

Effects of early maternal employment on maternal health and well-being

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Abstract This study uses data from the National Institute of Child Health and Human Development Study on Early Child Care to examine the effects of maternal employment on maternal mental and overall health, self-reported parenting stress, and parenting quality. These outcomes are measured when children are 6 months old. Among mothers of 6-month-old infants, maternal work hours are positively associated with depressive symptoms and parenting stress and negatively associated with self-rated overall health. However, maternal employment is not associated with quality of parenting at 6 months, based on trained assessors' observations of maternal sensitivity.

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1 Introduction

Maternal employment has been the norm in the USA since the 1980s. As of 2008, 71 % 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 % of mothers with children under 6 years old and 56 % 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 and Liu 2007).

When mothers reallocate their time from home to market work, however, this shift potentially affects not just the health and well-being of children but also the health and well-being of mothers (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. However, because only child outcomes and not maternal 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 data from phase I of the National Institute of Child Health and Human Development (NICHD) Study on Early Child Care (SECC) to examine the effects of maternal employment on maternal mental and overall health, parenting stress, and parenting quality. 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. Our findings indicate that, among mothers of 6-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. However, maternal employment is not associated with the quality of parenting at 6 months, based on trained assessors' observations of maternal sensitivity.

2 Effects of early maternal employment on maternal outcomes

There has been little attention in the economics literature to the effects of early maternal employment on maternal outcomes; most prior research focuses on children's outcomes. A few recent studies estimate the effect of one aspect of maternal employment—the length of maternity leave—on 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 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 postpartum physical problems. In the US context, Chatterji and Markowitz (2005, 2012) use data from the 1988 National Maternal and Infant Health Survey and the Early Childhood Longitudinal Study—Birth Cohort to examine the association between maternity leave length and maternal health. The findings from these two papers suggest that longer maternity leave (paid and unpaid) is associated with lower levels of maternal depressive symptoms, a lower likelihood of the mother having frequent outpatient visits during the first 6 months after childbirth, and better self-reported overall health.

To our knowledge, only one recent study in economics has focused on the effects of maternal employment on maternal outcomes. Baker et al. (2008) take advantage of a natural experiment in which one Canadian province (Quebec) introduced a comprehensive, highly subsidized child care system. These authors find that the policy change was associated with a rise in child care usage and an increase in maternal employment, as well as 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).

We build on this recent paper by examining similar outcomes 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 two respects. First, we expand the range of outcomes considered by examining the effects of maternal employment on maternal mental health, maternal overall health, parenting stress, and the quality of parenting. Second, we use data from the SECC, the only national data set available that includes detailed information on maternal work hours as well as state-of-the-art measurement of family outcomes, including trained observer assessments of parenting behaviors.

3 The NICHD 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 10 sites across the USA.¹ 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

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

phases, following children and their families from birth until age 15 through telephone and in-person interviews, as well as laboratory-based assessments. This paper is based on data collected from telephone interviews and in-person assessments that were conducted when the child was about 1, 3, and 6 months old.

We analyze maternal 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.

3.1 Maternal outcomes

Depressive symptoms The SECC assessed maternal depression at the 1- and 6-month interviews using the 20-item Center for Epidemiologic Studies Depression Scale (CES-D), which is used to measure depressive symptoms in the past week in nonclinical populations. The CES-D 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 four-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” (0 point), “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.

