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DOES THE LENGTH OF MATERNITY LEAVE AFFECT MATERNAL HEALTH?

Pinka Chatterji
Sara Markowitz

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ABSTRACT

The objective of this paper is to investigate the impact of the length of maternity leave on maternal health in a sample of working mothers. Two measures of depression and a measure of overall health are used to represent maternal health. Ordinary Least Squares models provide baseline estimates, and instrumental variables models account for the potential endogeneity of the return-to-work decision. The findings suggest that returning to work later may reduce the number or frequency of depressive symptoms, but the length of time before returning to work is not associated with a lower probability of being a likely case of clinical depression. Similarly, there is little evidence that longer maternity leave impacts physical and mental health as measured by frequent outpatient visits during the first six months after childbirth.

Pinka Chatterji
Center for Multicultural Mental Health Research
120 Beacon Street
Somerville, MA 02143
and NBER
pchatterji@charesearch.org

Sara Markowitz
NBER
365 Fifth Avenue, 5th Floor
New York, NY 10016
and Rutgers University
smarkow@andromeda.rutgers.edu

In the United States, 51% of mothers of infants currently work outside of the home (Bureau of Labor Statistics 2003). Among mothers who return to work during the first year after childbirth, almost all return to work by the third month (Klerman and Leibowitz 1994). Given the large number of mothers who are balancing employment with the care of a young infant, there has been increasing interest in researching the effects of maternal employment during infancy on child health and development. Recent studies suggest that some forms of maternal employment during the child's first year are associated with subsequent increases in behavior problems and negative effects on children's cognitive development (Brooks-Gunn et al. 2002, Waldfogel et al. 2002, Blau and Grossberg 1992, Baum 2003).

The results of previous studies suggest that making longer maternal leave available to working mothers may have real benefits for children. However, despite the interest in the impact of the length of maternal leave on children's outcomes, there has been very little research on how the length of maternal leave after childbirth may impact maternal health and well-being. This information is important not only from an individual mother's perspective, but from a policy perspective as well. Although the Family and Medical Leave Act of 1993 was motivated by concerns about the health of infants and postpartum women, there is little empirical evidence regarding whether or not longer maternity leave actually affects maternal health (Hyde 1995). Moreover, some states have recently passed or are considering legislation that would mandate businesses to provide paid family leave. This policy change would likely increase the length of maternity leave but at a cost to states, employees and businesses Without information about the health impact of longer maternal leave after childbirth, it is difficult to weigh the costs and benefits of these proposed state-level policy changes.

The objective of this paper is to inform the debate over family leave policy by investigating how the length of maternal leave affects maternal health in a sample of mothers who returned to work after childbirth. Data used in the paper come from the National Maternal and Infant Health Survey of 1988. We examine the impact of the timing of returning to work on two aspects of maternal health. Maternal mental health is measured by the Center for Epidemiologic Studies Depression Scale (CES-D), a widely-used screening tool for depression. A second measure of maternal health is represented by a dummy variable indicating whether or not the mother had at least 3 outpatient visits for any health problems during the 6 months after childbirth. We estimate baseline models using Ordinary Least Squares (OLS) methods and then address the potential endogeneity of the return-to-work decision using instrumental variables (IV) methods.

The results indicate that among employed mothers of infants, returning to work later is associated with fewer depressive symptoms, but it is not associated with the probability of meeting a threshold of depressive symptoms that is indicative of clinical depression. Holding other factors constant, an incremental increase in length of maternal leave from work would reduce depressive symptoms on average by 5 to 10 percent. There is no statistically significant association between the length of maternal leave and having had at least 3 postpartum outpatient visits for mental and physical health problems.

In this study, depressive symptoms are measured, on average, about 13 months after the mother has returned to work. Therefore, the analysis suggests that longer maternal leave may have lasting benefits for maternal mental health. These findings contribute to the growing literature on maternal leave policy, which primarily focuses on the benefits of leave for infant

health and development, by demonstrating that longer maternal leave also may have benefits for the health of mothers.

