individual fixed effects, as well as the strong degree of persistence in maternal health and parenting outcomes during the first 4.5 years of children's lives. This persistence may be due to true state dependence (e.g., stock of maternal health and parenting capital evolves slowly over time) and/or to unmeasured factors (e.g. genetics) (Contoyannis, 2004). To account for this persistence, our models include a lagged dependent variable on the right hand side, as seen below in Equation (1'). In equation 1',  $y_{it}$  represents the  $i$ th family's health/parenting outcomes at time  $t$ ,  $y_{it-1}$  is a lagged dependent variable measured 3 months prior to  $t$ ,  $\mathbf{X}$  is a vector of time-varying covariates,  $\mathbf{W}$  is a lagged measure of maternal employment measured 3 months prior to  $t$ ,  $v$  represents unmeasured family/maternal characteristics that affect  $y$ ,  $\varepsilon$  is a random error term, and  $\alpha$ ,  $\beta$ , and  $\delta$  are parameters to be estimated.

$$(1') y_{it} = y_{it-1}\delta + \mathbf{X}_{it}\alpha + \mathbf{W}_{it-1}\beta + v_i + \varepsilon_{it}$$

In the case of the maternal overall health outcome, we draw on unusually rich data. Maternal overall health, maternal employment information and some critical time-varying factors (household size, whether the father lives in the household) are reported by mothers about every 3 months from the 1 month to the 54 month interviews. We emphasize that the frequency of the data collection for this outcome reduces the likelihood of confounding by unmeasured time-varying factors, but increases the likely degree of state dependence in the maternal health outcome. For other outcomes (depression, parenting stress, quality of parenting), we draw on data that is available at the 1, 15, 24, 36, and 54 month interviews. Confounding by time-varying unmeasured factors is of greater concern in these models.

To estimate Eq. 1', we use Arellano-Bond (A-B) difference GMM methods (Arellano & Bond, 1991). These methods are well-suited for our case in which we have: (1) individual fixed effects; (2) a lagged dependent variable on the right hand side; and (3) a large N and a small t. A-B methods address the problem that lagged health/parenting (on the right hand side of Eq. 1') is correlated with the error term once the equation is first-differenced to remove the individual fixed effect. The A-B approach involves instrumenting for the difference between lagged and current health/parenting using deeper lagged measures of health/parenting. In our application, we also need to instrument for lagged work hours, which are predetermined in Equation 1' but become endogenous to the model when we take the first difference. We use the one-step version of the A-B estimator which generates robust standard errors, and we report results from tests for first and second order autocorrelation, and from Hansen's J test of overidentification.

## **V. Results**

We begin the formal analysis with an examination of the effects of maternal work hours measured at the 3 month interview on the five different maternal mental health and parenting outcomes measured when the child is six months old. Table 3a shows results for the full sample, where mothers who are employed but are on leave at 3 months have zero work hours and thus are combined in the baseline category with mothers who are not employed. Table 3b shows results for the employed sample, where mothers with zero work hours at 3 months are all employed but on leave from their jobs. In both tables, the dependent variables are listed in the rows. Column 1 shows estimates from the most parsimonious specification. The models in the columns labeled 2 through 6 incrementally add covariates as indicated in the bottom rows of the table. For continuous outcomes, we show estimated coefficients and T-statistics from OLS

models, and for dichotomous outcomes, we show average marginal effects and T-statistics from probit models.

The first row of estimates in Tables 3a and 3b pertain to the log CES-D score. For both the full and the employed samples, lagged hours of work are associated with increases in depressive symptoms. While the magnitude varies some according to the other included covariates, all coefficients are positive and statistically significant at the 5 percent level in a two-tailed test. The coefficients indicate that on average, an increase in weekly work hours of 10 hours is associated with an increase in the depression score in the range of 3 to 7 percent among the full sample, and a similar range of 6 to 9 percent for the employed sample. These are relatively small effects, given that a 10 hour increase corresponds to about a 40 percent increase in work hours among employed mothers (lagged work hours among employed mothers at the 6 month interview was about 25 hours per week).

Moreover, increases in work hours do not move mothers over the indicator threshold for depression unless current child care arrangements are included as covariates and the full sample is used for estimation (Tables 3a and 3b). Columns 5 and 6 in Table 3a show that after the indirect effect of child care arrangements is netted out of the total effect, increased work hours have a detrimental effect on maternal mental health, as indicated by an increased probability of being over the CES-D threshold score of 16. The magnitude of this effect implies that a ten hour increase in work hours on average increases the likelihood of depression by .02 in the both samples, which is about a 12 percent increase at the sample mean for depression of 17% in the full sample (Columns 5 and 6, Table 3a).