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.² The dichotomous measure is a dummy variable indicating whether or not the respondent’s CES-D score is equal to or exceeds 16. Although we refer to this indicator as “depressed,” 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 % of the sample crosses the threshold for depression at the time of the 6-month interview (Table 1). Mothers who are employed at 6 months have appreciably lower CES-D scores and rates of depression compared to mothers who are not employed at 6 months (Table 1). The rate of depression among full-time

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

employed mothers at 6 months is 15 vs. 22 % among mothers who were not employed at 6 months (Table 1).³

Overall health At the 1-, 3-, and 6-month interviews, SECC mothers rated their own health, 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 dichotomous indicator that equals 1 if the mother reports her health in general is fair or poor. At the 6-month interview, 12 % of mothers report poor or fair health (Table 1). Employed mothers at 6 months have lower rates of poor/fair health compared to mothers who are not employed at 6 months—for example, 9 % of full-time employed mothers report poor or fair health at 6 months compared to 18 % of mothers who are not employed at 6 months (Table 1). This pattern is true of poor health measured at the 1-month interview as well (results not shown).

Parenting stress At the 1- 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.” Higher scores indicate a greater degree of parenting stress. Table 1 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 (results not shown).

Maternal sensitivity Maternal sensitivity is measured using trained observers’ ratings of videotapes of mothers’ behavior toward their children in semi-structured play situations. 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, and the mother’s supportive presence, and hostility (reverse scored). Higher scores indicate higher degree of sensitivity to the child. Table 1 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.

³Rates of depression at the 1-month interview are lower for employed vs. not employed mothers as well. A full set of descriptive statistics is shown in Chatterji et al. (2011).

Table 1 Means by weekly work hours at 6 months ($n = 1,198$)

	Mean (SD)	0 h, $n = 428$	1–20 h, $n = 181$	21–39 h, $n = 198$	40+ h, $n = 391$
Maternal health and parenting at 6 months					
CES-D score	8.87 (8.19)	10.37	7.30*	7.77*	8.50*
Depressed	0.17	0.22	0.13*	0.12*	0.15*
Overall health rating (1 = poor, 2 = fair, 3 = good, 4 = excellent)	3.31 (0.68)	3.19	3.44*	3.37*	3.33*
Overall health is poor or fair	0.12	0.18	0.08*	0.12**	0.09*
Parenting stress score	50.06 (9.80)	51.78	49.31*	49.63*	48.74*
Parenting quality score (maternal sensitivity)	9.24 (1.78)	9.01	9.75*	9.39*	9.18
Maternal employment					
Mother is employed (either working or on leave) (6 months)	0.64				
Current weekly hours (6 months)	21.21 (19.15)	0.00	13.32*	31.23*	42.99*
Currently works 1 to 20 h weekly	0.15				
Currently works 21 to 39 h weekly	0.17				
Currently works 40+ h weekly	0.33				
Mother's work hours are completely or fairly flexible, employed mothers ($n = 772$)	0.64	N/A	0.80	0.61	0.58
Mother works evening, night, or variable shifts, employed mothers ($n = 772$)	0.22	N/A	0.39	0.23	0.14
Mother's work involves any overnight travel, employed mothers ($n = 772$)	0.18	N/A	0.08	0.21	0.22
Mother can work from home 10+ h weekly, employed mothers ($n = 772$)	0.12	N/A	0.17	0.11	0.11

Table 1 (continued)

	Mean (SD)	0 h, <i>n</i> = 428	1–20 h, <i>n</i> = 181	21–39 h, <i>n</i> = 198	40+ h, <i>n</i> = 391
Basic demographic characteristics					
Age	28.42 (5.54)	27.72	29.06*	28.82**	28.70*
Education in years	14.37 (2.47)	13.75	14.93*	14.82*	14.56*
Non-Latino white	0.82	0.76	0.91*	0.82	0.84*
African-American	0.12	0.17	0.06*	0.12***	0.08*
Latino	0.04	0.04	0.02	0.04	0.05
Other race	0.06	0.07	0.04	0.07	0.07*
Married, 1 month	0.80	0.73	0.88	0.83	0.83

The 0-h category includes two respondents who are employed but are on leave at the time of the 6-month interview. *t* tests performed on equality of means for each work hour category (1–20, 21–39, 40+) vs. the 0-h category. *t* tests not conducted for the maternal work characteristics variables since only employed mothers responded to these questions