1 Returning to work and maternal health

Theoretical Motivation

Previous research suggests that the postpartum work experience is challenging for many employed mothers. Mothers who have recently returned to the workforce have to balance dual, time-intensive roles, while also dealing with the health problems and life changes that all postpartum women, employed or not employed, typically face. These issues may include physical recovery from childbirth, postpartum blues or depression, changes in marital relationships and role identities, and infant health problems (Gjerdingen et al. 1993, Gjerdingen et al. 1995, McGovern et al. 1997, Ellis and Hewitt 1985, Mercer 1985).

The models of household production and the production of health (Becker 1965, Grossman 1972) illustrate the problem and provide the motivation for this study. Consider the utility function of a working mother which includes her own health and the health of her child, both of which are produced with market goods and time. Utility is maximized subject to budget and time constraints, where time is divided between time spent in the labor market, time spent investing in the health and well-being of her child, and time spent investing in her own physical and mental health. The optimal quantities of child health and maternal health demanded by the mother depend on the marginal utilities and the shadow prices of these two commodities. The shadow prices of child health and maternal health are the marginal costs associated with the additional time and good inputs needed to produce an incremental unit of health.

An increase in the opportunity cost of time, which occurs when the mother re-enters the labor force, increases the shadow prices of both maternal health and child health. However, the net effect of the return to work on the quantities of maternal and child health demanded by the mother depends on the relative strength of two effects. First, the pure income effect predicts that the mother will demand more of both commodities (child health and maternal health). That is, mothers who return to work earlier have more income, and therefore will demand more of all commodities, compared to mothers who return to work later. Second, the rise in the opportunity cost of time would induce substitution in consumption away from the commodity whose shadow price has a relatively larger time component, since that commodity's shadow price would rise in relation to the shadow price of the other commodity, holding other factors constant.

The substitution effect may induce an increase or a decrease in the quantity of maternal health demanded, depending on the maternal and child health production processes. If the production of maternal health is relatively more time intensive than the production of child health, the return to work would induce a substitution away from maternal health. However, if maternal health is relatively less time intensive than child health, the substitution and income effects would predict an increase in maternal health as a result of the return to work. As a result, the combined impacts of the income and substitution effects are theoretically ambiguous. It is difficult to speculate on the relative time intensity of the production of child health versus mother health; therefore, the direction of the total effect of returning to work on maternal health must be studied empirically.

At the empirical level, we hold household income constant in all of the models. As a result, we capture a pure substitution effect rather than the net effect of the income and substitution effect, as described above. The net effect of returning to work on maternal health is

still ambiguous theoretically because it depends on the time intensity of producing maternal health relative to the time intensity of producing child health.

Previous Research

To the best of our knowledge, no previous study in the economics literature has explored the effect of the length of maternity leave on maternal wellbeing. In the economics literature, most of the research on maternal leave has focused on the impact of leave and leave policies on labor market outcomes, such as employment, wages and job continuity (Baum 2003; Klerman and Leibowitz 1999; Waldfogel 1998), and child health and development (Winegarden and Bracy 1995, Ruhm 2000, Baum 2003). These latter studies suggest that longer maternity leave has positive effects on children's health and development.

Winegarden and Bracy (1995) and Ruhm (2000) use time-series of data from European countries to study the effect of paid maternal leave on child health. Both Winegarden and Bracy and Ruhm find that longer paid leave is associated with reductions in infant mortality; Ruhm additionally finds that longer maternal leave is associated with lower rates of young child mortality. Baum (2003), using data from the National Longitudinal Survey of Youth, demonstrates that returning to work within the first three months of life is associated with lower cognitive test scores during childhood. These studies suggest that longer maternal leave after childbirth may benefit infant health and development.