But what this finding also indicates is that that at least some forms of child care have a protective effect on maternal mental health – adjusting for other factors, the results show that



using center-based child care and having a grandparent care for the child, relative to care by the mother, both are associated with reductions in depressive symptoms at the 6 month interview (results not shown). However, as we argue above, the effect we are most interested in is the total effect of work hours on the outcomes, not the effect of working net of the mechanisms. The models that exclude child care represent the total effect of hours on the depression indicator, which includes the direct effect of working on health, as well as the indirect effects of child care arrangements and income (which is determined by work hours) on health.

For the full sample, Table 3a shows that overall health, parenting stress, and parenting quality are all unaffected (statistically) by increases in maternal work hours. These insignificant results persist regardless of the other included variables. However, these results likely reflect the averages of two groups of women, those who work and those who do not. Among employed mothers, in fact, we find that hours worked is positively associated with self-reported parenting stress at 6 months (Table 3b). However, this stress apparently does not translate into poorer parenting based on objective measurements, as increased work hours are not statistically associated with the parenting quality (maternal sensitivity) score at 6 months (Tables 3a-b).

We also estimated the models shown in Tables 3a-b using sub-samples of mothers who were college educated, not college educated, married at the 1 mo. interview, not married at the 1 mo. interview, living in poverty at the 1 mo. interview and not living in poverty at the 1 mo. interview (results not shown). Some of these samples are small, but the general pattern of findings suggests that the negative effects of work hours on depression and parenting stress are driven by effects among married mothers, and they hold for both college and not college educated mothers. The sub-sample analyses indicate that after including controls for income and

child care, work hours detract from parenting quality in the not college educated and the not poor samples, but not in the college educated or the poor samples.

In Table 4, we show results from ordered probit models in which we examine the effects of maternal work hours on self-rated overall health of mothers measured at 6 months. The findings suggest that in the full sample, which includes both working and non-working mothers, there are no effects of work hours at 3 months on maternal overall health at 6 months. However, among mothers who are employed or on leave at 6 months, higher work hours at 3 months is associated with a reduction in overall health. This effect is small in magnitude – a 10 hour increase in work hours at 3 months (about a 40 percent increase) is associated with a 2 percent reduction in the probability of being in excellent health, and a 2 percent increase in the probability of being in good health.

In the appendix, we show results from models in which we use alternative definitions of work hours, and results from models in which we examine characteristics of work at 6 months. Rather than use the number of weekly hours worked at the 3 month interview, in Appendix Table 1 we use 1) the average hours per week worked over the child's life (i.e. in the first 6 months); 2) the average weekly hours reported in the one month and three month interviews; and 3) three indicator variables for the categories of working 1 to 20 hours per week at last interview, working 21 to 39 hours per week at last interview, and working at least 40 hours per week at last interview. The models shown in these tables use the same set of covariates used in column 3 of Tables 3a and 3b. We use this specification because it includes the most complete set of covariates, while still providing an estimate of the total effect of work hours on the outcomes.

The results in Appendix Table 1 are similar to those in the previous tables, where more hours of work are associated with higher CES-D scores. However, we learn from this table that

the effect is driven by, and is concentrated among, women working 40 or more hours at the three month interview. Mothers who work 40+ hours when their infants are 3 months old have depressive symptoms score that are 16 to 22 percent higher than other mothers, after adjusting for other factors (Appendix Table 1). This increase in depressive symptoms, however, does not translate into an increase in the likelihood of having a CES-D score greater than 16 (Appendix Table 1). The probability of being in poor health is not associated with work hours, nor is the parenting quality score. Parenting stress, however, is increasing with hours of work among women in the employed sample. Women who work any of the categories of hours (1-20, 21-39 and 40+) at 3 months report more stress relative to their employed counterparts who are on leave and working zero hours at 3 months (Panel B, Appendix Table 1). This result does not hold in the corresponding model using the full sample (Panel A, Appendix Table 1).

Appendix Table 2 shows the effects of different job characteristics on the maternal health and parenting outcomes among the sample of employed women. The job characteristics considered are: whether flexible hours are available, whether the job requires overnight travel, whether the mother works non-standard hours, and whether the mother works from home 10 hours or more a week. We interpret these findings with caution since these characteristics are measured at 6 months (the mothers did not provide information on flexible hours and overnight travel at the 3 month telephone interview). Two findings are notable. First, more hours of work at 3 months are still associated with more depressive symptoms and parenting stress at 6 months, even when controls for work characteristics are included in the model. Second, although flexible hours and overnight travel are not statistically associated with any of the health and parenting outcomes, non-standard work hours are associated with increases in depressive symptoms of 16 to 18 percent, as well as increases in the parenting stress index. The ability to work from home

at least 10 hours per week is associated with a reduction of in the probability of being in fair or poor health, although the size of this effect appears to be implausibly large.

To summarize, the results thus far demonstrate that work hours, particularly full-time work hours, at 3 months have adverse effects on maternal depressive symptoms, parenting stress, and overall maternal health measured at 6 months. But these effects do not appear to have clinical ramifications since work hours are not associated with the quality of parenting (as measured by a trained observer) or dichotomous indicators of depression and fair/poor health.