* $p < .01$ (statistically significant difference); ** $p < .05$ (statistically significant difference); *** $p < .10$ (statistically significant difference)

3.2 Maternal employment

The primary maternal work measure of interest is the number of hours per week the mother worked at the 3-month interview. In the regression analyses, we use mother's work hours at the 3-month interview divided by 10 so that a 1-unit change in the maternal work variable corresponds to a 10-h per week increase in work hours. We also explore specifications that include the following alternative measures of maternal work hours: (1) the average number of hours per week the mother worked at the 1- and 3-month interviews, divided by 10; (2) the average number of hours per week the mother worked at the 1-, 3-, and 6-month interviews, divided by 10; and (3) a set of dummy indicators for 1 to 20 h per week at the 3-month interview, 21 to 39 h per week at the 3-month interview, and at least 40 h per week at the 3-month interview. We also estimate models that include work hours and work hours squared and models that include dummy indicators for maternal work hours measured in 10-h increments (e.g., mother works 1–10 h, mother works 11–20 h, etc.).

In addition to work hours, employed SECC mothers provided information regarding the following: the number of hours they could work at home, the time of day of their work hours (daytime, evening, night, or varying shifts), 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 the following: (1) the mother could work at least 10 h a week from home, (2) the mother worked a nondaytime shift, (3) the mother's job requires any overnight travel (either less than once a month or more than once a month), and (4) the mother's job is either fairly or completely flexible. The first two characteristics are measured at the 3-month interview, while the latter two are measured at the 6-month interview (since these two questions were not asked at the 3-month interview). When work characteristics are of interest, we limit the sample to employed mothers.

At the 6-month interview, 64 % of mothers were employed or on leave (Table 1), and the average weekly hours among employed mothers were about 33 (results not shown). Among employed mothers at the 6-month interview, 64 % reported flexible hours, 22 % worked alternate shifts, 18 % had overnight travel, and 12 % worked from home at least 10 h per week (Table 1).

3.3 Other covariates

All models include the following measures: mother's age in years, number of years of maternal 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 indicators 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 (2,500 g or less), dummy indicator for premature child (born before 37 weeks of 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,⁴ family income in the year prior to childbirth, current family income, mother's score on a scale measuring the progressivity of child-rearing beliefs measured at 1-month interview, mother's score on a scale measuring work commitment administered at 1-month interview, mother's score on a 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 the household), and dummy indicators for whether the child spends at least 10 h a week in one of six types of child care arrangements (daycare center, child care home, father, grandparent, in-home caregiver, multiple arrangements).⁵ Descriptive statistics related to all of these variables are shown in Tables 1 and 2 in Chatterji et al. (2011).

4 Empirical approach

We begin by estimating Eq. 1 below:

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

In Eq. 1, y_{i6} represents the i th mother's 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 , ε is a random error term, and α and β are parameters to be estimated. As discussed below, lagged employment is used to help reduce the possibility of bias resulting from reverse causality.⁶ For continuous outcomes (e.g., depressive symptoms, parenting quality, parenting stress), we use OLS for estimation of Eq. 1, while we use standard

⁴Professional; 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.

⁵Children 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.

⁶In addition to estimating effects of maternal employment measured at 3 months, we also experiment with models using the average of maternal work hours measured at the 1- and 3-month interviews and at the 1-, 3-, and 6-month interviews. Results are very similar to those presented here.