A few studies from other disciplines have explored the impact of returning to work on the mother's health. In regards to physical health, employed postpartum women have higher rates of respiratory infections, breast symptoms, and gynecologic problems compared to postpartum women who are not employed (Gjerdingen et al. 1995, Gjerdingen et al. 1993). This research on physical health is based on a sample of 436 first-time mothers in Minnesota. In regards to

mental health, there is some mixed evidence that among employed mothers, returning to work earlier increases depressive symptoms. Hyde et al. (1995), for example, uses a sample of 570, mostly white mothers in Wisconsin to explore the postpartum employment experience. They find that among mothers back at work four months postpartum, short length of maternal leave increased the probability of depression, but only among mothers who also had marital concerns and mothers who felt their jobs were unrewarding. Gjerdingen et al. (1994), based on a sample of 436 married, employed, first-time mothers in Minnesota, find that returning to work within 24 weeks after childbirth, as well as longer work hours, are associated with poor mental health. These studies are based on small, non-representative samples. Moreover, it is not clear whether or not the association between shorter maternity leave and increased depressive symptoms is causal.

McGovern et al. (1997) address some of these problems by using a larger sample of 654 employed mothers in Minnesota, and by accounting for the possibility that the timing of the return-to-work decision is endogenous. They find that maternity leave length has a positive effect on mothers' wellbeing, measured at about seven months postpartum using a generic measure of mental health, vitality and role function. As identifying instruments, these researchers use a set of variables that measure the infant's health endowment (birth-weight and gestation, congenital anomalies), the infant's race, health insurance, maternal leave policies, child care arrangements and job characteristics. These variables are shown in the analysis to be reasonably adequate predictors of maternal leave length. However, it seems unlikely that they can be validly left out of the maternal health equation. For example, there is evidence from other studies that infant health and child care arrangements affect maternal stress and depression

(McLennan et al. 2001, Mandl et al. 1999, Gjerdingen et al. 1995). No results from over-identification tests are shown to justify these exclusions.

McGovern et al. (1997) contribute to the limited literature on the effect of the length of maternal leave on maternal wellbeing by addressing the potential endogeneity of the timing of returning to work. We build on this study in the following ways. First, we use state-level labor market conditions and state-level maternal leave policies as identifying instruments, rather than the potentially endogenous individual characteristics used by McGovern et al. (1997). We believe that state-level variables are more likely than individual-level variables to be exogenous to the model.

Second, we test the set of identifying instruments to gauge whether or not they can be validly left out of the maternal health equation, and to determine whether or not they are reasonably strong predictors of the length of maternal leave from work. We also estimate all models using several sets of independent variables to see whether the estimates are sensitive to the variables included in the model, some of which may be endogenous.

Third, we improve upon McGovern et al. by using data from the National Maternal and Infant Health Survey (NMIHS), which includes a national, racially diverse sample of mothers. The McGovern et al. sample is limited to the Twin Cities region of Minnesota, and 91% of the sample respondents are White. Because the NMIHS was a national survey that over-sampled African-American and low birth-weight infants, our sample respondents come from all fifty states and almost 50% of our analysis sample is non-White. It is important to note, however, that the analysis sample used in the paper is not necessarily representative of employed mothers in 1988. Consequently, the results should still be generalized with caution.

2 Modeling the Return- to-Work and Maternal Health Relationship

This paper is based on the hypothesis that among mothers who were employed while pregnant and who return to work during the first six months of the child's life, longer leave from work will impact maternal health, although the direction of the impact is theoretically indeterminate. The study focuses on estimating the following equation:

1) $H = b_0 + b_1E + b_2X + b_3Y + u + e.$

This equation is specific to the mother/child dyad. The dependent variable H is a measure of maternal health, which in our case is represented by two measures of depressive symptoms, and a measure indicating whether or not the mother had at least 3 outpatient visits during the first 6 months after childbirth.

We focus on maternal mental health as well as physical health because depression is the leading cause of lost years of healthy life among women, as measured by disability-adjusted life years (DALYs) (Murray and Lopez 1996). Depression is particularly common among women with young infants, 10 to 20% of whom develop postpartum depression within six months of delivery (Miller 2002). Moreover, maternal depression is important to study as an outcome because it is associated with adverse outcomes for children, including insecure infant/mother attachment and children's behavior problems (Civic and Holt 2000, Martins and Gaffan 2000).