The next question to ask is if these detrimental effects persist when we examine the child's first 4.5 years of life (1 mo. – 54 mo. interview). In Table 5, we present two sets of findings estimated using a sample that pools data from the 1 month to the 54 month interviews. The first set of findings are estimates from standard OLS models with robust standard errors adjusted for clustering on respondent id. These models are based on our preferred specification (column 3 in Tables 3a-b) but they also include a lagged version of the dependent variable as a covariate. The obvious drawback of these models is omitted variables bias - the individual fixed effect may be directly related to the health/parenting outcome, as well as correlated with right hand side variables, including lagged work hours. The next set of findings show the A-B estimates. In these models, we account for both state dependence as well as unobserved heterogeneity, and we treat the dependent variables as continuous in all cases.

In Table 5, two findings are notable. First, for all outcomes, the pooled OLS models show strong state dependence. However, once the individual fixed effect is acknowledged in the A-B model, state dependence is no longer apparent in the log CES-D, parenting stress, and parenting quality outcomes. In the case of the depressed, poor/fair health, and overall health outcomes, state dependence still exists, but its importance is diminished considerably once fixed

effects are considered. Second, there is no evidence that the detrimental effects of maternal employment we observed at the 6 month interview persist during early childhood. In fact, more maternal work hours is associated with reductions in parenting stress, perhaps because mothers find combining work and child care satisfying once children grow older. More maternal work hours is associated with lower overall health, but the magnitude of this effect appears to be small, and we find no effect of work hours on the likelihood of being in fair/poor health.

As expected, we reject the null of zero autocorrelation in the test for order 1 autocorrelation. We fail to reject order 2 autocorrelation in all models except the parenting stress model. This result suggests no autocorrelation in the original error term in any of the models aside from the parenting stress model. We fail to reject the overidentifying assumptions in all models except parenting stress and log CES-D. Overall, then, the A-B model appears appropriate in all models except for parenting stress, and we have some concern about the identifying assumptions in the CES-D model as well.

## **VI. Conclusions**

Prior work on the effects of maternal employment has focused on child outcomes. In this paper, we add to the literature by examining effects of maternal work on maternal health and parenting outcomes. We find that among employed mothers, work hours measured when infants are about 3 months old are positively associated with depressive symptoms and parenting stress, as well as a small decline in self-reported overall health, measured when infants are about 6 months old. The effects on depression are driven by mothers who are working full-time at 3 months post-childbirth, while for parenting stress, any level of work hours at 3 months is associated with adverse effects. The only work characteristic that appeared to affect outcomes

was alternate shift work, which is associated with more depressive symptoms and parenting stress at 6 months.

However, these detrimental effects do not persist as children get older. During the first 4.5 years of children's lives as a whole, more work hours is not associated with depression, and has very small detrimental effects on maternal overall health. If anything, more maternal work hours reduces parenting stress during the first 4.5 years.

These findings are consistent with those of Brooks-Gunn et al. 2010, who use structural equation modeling and data from the SECC to assess the effects of first-year maternal employment on children's outcomes up to age 7. They find that there are both negative and positive effects of maternal employment on children's cognitive, social, and emotional outcomes, but the net effect on children is zero (Brooks-Gunn et al., 2010). We find that for maternal health and parenting outcomes, full-time maternal employment at 3 months detracts from mothers' health and increases stress at 6 months post childbirth. These effects are unlikely to have long-term effects on families since (1) maternal employment affects depressive symptoms, but does not affect the CES-D threshold for a likely clinical case of depression; (2) the effects on maternal overall health are statistically significant, but small in magnitude; and (3) self-reported parenting stress is affected, but objective measurement of parenting quality is not affected. Moreover, when the first 4.5 years post-childbirth are considered as a whole, there is no pattern of negative effects of maternal employment on maternal health and parenting.

However, the results still suggest that the transition back into employment immediately after childbirth is difficult for the average family, detracting from maternal health and increasing self-reported parenting stress. These findings emphasize the need for parental leave policies that

allow new parents to take longer leave, and/or work fewer hours in the first few months after childbirth.