Table 2 Effect of maternal work hours (measured in 10-h increments) at 3 months on maternal outcomes measured at 6 months

	(1) Full sample	(2)	(3)	(4)	(5)	(6)	(7) Employed sample
Dependent variable							
Log CES-D score	0.03 (3.95)	0.04 (4.09)	0.04 (3.50)	0.04 (3.08)	0.07 (1.97)	0.07 (1.90)	0.06 (2.75)
Depressed (0/1)	0.02 (0.78) [0.004]	0.03 (1.38) [0.01]	0.03 (1.48) [0.01]	0.03 (1.27) [0.01]	0.10 (2.06) [0.02]	0.10 (1.96) [0.02]	0.02 (0.62) [0.004]
Overall health is poor/fair (0/1)	-0.01 (-0.72) [-0.002]	-0.03 (-1.04) [-0.005]	-0.02 (-0.79) [0.006]	-0.01 (-0.42) [-0.002]	-0.10 (-1.88) [-0.02]	-0.09 (-1.77) [-0.01]	0.01 (0.34) [0.01]
Parenting stress score	-0.01 (-0.05)	0.002 (0.02)	0.02 (0.20)	0.04 (0.39)	0.07 (0.51)	0.09 (0.64)	0.30 (2.94)
Parenting quality score	-0.01 (-0.23)	-0.02 (-0.52)	-0.01 (-0.39)	-0.02 (-0.50)	-0.05 (-1.13)	-0.05 (-1.17)	-0.01 (-0.21)
Covariates							
Standard set of covariates	X	X	X	X	X	X	X
Maternal occupation		X	X	X	X	X	X
and family income in year prior to childbirth							
Family structure, maternal work commitment, and maternal beliefs about childrearing and benefits of work, measured at 1 mo.			X	X	X	X	X
Current family income				X			
Current child care arrangements					X	X	

Table shows estimates from OLS and probit models (for 0/1 dependent variables), estimated coefficient, average marginal effect in brackets (probit models), and T statistics in parentheses on maternal weekly work hours (measured in 10-h increments), measured at 3-month telephone interview. T statistics computed from Huber-White standard errors adjusted for clustering on site. Standard set of covariates includes log CES-D at 1 month, overall health at 1 month, parenting stress at 1 month, maternal age in years, maternal education in years, household size at 1 month, 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 birth weight (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. Full sample $n = 1,198$; employed sample $n = 772$; mothers from full sample who were employed (working or on leave) at 1-month interview

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 well-being, β , may be positive or negative. Maternal employment may detract from family well-being by reducing the amount of time mothers spend investing in their families and in their own health and well-being (Cawley and Liu 2007).⁷ 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 β is complicated by several potential problems. First, if families/mothers have unmeasured characteristics (ν) that are correlated with both maternal outcomes (y) and maternal work hours (\mathbf{W}), the estimate of β will be biased. The direction of the bias is uncertain. For example, mothers who work longer hours may tend to have high ability, both in market and nonmarket production. If \mathbf{X} does not adequately capture ability, the estimated coefficient on maternal work hours would represent both the effect of work hours and the likely beneficial effect of maternal ability on maternal outcomes. The opposite direction of bias is possible too, if mothers who work longer hours tend to be of lower SES, and if \mathbf{X} does not completely capture SES. In this case, the estimated coefficient on maternal work hours would capture both the effect of work hours and the likely detrimental effect of low SES on maternal outcomes.

In order to reduce the possibility of this source of bias, we estimate models with unusually rich and extensive sets of control variables. We begin with a specification that includes only predetermined 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 well-being, as well as for maternal ability, which are perhaps the two most likely confounding factors.⁸

⁷Cawley and 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 and Liu 2007). Bianchi (2000) notes that employed mothers sleep fewer hours and spend less time in self-care and leisure time activities compared to nonemployed mothers.

⁸Although 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.

Next, 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 measured when the child was 1 month old. The goal of including these additional characteristics is to further reduce unobserved heterogeneity, but some of these variables are potentially endogenous to the return-to-work decision. For example, mothers may choose occupations before the child was born based on their desired work hours after the child is born. Thus, we interpret findings from these extended models with caution.

In addition to unobserved heterogeneity, a second potential problem that arises in estimating β is reverse causality. Although we seek to estimate the effect of maternal employment on family well-being, causation may run the other way, with mothers changing their employment decisions in response to their health outcomes. For example, mothers may work fewer hours because they are feeling depressed. To address the possibility of reverse causality, we use lagged measures of maternal employment. This reduces but does not eliminate the possibility of this problem, since maternal outcomes such as depression may be chronic and correlated with work across time.