The main independent variable of interest is E, the length of time after the birth of the child when the mother returns to work. We hypothesize that returning to work will alter the demand for maternal health, generating measurable differences in health status among women with varying durations of time away from the labor force. The coefficient on E will show the direction and magnitude of this effect.

The vector X includes observed maternal factors that may affect maternal health, such as

the mother's age, marital status, number of children, education, occupation, and income. The vector Y includes observed child-specific factors that may influence maternal health, such as the child's health endowment. Specific details about the variables included are discussed below. In addition to these measured variables, there may exist unobserved, individual-level factors that are associated with both health status and employment decisions. These unobserved factors are represented by u in Equation 1, and e is a random disturbance term.

Initially, a standard ordinary least squares (OLS) model is used to estimate equation 1. Estimating equation 1 by OLS, however, can lead to biased and inconsistent estimates if a problem of reverse causality exists (e.g. postpartum health affects the timing of returning to work), or if unobserved, mother-specific factors exist that influence both maternal health and return-to-work decisions (e.g. u is correlated with E and H). It is difficult to predict the direction of the bias – some mothers experiencing depressive symptoms and other health problems may return to work later because of their health, but others may choose to return to work sooner, in an effort to overcome postpartum health problems. We attempt to account for this problem using instrumental variables (IV) methods, which purge the potentially endogenous return-to-work variable of its correlation with the error term.

The OLS and IV models are estimated with a set of basic covariates that are exogenous from the mother's perspective, and with a full set of covariates that includes potentially endogenous variables such as smoking and occupation. The endogeneity of the timing of return-to-work with respect to maternal health is tested using the Durbin-Wu-Hausman test, and all models are estimated using robust standard errors that account for clustering of observations at the state level. Additionally, the validity of the over-identifying restrictions is tested, and the predictive power of the identifying instrumental variables is assessed.

3 The National Maternal and Infant Health Survey

This study uses data from the National Maternal and Infant Health Survey of 1988 (NMIHS). The objective of the NMIHS was to investigate the determinants of negative pregnancy outcomes. The survey respondents were a national sample of women between 15 and 49 years old who had a pregnancy in 1988. The NMIHS over-sampled very low birthweight, low birthweight and African-American infants. Initially, 26,355 women were sampled based on birth certificates, death certificates, and reports of fetal death from 1988. The sample includs 13,417 women who had live births, 4,772 women who had fetal deaths and 8,166 women who had infant deaths. This paper uses data only from NMIHS respondents who had live births in 1988 (USDHHS 1992).

Of the 13,417 mothers who had live births, 9,953 completed the survey, a response rate of 74 percent. On average, mothers of live births completed the NMIHS survey 17 months after the child's birth (USDHHS 1992). The NMIHS dealt with non-item response by imputing many variables using the hot-deck imputation procedure (see USDHHS 1992 for more details about this procedure). In most cases, this imputation affected less than 1 percent of respondents (USDHHS 1992).

Analysis Sample

We limit the sample to eligible respondents of at least 18 years of age who had worked at any point during pregnancy, and who had returned to work by the time the infant was six months old. We exclude mothers with infants older than 24 months at the time of the survey, mothers who were no longer employed at the time of the interview, and mothers who are currently pregnant with another child by the time of the survey. The sample is limited to mothers who

returned to work within 6 months in order to ensure that depressive symptoms were measured after the mother has returned to work. These exclusions reduce the sample size to 1,762 mothers.

Limiting the sample to mothers who returned within 6 months eliminates the problem that some mothers who were interviewed relatively early and who returned to work relatively late actually completed the depression screener before they returned to work. We limit the sample to adult mothers because the focus of the study is employment. Mothers who are currently pregnant with another child are excluded because the new pregnancy may affect their depressive symptoms and health services utilization.