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<b>TABLE 1: DESCRIPTIVE STATISTICS, 6 MO. SAMPLE (N = 1,198)</b>				
<i>Maternal health and Parenting at 6 months</i>	mean	SD	min	max
CES-D score	8.87	8.19	0.50	52.00
Depressed	0.17	0.37	0.00	1.00
Overall health rating (1 = poor, 2 = fair, 3 = good, 4 = excellent)	3.31	0.68	2.00	4.00
Overall health is poor or fair	0.12	0.33	0.00	1.00
Parenting stress score	50.06	9.80	26.00	83.00
Parenting quality score (maternal sensitivity)	9.24	1.78	3.00	12.00
<i>Maternal Employment and Family Income</i>				
Mother is employed (either working or on leave) (6 mos.)	0.64	0.48	0.00	1.00
Current weekly hours (6 mos.)	21.21	19.15	0.00	122.00
Average hours in child's life (1 mo., 3 mo., & 6 mo.)	13.53	12.75	0.00	103.33
Average weekly hours over two prior assessments (1 mo. & 3 mo.)	9.69	11.34	0.00	94.00
Currently works 1 to 20 hours weekly	0.15	0.36	0.00	1.00
Currently works 21 to 39 hours weekly	0.17	0.37	0.00	1.00
Currently works 40+ hours weekly	0.33	0.47	0.00	1.00
Current weekly hours among employed mothers (6 mos.) (n = 772)	32.90	13.56	0.00	122
Average hours in child's life (1 mo., 3 mo., & 6 mo.)	20.32	10.71	0.33	103.3
Average weekly hours two prior assessments among employed (1 mo. & 3 mo.) (n = 772)	14.03	11.34	0.00	94
Currently works 1 to 20 hours weekly, employed mothers (n = 772)	0.23	0.42	0.00	1.00
Currently works 21 to 39 hours weekly, employed mothers (n = 772)	0.26	0.44	0.00	1.00
Currently works 40+ hours weekly, employed mothers (n = 772)	0.51	0.50	0.00	1.00
Mother's work hours are completely or fairly flexible, employed mothers (n = 772)	0.64	0.48	0.00	1.00
Mother works evening, night, or variable shifts, employed mothers (n = 772)	0.22	0.42	0.00	1.00
Mother's work involves any overnight travel, employed mothers (n = 772)	0.18	0.39	0.00	1.00
Mother can work from home 10+ hours weekly, employed mothers (n = 772)	0.12	0.33	0.00	1.00
Total family income in dollars, 6 mo.	49340.58	39381.26	2500.00	315000.00

Total family income in year prior to birth of child	52391.49	39279.10	2500.00	275001.00
<i>Initial Health &amp; Wellbeing of Family</i>				
CES-D score, 1 mo.	11.13	8.85	0.50	53.00
Depressed, 1 mo.	0.24	0.43	0.00	1.00
Overall health rating (1 = poor, 2 = fair, 3 = good, 4 = excellent), 1 mo.	3.48	0.58	2.00	4.00
Overall health is poor or fair (1/0), 1 mo.	0.04	0.20	0.00	1.00
Parenting stress score, 1 mo.	53.14	10.65	27.00	94.00
Health complications during pregnancy	0.32	0.47	0.00	1.00
Child was low birth-weight (<=2500 grams)	0.02	0.15	0.00	1.00
Child was premature (<=37 weeks)	0.04	0.19	0.00	1.00
Mother smoked during pregnancy	0.23	0.40	0.00	1.00
Mother smoked during pregnancy missing	0.08	0.27	0.00	1.00
<i>Maternal Characteristics</i>				
Age	28.42	5.54	18.00	46.00
Education in years	14.37	2.47	7.00	21.00
Standardized PPVT score, 36 mos.	99.54	17.15	40.00	159.00
PPVT score missing	0.10	0.30	0.00	1.00
Non-Latino white	0.82	0.38	0.00	1.00
African-American	0.12	0.32	0.00	1.00
Latino	0.04	0.20	0.00	1.00
Other race	0.06	0.25	0.00	1.00
Total household size, 1 mo.	4.05	1.28	2.00	14.00
Married, 1 mo.	0.80	0.40	0.00	1.00
Lives with a partner, 1 mo.	0.08	0.27	0.00	1.00
Single or other family structure, 1 mo.	0.12	0.32	0.00	1.00
<i>Occupation prior to birth of child</i>				
Executive, administrative, managerial	0.09	0.28	0.00	1.00
Professional	0.21	0.41	0.00	1.00
Technical or related support	0.04	0.19	0.00	1.00

Sales	0.10	0.30	0.00	1.00
Administrative support or clerical	0.22	0.42	0.00	1.00
Private household	0.01	0.10	0.00	1.00
Protective service	0.003	0.05	0.00	1.00
Service	0.11	0.32	0.00	1.00
Farm operation or management	0.003	0.06	0.00	1.00
Mechanic operator, assembler, inspector	0.01	0.07	0.00	1.00
Machine operator, assembler, inspector	0.04	0.19	0.00	1.00
Transportation or material moving	0.003	0.06	0.00	1.00
Handler, equipment cleaner, helper, laborer	0.01	0.10	0.00	1.00
Occupation missing	0.16	0.37	0.00	1.00
<i>Child characteristics</i>				
Female child	0.49	0.50	0.00	1.00
Second born	0.35	0.48	0.00	1.00
Third born	0.14	0.35	0.00	1.00
Fourth born or higher birth order	0.06	0.23	0.00	1.00
<i>Child care arrangements at 6 mos.</i>				
Child care center, 10+ hours week	0.09	0.29	0.00	1.00
Child care home, 10+ hours week	0.22	0.42	0.00	1.00
Father, 10+ hours per week	0.13	0.34	0.00	1.00
Grandparent, 10+ hours per week	0.11	0.31	0.00	1.00
In-home caregiver, 10+ hours per week	0.09	0.28	0.00	1.00
Multiple arrangements, 10+ hours per week	0.17	0.37	0.00	1.00
<i>Maternal Beliefs</i>				
Progressive beliefs about child-rearing, 1 mo.	32.78	3.52	18.00	40.00
Beliefs about benefits of maternal employment, 1 mo.	19.18	3.16	5.00	30.00
Commitment to work, 1 mo.	21.20	5.85	6.00	36.00