A third empirical issue is the interpretation of the estimate of β . Our interest is in the total effect of maternal employment on maternal outcomes (Gregg et al. 2005). For example, if maternal employment leads to usage of child care and an increase in family income, both of these changes may affect maternal outcomes, and our intention is to capture both pathways with the coefficient on maternal employment. This approach 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 (and they are clearly endogenous). In alternative 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.

Our main findings are based on the full sample of mothers. However, we reestimate all of these models after limiting the sample to mothers who are employed (either working or on leave) at the 1-month interview.⁹ Limiting the sample this way may further reduce unobserved heterogeneity, but it comes with a reduction of power. Also, limiting the sample to employed mothers may

⁹When we estimate models using the full sample of mothers, the baseline category combines mothers who are not employed with mothers who are employed but are on leave. 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.

introduce new endogeneity problems, since maternal leave itself is likely to be endogenous. Therefore, we interpret the findings from the employed sample with caution.

5 Results

The first row of estimates in Table 2 pertains to the log CES-D score. As described above, we focus on the specification shown in columns 1–3, which do not include current family income and child care arrangements. The findings demonstrate that 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 % level in a two-tailed test. The coefficients indicate that on average, an increase in weekly work hours of 10 h is associated with an increase in the depression score in the range of 3 to 4 %. Adding in income and child care arrangements in columns 4–6 increases the magnitude to a range of 4 to 7 %. Nevertheless, these are relatively small effects, given that a 10-h increase corresponds to about a 40 % increase in work hours among employed mothers (lagged work hours among employed mothers at the 6-month interview was about 25 h per week). When compared to our preferred specification in column 3, the effect increases in size and remains statistically significant when we limit the sample to employed mothers in Table 2, column 7.

Increases in work hours do not move mothers over the indicator threshold for depression unless current child care arrangements are included as covariates (Tables 2, columns 5–6). The magnitude of this effect implies that a 10-h increase in work hours on average increases the likelihood of depression by .02 in the full sample, which is about a 12 % increase at the sample mean for depression of 17 % in the full sample. We fail to reject some effects of work hours on depression that are perhaps reasonably sized due to lack of power. In our preferred specification in the full sample (Table 2, column 3), for example, the effect of work hours on depression is not statistically significant, even though the magnitude would suggest that an additional 10 h of work increases the likelihood of depression by a one percentage point (about a 6 % increase at the mean depression rate of 17 %).

Table 2 shows that fair/poor health, parenting stress, and parenting quality are not statistically associated with maternal work hours in the full sample of mothers. However, in the case of fair/poor health in columns 5 and 6, the coefficients are negative and statistically significant at the 10 % level. A negative sign is contrary to our expectations and implies that an increase in work hours is associated with better health. We note that this result only appears in the models that include the potentially endogenous child care variables, and that model is not our preferred specification. Among employed mothers, we find that hours worked is positively associated with self-reported parenting stress at 6 months (Table 2, Column 7). 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.¹⁰

We also estimated the models shown in Table 2 using sub-samples of mothers who were college educated, not college educated, married at the 1 month interview, not married at the 1 month interview, living in poverty at the 1 month interview and not living in poverty at the 1 month interview (results not shown). Some of these samples are small, and we lack power to rule out fairly large effects. The general pattern of findings, however, suggests that the negative effects of work hours on depressive symptoms are driven by effects among married mothers, and mothers with less 16 years of education. The subsample 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.

We also estimated ordered probit models in which we examine the effects of maternal work hours on self-rated overall health of mothers measured at 6 months. These results are available in Chatterji et al. (2011). The findings suggest that in the full sample, which includes both working and nonworking 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, a 10-h increase in work hours at 3 months (about a 40 % increase) is associated with a one percentage point reduction in the probability of being in excellent health, and a one percentage point increase in the probability of being in good health (results not shown).