Dependent Variables

1. Center for Epidemiologic Studies Depression Scale

The NMIHS survey includes a Center for Epidemiologic Studies Depression Scale (CES-D) to measure depressive symptoms. The CES-D is one of the most widely used psychiatric scales in existence. The scale captures symptoms of depression, and includes 20 items that focus on mood, somatic problems, interactions with others, and motor functioning, such as "I felt lonely," "my sleep was restless," and "I could not get going."[1]

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). The final CES-D score is computed by adding the points assigned to each item. The maximum score is 60 (20 items x maximum of 3 points per item), and a score of 16 or higher is generally considered a likely case of clinically defined

[1] In the NMIHS, two items of the CES-D were imputed using the hot-deck method because of item non-response in 5 to 10 percent of cases. These two items were "people were unfriendly" and "I talked less than usual."

depression. However, the CES-D scale 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).

Because the CES-D is highly skewed to the right in these data, we use the natural log of the total CES-D score as a dependent variable in this analysis. We also consider a dummy variable indicating whether or not the respondent's 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).

Ideally, we would have liked to measure depression at the same point in time for all mothers (e.g. when all infants were 1 year old). Unfortunately, this approach is not possible because although all of the infants were born in 1988, the mothers did not complete the depression screener when all of their infants were a particular age. It is possible that the timing of return to work impacts the mother's depressive symptoms differently depending on the current age of the child. Although we do limit the sample to mothers whose children are 24 months old or younger, this issue remains a limitation of the analysis. Since the youngest infant in the sample was 6 months old at the time of the survey, the sample is effectively limited to mothers of infants who are between 6 and 24 months old.

In all of the models, we control for how long the mother has been back at work at the time of the interview. This variable is likely to be negatively correlated with the timing of the mother's return to the labor force – mothers who took relatively long maternity leaves are more likely to have returned to work more recently compared to mothers who took shorter leaves from

work. For this reason, we examine the sensitivity of the estimates to the inclusion and exclusion of this variable. Results are discussed below.

The CES-D captures depressive symptoms measured when each respondent's infant is 6 to 24 months old. About 50% of mothers experience increases in emotional reactivity for up to several weeks following the birth of a child (Miller 2002). This period of "postpartum blues" is transient and should be distinguished from postpartum depression, a mental disorder that affects nearly 10 to 20% of mothers in the US within six months of delivery (Miller 2002). Postpartum depression is defined as major depression that has its onset during the postpartum period, which lasts for up to six months after delivery (American Psychiatric Association 1994). The CES-D cannot be used to diagnose postpartum depression, or any other form of depression. However, the CES-D may capture some symptoms associated with this condition. The 6 to 24 months postpartum time period is well outside the period during which postpartum blues is prevalent, but some mothers may be experiencing postpartum depression.

2. Postpartum Utilization of Outpatient Health Services

We capture another dimension of maternal health using a measure of the mother's postpartum health services utilization. NMIHS respondents were asked to report the number of outpatient visits they made to a clinic or physician concerning their own physical or mental health during the first six months after childbirth. The American College of Obstetricians and Gynecologists recommends that healthy postpartum women have one outpatient visit 4 to 6 weeks after childbirth (American Academy of Pediatrics and the American College of Obstetricians & Gynecologists 1997). Since the NMIHS over-sampled low birth-weight infants, who may be more likely than normal weight infants to have had complicated deliveries, outpatient utilization may be higher than normal for the analysis sample, even if the mothers are

not experiencing postpartum health problems. For this reason, we measure maternal health using a dummy variable set equal to one if the mother had at least 3 outpatient visits during the first 6 months after childbirth. This variable is a crude indicator of poor postpartum health.