**TABLE 2: MEANS BY WEEKLY WORK HOURS AT 6 MOS., 6 MO. SAMPLE (N = 1,198)**

	0 HOURS n = 428	1-20 HOURS n = 181	21-39 HOURS n = 198	40+ HOURS n = 391
CES-D score	10.37	7.30***	7.77***	8.50***
Depressed	0.22	0.13***	0.12***	0.15***
Overall health rating (1 = poor, 2 = fair, 3 = good, 4 = excellent)	3.19	3.44***	3.37***	3.33***
Overall health is poor or fair	0.18	0.08***	0.12**	0.09***
Parenting stress score	51.78	49.31***	49.63***	48.74***
Parenting quality score (maternal sensitivity)	9.01	9.75***	9.39***	9.18
Current weekly hours (6 mos.)	0.00	13.32***	31.23***	42.99***
Average hours in child's life (1 mo., 3 mo., & 6 mo.)	1.28	8.16	18.75	26.78
Average weekly hours over two prior assessments (1 mo. & 3 mo.)	1.92	5.57	12.50	18.68
Total family income in dollars, 6 mo.	37739.50	50870.18***	56553.04***	57679.03***
Total family income in year prior to birth of child	45846.98	53549.73**	58863.64***	55741.69***
CES-D score, 1 mo.	12.76	9.73***	10.05***	10.54***
Depressed, 1 mo.	0.31	0.19***	0.22**	0.21***
Overall health rating (1 = poor, 2 = fair, 3 = good, 4 = excellent), 1 mo.	3.37	3.57***	3.56***	3.52***
Overall health is poor or fair (1/0), 1 mo.	0.09	0.01***	0.03***	0.02***
Parenting stress score, 1 mo.	54.16	52.59*	53.38**	52.16***
Health complications during pregnancy	0.33	0.32	0.31	0.33
Child was low birth-weight (<=2500 grams)	0.02	0.02	0.03	0.02
Child was premature (<=37 weeks)	0.03	0.03***	0.04**	0.05*
Mother smoked during pregnancy	0.28	0.16	0.20	0.22
Mother smoked during pregnancy missing	0.09	0.06	0.06	0.10
Age	27.72	29.06***	28.82**	28.70***
Education in years	13.75	14.93***	14.82***	14.56***
Standardized PPVT score, 36 mos.	97.55	103.44***	100.30*	99.54*
PPVT score missing	0.12	0.07*	0.08	0.10
Non-Latino white	0.76	0.91***	0.82	0.84***

African-American	0.17	0.06***	0.12*	0.08***
Latino	0.04	0.02	0.04	0.05
Other race	0.07	0.04	0.07	0.07***
Total household size, 1 mo.	4.30	4.14	3.67***	3.93***
Married, 1 mo.	0.73	0.88	0.83	0.83
Lives with a partner, 1 mo.	0.11	0.05**	0.06**	0.06**
Single or other family structure, 1 mo.	0.16	0.07***	0.11*	0.10**
Executive, administrative, managerial	0.04	0.06	0.09**	0.15***
Professional	0.11	0.34***	0.29***	0.20***
Technical or related support	0.02	0.03	0.07***	0.04**
Sales	0.08	0.14**	0.12	0.10
Administrative support or clerical	0.16	0.19	0.20	0.32***
Private household	0.01	0.01	0.01	0.01
Protective service	0.00	0.00	0.00	0.01
Service	0.13	0.13	0.13	0.08***
Farm operation or management	0.00	0.01	0.01	0.00
Mechanic operator, assembler, inspector	0.00	0.00	0.01	0.01
Machine operator, assembler, inspector	0.04	0.01**	0.04	0.05
Transportation or material moving	0.01	0.00	0.00	0.00
Handler, equipment cleaner, helper, laborer	0.02	0.00*	0.00*	0.01
Occupation missing	0.38	0.09***	0.04***	0.02***
Child care center, 10+ hours week	0.02	0.02	0.15***	0.17***
Child care home, 10+ hours week	0.06	0.10**	0.32***	0.41***
Father, 10+ hours per week	0.03	0.19***	0.18***	0.20***
Grandparent, 10+ hours per week	0.04	0.09***	0.22***	0.14***
In-home caregiver, 10+ hours per week	0.02	0.10***	0.12***	0.14***
Multiple arrangements, 10+ hours per week	0.05	0.18***	0.28***	0.22***
Progressive beliefs about child-rearing, 1 mo.	32.30	33.09**	33.07***	33.01***
Beliefs about benefits of maternal employment, 1 mo.	18.32	18.19	19.89***	20.21***