In Chatterji et al. 2011, 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.¹¹ We learn from these findings that the effect of maternal work hours on depressive symptoms (Table 2, column 3) is driven by mothers working 40 or more hours at the 3-month interview. Mothers who work 40+ h when their infants are 3 months old have depressive symptoms score that are 16 to 22 % higher than other mothers, after adjusting for other factors (results not shown). However, we find mixed evidence that work characteristics affect maternal outcomes. Flexible hours and overnight travel are not statistically associated with any of the health and

¹⁰For continuous outcomes (depressive symptoms, parenting stress, and parenting quality), we also estimated models which included both hours and hours squared. Hours squared was not a statistically significant predictor of outcomes in these models. Results available upon request.

¹¹Rather than using the number of weekly hours worked at the 3-month interview, we use (1) the average hours per week at 1-, 3-, and 6-month interviews; (2) the average hours per week at the 1- and 3-month interviews; and (3) three indicator variables for the categories of working 1 to 20 h per week at last interview, working 21 to 39 h per week at last interview, and working at least 40 h per week at last interview. For all outcomes, we also explore a specification that includes dummy indicators for each 10-h increment of work hours (1–10, 11–20, 21–30, 40+). The advantage of this approach is that we allow for greater flexibility in the effects of work hours on outcomes. The disadvantage is the cell sizes are small in the three categories for those working 30 or fewer hours per week. The general pattern is consistent to what we discuss in the paper already—full-time work (more than 30 h per week) has statistically significant, detrimental effects on depressive symptoms and parenting stress, although the effects on parenting stress exist in the employed sample only.

parenting outcomes, but nonstandard work hours are associated with increases in depressive symptoms of 16 to 18 %, as well as increases in the parenting stress index. The ability to work from home at least 10 h per week is associated with a reduction in the probability of being in fair or poor health, although the size of this effect appears to be implausibly large (results not shown).

6 Conclusions

Prior research indicates that early maternal employment, particularly full-time work, is associated with increases in behavior problems and detracts from school readiness, verbal ability, and test scores among children (Baum 2003; Berger et al. 2005, 2008; Brooks-Gunn et al. 2002; Hill et al. 2005; Waldfogel et al. 2002; Waldfogel 2002; Ruhm 2004, 2008; James-Burdumy 2005; Gregg et al. 2005). Moreover, nonstandard maternal work schedules during the child's first few years are associated with child behavior problems (Daniel et al. 2009; Han 2005). From this paper, we learn that early maternal employment detracts from mothers' outcomes as well. 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 postchildbirth, while for parenting stress, any level of work hours at 3 months is associated with adverse effects. Alternate shift work among employed mothers is associated with depressive symptoms and parenting stress at 6 months.

We caution, however, that we only find effects of maternal work hours on parenting stress and overall maternal health in the employed sample, a sample in which we have concerns about endogeneity, and not in the full sample. Also, we cannot definitively conclude that these effects are casual. Despite the extensive set of controls included in the models, there may still remain unmeasured factors that are associated with both maternal work hours and maternal outcomes, and that confound our estimates of the effects of maternal work hours on outcomes.

The detrimental effects we report in this paper are unlikely to have long-term consequences for 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 increased, but objective measurement of parenting quality is not affected. In sum, our interpretation of the findings is that the transition back into employment immediately after childbirth is somewhat difficult for the average mother, particularly for mothers returning full time. The benefits of longer leave and reduced work hours may be stronger for certain groups of mothers, such mothers with a prior history of depression or mothers lacking social support. We lack adequate data to analyze these kinds of effects. Thus, our

findings suggest that public policies that support longer maternal leave and reduced work hours for mothers of infants will have benefits for mothers themselves, in addition to benefits for children, as prior research suggests.

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