Clearly, using a measure of health services utilization to proxy maternal health has limitations. Health care utilization is influenced by many factors other than health, and although we can control for many of these factors (e.g. insurance status, health behaviors), some remain unobserved. The use of IV methods will address the possibility that unobserved factors that are associated with health services utilization are also correlated with the timing of return to work. NMIHS respondents were not asked about the exact timing of outpatient visits, the reasons for their outpatient visits, or physical health symptoms they experienced during the first six months after childbirth.[2] Moreover, they provided this information on health care utilization retrospectively.

Despite these limitations, considering health services utilization in addition to depressive symptoms as outcomes enhances this analysis for several reasons. First, the timing of returning to work may impact physical and well as mental health, and the utilization measure may capture physical health problems. Second, respondents were asked about health care utilization that took place within the first six months after childbirth. Since approximately 50% of the sample returned to work within 8 weeks and over 75% returned within 12 weeks, this outcome captures much of the short-term health impact of returning to work. In contrast, depressive symptoms were measured more than a year (on average) after the mother has returned to work. Focusing

[2] Because the exact timing of the outpatient visits within the 6 month period is not known, we cannot be certain that the outpatient visits occurred before or after the mother returned to work. This issue affects the interpretation of the results. Preparing for the return-to-work (both physically and emotionally) could affect maternal health – therefore, in these models, it is not clear whether it is the actual return to work or the preparation for returning to work that affects outcomes. Although this distinction may not matter from a policy perspective, this problem remains a limitation of the analysis.

on depressive symptoms alone, therefore, would limit the analysis to studying the effect of the timing of returning to work on long-term, mental health of mothers. Considering both outcomes allows one to study both the short and long term effects of the timing returning to work on maternal health.

Independent Variables

The main independent variable of interest in this study is the number of weeks after giving birth when the mother returns to employment.[3] This variable was constructed by NMIHS based on the mother's reported date of return to work and the child's date of birth, which is confidential and not provided to researchers. In the analysis sample, the mean child age when the mother returned to work was 9 weeks. To proxy the intensity of work, we also include as a covariate whether or not the mother worked part-time (defined as less than 35 hours) at the time of the interview. Because this variable may be endogenous to the model, we examine the sensitivity of the estimates to this variable by estimating models with and without part-time work, as well as other job characteristics, as covariates.

The timing of the return to work decision may be affected by policies such as the youngest age at which most day care centers will admit a child (i.e. 6 or 8 weeks) or the length of time covered by state-level family and medical leave laws (typically 6, 8, 12 or 16 weeks at the time the respondents were surveyed). For this reason, we use as alternative variables a series of dichotomous indicators for the following categories: 1) whether or not the mother returned to work between 6 and 8 weeks postpartum; 2) whether or not the mother returned to work between 8 and 12 weeks postpartum; and 3) whether or not the mother returned to work later than 12

[3] We do not have information regarding whether or not the mother returned to the same employer. However, previous research by Klerman & Leibowitz suggests that during the time period when NMIHS mothers gave birth, most mothers who worked full-time during pregnancy continued to work for the same employer after childbirth (Klerman & Leibowitz 1999).

weeks postpartum. These cutoffs are chosen to correspond with the second, third, and fourth quartiles in the distribution of length of maternal leave in the analysis sample. Because returning to work at or within 6 weeks postpartum represents the omitted category, the estimated effects of these thresholds are relative to women who stay out of the labor market for the shortest period of time.

In addition to the length of leave from work, maternal depressive symptoms and outpatient services utilization are likely to be influenced by numerous other personal and family-level factors. Previous research suggests that important predictors of postpartum depression include poor prenatal mental and physical health, low social support, concerns about child care arrangements, young maternal age, and low income. (McGovern et al. 1997, Gjerdingen et al. 1995, Gjerdingen and Chaloner 1994, Gjerdingen et al. 1993, Gjerdingen and Froberg 1991, Gjerdingen et al. 1991, Chaudron et al. 2001, Deal and Holt 1998). To proxy these factors, we include the following variables in all of the models: (1) mother's age in years; (2) mother's education (dummy indicators with high school graduate as the baseline, dropout, some college completed, four-year college degree); (3) household income; (4) race/ethnicity (dummy indicators with white as the baseline, African-American, Hispanic, Asian); (5) number of months between return to work date and interview date; (6) the number of other children in the household; and (7) a dummy variable indicating whether or not the mother is married.