Commitment to work, 1 mo.	20.27	20.06	21.70***	22.48***
Mother's work hours are completely or fairly flexible, employed mothers	N/A	0.80	0.61	0.58
Mother works evening, night, or variable shifts, employed mothers	N/A	0.39	0.23	0.14
Mother's work involves any overnight travel, employed mothers	N/A	0.08	0.21	0.22
Mother can work from home 10+ hours weekly, employed mothers	N/A	0.17	0.11	0.11

NOTES: (1) The zero hours category includes 2 respondents who are employed but are on leave at the time of the 6-month interview; (2) T-tests performed on equality of means for each work hour category (1-20, 21-39, 40+) versus the 0 hour category; (3) \* denotes statistically significant difference at the .10 level, \*\* denotes statistically significant difference at the .05 level and \*\*\* denotes statistically significant difference at the .01 level; (4) T-tests not conducted for the maternal work characteristics variables since only employed mothers responded to these questions

<b>Table 3a: Effect of maternal work hours at 3 mos. on maternal health and parenting measured at 6 mo. wave – Full sample</b>						
Model #	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:						
Log CES-D score	0.003	0.004	0.004	0.004	0.007	0.007
	3.95	4.09	3.50	3.08	1.97	1.90
Depressed (0/1)	0.0004	0.0006	0.0006	0.0006	0.002	0.002
	0.78	1.38	1.48	1.27	2.06	1.96
Overall health is poor/fair (0/1)	-0.0002	-0.0004	0.0006	-0.0002	-0.002	-0.001
	-0.72	-1.04	-0.79	-0.42	-1.88	-1.77
Parenting stress score	-0.001	0.002	0.002	0.004	0.007	0.009
	-0.050	0.02	0.20	0.39	0.51	0.64
Parenting quality score	-0.001	-0.002	-0.001	-0.002	-0.005	-0.005
	-0.23	-0.52	-0.39	-0.50	-1.13	-1.17
Covariates:						
Standard set of covariates	X	X	X	X	X	X
Maternal occupation and family income in year prior to childbirth		X	X	X	X	X
Family structure, maternal work commitment, and maternal beliefs about childrearing and benefits of work, measured at 1 mo.			X	X	X	X
Current family income				X		X
Current child care arrangements					X	X

Notes: (1) Table shows estimates from OLS and probit models (for 0/1 dependent variables) with Huber-White standard errors adjusted for clustering on site; (2) Table shows estimated coefficient (OLS models) or average marginal effect (probit models) and T-stat on maternal weekly work hours measure, measured at 3 mo. telephone interview; (3) Standard set of covariates includes: log CES-D at 1 mo., overall health at 1 mo., parenting stress at 1 mo., maternal age in years, maternal education in years, household size at 1 mo., maternal PPVT reading score, maternal reading score missing (1/0), maternal race/ethnicity (black, other race vs. white, Latino vs. non-Latino), dummy indicators for birth order of child (second, third, fourth or higher vs. firstborn), child was low birthweight (1/0), child was premature (1/0), pregnancy complications (1/0), mother smoked during pregnancy (1/0), mother smoked during pregnancy missing (1/0), dummy indicators for site, and dummy indicators for child birth month; (4) N = 1,198

<b>Table 3b: Effect of maternal work hours at 3 mos. on maternal health and parenting measured at 6 mo. wave – Employed sample</b>						
Model #	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:						
Log CES-D score	0.006	0.006	0.006	0.006	0.009	0.009
	3.43	2.96	2.75	2.51	2.00	1.94
Depressed (0/1)	0.001	0.001	0.0004	0.0004	0.002	0.002
	1.04	0.85	0.62	0.66	1.75	1.74
Overall health is poor/fair (0/1)	0.0001	-0.00003	0.0005	0.001	-0.0005	-0.0005
	0.30	-0.09	0.34	0.47	-0.86	-0.81
Parenting stress score	0.030	0.027	0.030	0.032	0.029	0.031
	3.00	2.66	2.94	3.13	1.90	1.99
Parenting quality score	-0.002	-0.002	-0.001	-0.001	-0.005	-0.005
	-0.42	-0.35	-0.21	-0.26	-0.86	-0.89
Covariates:						
Standard set of covariates	X	X	X	X	X	X
Maternal occupation and family income in year prior to childbirth		X	X	X	X	X
Family structure, maternal work commitment, and maternal beliefs about childrearing and benefits of work, measured at 1 mo.			X	X	X	X
Current family income				X		X
Current child care arrangements					X	X