Previous research suggests that other factors, such as socioeconomic stresses, insurance status, preexisting depression and health problems, and poor infant health may affect maternal depression as well as health services use (McLennan et al. 2001, Mandl et al. 1999). For this reason, in some models, we include the following measures of socioeconomic stress: (8) whether or not the mother receives welfare, and (9) whether or not the mother has any kind of health

insurance. Although we have no direct measures of the mother's physical and mental health before the child was born, we have proxies for prenatal health behaviors which may be correlated with her health status at the time. These proxies are: (10) whether or not the mother smoked during pregnancy, and (11) whether or not the mother initiated prenatal care during the first trimester. Finally, to proxy the mother's prenatal health and child's initial health endowment, we include: (12) whether or not the mother was advised by a doctor to take stay in bed for at least a week during the pregnancy; (13) whether or not the child was born prematurely (before 37 weeks gestation); and (14) whether or not the child was low birth-weight (less than or equal to 2500 grams). It is arguable as to whether or not these variables are endogenous to the return to work decision. By both excluding and including this set of variables, we are able to gauge the sensitivity of the return to work coefficient to these factors in the OLS regressions.

Because previous work shows that employment factors, work intensity, and child care arrangements is associated with maternal postpartum depression and health, we also include in some models: (15) the mother's occupational class (other occupation as the baseline, manager, service or technical); (16) whether or not the mother currently works part-time; and (17) child care arrangements (daycare center as the baseline, non-relative babysitter, relative babysitter, and other type of child care). All of these independent variables are potentially endogenous. Consequently, the OLS and IV models are estimated with and without this richer set of variables.

Identifying Instrumental Variables

The NMIHS respondents gave birth in 1988, when the United States was one of just two industrialized countries that did not have a national maternal leave policy (Hyde 1995). The Family and Medical Leave Act (FMLA) of 1993 guarantees 12 weeks of unpaid leave for eligible mothers and the right to return to their jobs. However, before this national legislation

was passed, many states had laws that provided some of the leave provisions, or more generous provisions, that currently are covered by the FMLA (Department of Labor 1990, RAND 1995).[4] As of 1990, 30 states had some kind of maternity or parental leave law, ranging from laws that allow only for leave for the mother during recovery from childbirth to laws that allow for up to one year of leave for either parent to care for an infant (Department of Labor 1990). Of the 30 states with maternity/paternal laws of some kind, 12 states had laws that applied to state employees only. Most state laws regarding leave exempted small businesses, but the definition of a small business varied by state (Family & Medical Leave Commission 1995). Several states in 1990 also had temporary disability laws, which provided some salary support during leave from work (Department of Labor 1990). The temporary disability laws covered all employers with at least one employee (Family & Medical Leave Commission 1995).

In this study, we use the cross-sectional variation in these state-level policies to instrument for the length of the mother's leave from work. We use two dummy indicators to represent these state policies: (1) whether or not the state had any kind of job-protected maternity leave law in 1988 that applied to private-sector workers, not just state employees; and (2) whether or not the state had a temporary disability law in 1988. These data come from Waldfogel (1999) and the Department of Labor (Department of Labor 1990). We expect that mothers who lived in states with maternity leave laws and disability laws will take longer leaves from work compared to mothers who lived in states without these laws.

Following Baum's (2003) previous work on maternal employment and child development, we use additional instruments which are intended to proxy local labor market conditions. Mothers living in more economically depressed labor markets are expected to return

[4] Some businesses also voluntarily offered employees leave options before the FMLA was enacted. We do not explore these variables as potential identifying instruments because the mother's choice of occupation and industry

to work earlier than other mothers because of concerns about retaining their jobs. Also, women with higher potential earnings in the market, as proxied by local per capita income, are expected to return to work sooner than other women. However, state-level labor market variables are not expected to directly impact maternal health after controlling for a range of individual-level socioeconomic factors.