Notes: (1) Table shows estimates from OLS and probit models (for 0/1 dependent variables) with Huber-White standard errors adjusted for clustering on site; (2) Table shows estimated coefficient (OLS models) and average marginal effect (probit models) and T-stat on maternal weekly work hours measure, measured at 3 mo. telephone interview; (3) Standard set of covariates includes: log CES-D at 1 mo., overall health at 1 mo., parenting stress at 1 mo., maternal age in years, maternal education in years, household size at 1 mo., maternal PPVT reading score, maternal reading score missing (1/0), maternal race/ethnicity (black, other race vs. white, Latino vs. non-Latino), dummy indicators for birth order of child (second, third, fourth or higher vs. firstborn), child was low birthweight (1/0), child was premature (1/0), pregnancy complications (1/0), mother smoked during pregnancy (1/0), mother smoked during pregnancy missing (1/0), dummy indicators for site, and dummy indicators for child birth month; (4) N = 772, mothers from full sample who were employed (working or on leave) at 1 mo. interview.

<b>Table 4: Effect of maternal work hours at 3 mos. on maternal overall health measured at 6 mo. wave</b>			
PANEL A	<i>Mother's self-rating of overall health</i>		
	<i>(3 = excellent, 2 = good, 1 = fair or poor)</i>		
	Ordered Probit Model		
		Full Sample	Employed Sample
	Work hours at 3 months	-0.002 (-1.34)	-0.004 (-2.15)
Cut 1 (se)	0.639 (0.800)	0.626 (1.06)	
Cut 2 (se)	2.30 (0.816)	2.41 (1.09)	
PANEL B	<i>Marginal Effects</i>		
	Full Sample		
Work hours at 3 months			
Health is excellent	-0.001 (-1.34)		
Health is good	0.001 (1.37)		
Health is fair or poor	0.0003 (1.28)		
	Employed Sample		
Work hours at 3 months			
Health is excellent	-0.001 (-2.15)		
Health is good	0.001 (2.19)		
Health is fair or poor	0.0004 (1.99)		

Notes: (1) Panel A shows estimated coefficient and T-statistic on maternal work hour measure from an ordered probit model. T-statistics are based on robust standard errors adjusted for clustering on site. (2) Panel B shows marginal effects and T-statistics. Marginal effects indicate the change in the probability of being in the health category associated with a one hour increase in maternal work hours at 3 months. (3) All models include standard set of covariates described in notes to Table 3 as well as maternal occupation, family income in year prior to childbirth, family structure, maternal work commitment, and maternal beliefs about childrearing and benefits of work.; (4) Full sample N = 1198; Employed sample N = 772, sample limited to respondents who are employed (either working or on leave) at 1 mo.

<b>Table 5: Effects of maternal work hours on maternal health and parenting, 1 mo.- 54 mo.</b>												
	Log CES-D		Parenting stress		Parenting quality		Depressed		Poor/fair health		Overall health rating	
	Pooled OLS	A-B	Pooled OLS	A-B	Pooled OLS	A-B	Pooled OLS	A-B	Pooled OLS	A-B	Pooled OLS	A-B
w(t-1)	0.00003 (0.05)	-0.003 (-1.48)	-0.007 (-1.55)	-0.077 (-3.88)	0.460 (20.38)	-0.001 (-0.20)	-0.0004 (-1.64)	-0.001 (-0.49)	-0.0004 (-2.49)	0.00004 (0.08)	0.0004 (1.16)	-0.002 (-2.89)
y(t-1)	0.538 (34.34)	0.028 (0.69)	0.510 (43.89)	0.034 (0.62)	0.003 (1.57)	0.061 (0.75)	0.340 (16.27)	0.080 (2.24)	0.318 (20.62)	0.066 (4.43)	0.474 (43.64)	0.075 (5.86)
n	5,618	4,169	4,573	3,213	4,371	3,071	5,618	4,169	18,655	16,962	18,655	16,962
# instruments		20		12		15		20		240		240
AR(1) test stat Pr > z		-13.08 (0.00)		-4.28 (0.00)		-6.87 (0.00)		-11.1 (0.00)		-22.48 (0.000)		-26.93 (0.00)
AR(2) test stat Pr > z		1.02 (0.307)		-2.43 (0.015)		-0.05 (0.959)		0.38 (0.706)		-0.46 (0.649)		0.45 (0.655)
Overiden. test		19.79 (0.071)		15.48 (0.009)		8.49 (0.387)		14.65 (0.261)		233.29 (0.272)		211.54 (0.665)

Notes: (1) Table 5 only shows estimated coefficients and T-statistics on lagged work hours and lagged dependent variable. Models also include: whether father is in household, household size, and dummy variables for survey wave – estimated coefficients not shown; (2) In pooled OLS models, robust standard errors adjusted for clustering on respondent are shown; (3) Arellano-Bound estimates generated using one-step, difference A-B estimator with robust standard errors.

Appendix Table 1: Effect of maternal work hours on maternal health and parenting measured at 6 month SECC interview														
OLS Models with alternate measures of maternal employment														
Dependent Variable														
	Log CES-D score			Depressed			Overall health poor/fair			Parenting stress score			Parenting quality score	
Panel A: Full Sample														
Ave hours in child's life	0.004			0.0004			-0.001			-0.012			-0.003	
	2.96			0.77			-1.28			-0.54			-0.58	
Ave hours in prior 2 waves	0.005			0.001			-0.001			0.016			-0.001	
	2.35			1.33			-1.04			0.75			-0.30	
1-20 hours, 3 mo.			0.028			-0.024			-0.021			0.35		0.05
			0.30			-0.43			-0.66			0.44		0.92
21-39 hours, 3 mo.			0.027			-0.022			-0.004			0.53		0.010
			0.25			-0.74			-0.11			0.74		0.06
40+ hours, 3 mo.			0.156			0.013			-0.021			-0.025		-0.027
			3.86			0.75			-1.11			-0.06		-0.14
Panel B: Employed Sample														
Ave hours in child's life	0.007			0.0001			-0.002			0.037			-0.003	
	2.03			0.62			-0.47			1.63			-0.57	
Ave hours in prior 2 waves	0.007			0.0001			-0.0005			0.060			-0.0003	
	1.76			0.86			-1.05			3.17			-0.1	
1-20 hours, 3mo.			0.05			-0.016			-0.026			1.47		-0.005
			0.48			-0.35			-1.06			2.37		-0.05
21-30 hours, 3 mo.			0.07			-0.048			0.02			1.60		0.012
			0.62			-1.50			0.95			2.60		0.05
40+ hours, 3 mo.			0.22			-0.001			-0.009			1.34		-0.035
			2.65			-0.05			-0.76			2.90		-0.14

Notes: (1) Table shows estimated coefficients and T-statistics in parentheses from OLS models with Huber-White standard errors adjusted for clustering on site; (2) Table shows estimated coefficient on maternal work hours measure(s) only. Work hours measures are: average hours per week worked in child's life; Average hours per week in prior two interviews (1 and 3 mos.); Hours worked in prior (3 mo.) interview, 1-20 hrs/wk; Hours worked in prior (3 mo.) interview, 21-39 hrs/wk; Hours worked in prior (3 mo.) interview, 40+ hrs/wk (3) All models include standard set of covariates described in notes to Tables 3a-b as well as maternal occupation, family income in year prior to childbirth, family structure, maternal work commitment, and maternal beliefs about childrearing and benefits of work.; (4) Full sample N = 1198; Employed sample N = 772, sample limited to respondents who are employed (either working or on leave) at 1 mo.

<b>Appendix Table 2: Effect of work characteristics on maternal health and parenting measured at 6 month SECC interview –Employed sample</b>										
	Log CES-D score		Depressed (1/0)		Poor/fair health (1/0)		Parenting stress index		Parenting quality score	
Hours worked per week in prior (3 mo.) interview	0.005		0.000		0.000		0.030		0.000	
	2.450		0.460		0.020		2.840		-0.220	
1-20 hours worked in prior interview		-0.019		-0.022		-0.014		1.152		-0.021
		-0.170		-0.500		-0.520		1.890		-0.370
21-39 hours worked in prior interview		0.051		-0.053		0.026		1.473		0.050
		0.430		-2.030		1.150		2.470		0.610
40+ hours worked in prior interview		0.202		-0.008		-0.013		1.267		-0.031
		2.430		-0.350		-0.810		2.470		-0.340
Flexible hours	-0.014	-0.010	0.008	0.004	-0.028	-0.027	-0.204	-0.272	0.032	0.034
	-0.160	-0.110	0.260	0.140	-1.040	-1.010	-0.410	-0.540	0.590	0.580
Overnight travel	0.020	0.022	-0.006	-0.005	-0.007	-0.007	0.125	0.233	-0.029	-0.028
	0.180	0.210	-0.180	-0.170	-0.260	-0.260	0.200	0.360	-0.500	-0.470
Non-standard hours	0.164	0.178	-0.006	0.000	0.003	0.003	1.498	1.331	0.037	0.039
	2.270	2.150	-0.170	-0.010	0.140	0.150	3.340	2.860	0.710	0.700
Works from home 10+ hrs	0.014	0.016	-0.002	-0.006	-0.066	-0.064	-0.512	-0.489	0.035	0.040
	0.140	0.150	-0.070	-0.190	-2.630	-2.400	-0.720	-0.700	0.460	0.530

Notes: (1) For continuous variables, table shows estimated coefficients and T-statistics in parentheses from OLS models with Huber-White standard errors adjusted for clustering on site; for dichotomous variables, average marginal effect is shown instead of coefficient (2) Table shows estimated coefficient on maternal work hours and job characteristics measure(s) only. (3) All models include standard set of covariates described in notes to Tables 3a-b as well as maternal occupation, family income in year prior to childbirth, family structure, maternal work commitment, and maternal beliefs about childrearing and benefits of work.; (4) N = 772, sample limited to respondents who are employed (either working or on leave) at 1 mo.