To proxy local labor market conditions, Baum (2003) uses measures such as the local unemployment rate, the percentage of the local labor market that is female, local per capita income, and the percentage of the local population that has a high school and college degree. We have access to state but not local identifiers for NMIHS respondents. Therefore, we proxy local labor market conditions by using state-level measures of unemployment, the percentage of women in the labor force, the percentage of the population with a college degree, and average real per capita income.

4 Results

Table 1 displays means and standard deviations for all variables used in the analysis. The average CES-D score in the sample was 9.5, and 20 percent of the respondents had a CES-D score of at least 16, which is considered to be an elevated rate of depressive symptoms that may be indicative of clinical depression. This high rate of depression is consistent with other research based on NMIHS. McLennan et al. (2001), for example, use a sample of 7,537 mothers from NMIHS and report that 24 percent had a CES-D score of at least 16.. About 18 percent of mothers in the sample report having made at least 3 visits to an outpatient provider during the first 6 months after childbirth.

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may be endogenous.

On average, the sample mothers returned to work 9 weeks after childbirth, and more than 75 percent had returned to work by the time their infants were 12 weeks old (Figure 1). This finding is consistent with the work of Klerman and Leibowitz (1994), who find that most mothers who return to work during the first year do so within 3 months of childbirth. Almost all mothers in the sample have at least a high school degree (97 percent), and 44 percent have completed some college or a college degree. The sample includes a large proportion of African-American mothers (40 percent) and low birth-weight infants (23 percent) because the NMIHS over-sampled these groups. However, the sample is only 5 percent Hispanic and 3 percent Asian.

Table 2 shows results from all models that are estimated with the log of the CES-D score as the dependent variable. Columns (1)-(3) display OLS estimates with increasingly richer specifications. Column (1) presents a model with only basic, socio-demographic variables included on the right hand side. Column (2) shows a model that also includes potentially endogenous socioeconomic and infant health endowment variables. Finally, column (3) displays a model that additionally includes employment characteristics and child care arrangements as covariates. Columns (4)-(6) show IV models that correspond to each of the OLS specifications presented in columns (1)-(3).

All of the models indicate that returning to work later is associated with fewer depressive symptoms (Table 2, columns (1)-(6)). In the OLS models, returning to work a week later is associated with a 1 percent decline in the mother's CES-D score. At the sample mean of 9, this 1 percent drop is a reduction of about 1 point in the CES-D score, which could correspond to no longer validating a particular depressive symptom in the past week, or experiencing a depressive symptom less frequently in the past week. The OLS models show no evidence that the timing of

returning to work is correlated with other, observed characteristics that also affect depressive symptoms. The magnitude of the estimated effect remains virtually the same regardless of the model specification.

The OLS models do not account for the possibility of reverse causality -- mothers may return to work later or earlier as a response to their depressive symptoms. Also, the OLS estimates may be confounded by unmeasured characteristics that are correlated with both the timing of returning to work and depression. IV methods account for these problems by purging the potentially endogenous return-to-work variable of its correlation with the error term.

The IV results support the OLS findings – in every case, returning to work later is associated with a statistically significant reduction in depressive symptoms (Table 2, columns (4)-(6)). The magnitude of the IV estimates, however, is five times larger than the OLS estimates. Returning to work one week later is associated with a 5-6 percent reduction in depressive symptoms, which corresponds to a decrease of 5 points at the mean CES-D score. Like the OLS estimates, the IV estimates are not sensitive to the covariates included in the models.

The identifying instrumental variables perform reasonably well in these models. The F-test on the identifying instruments ranges from approximately 11 to 13 which is statistically significant at the 0.001 level. The over-identification test suggests that the instruments can be validly excluded from the depression equation. The Durbin-Wu-Hausman test is used to test for the consistency of the OLS estimate. The null hypothesis is rejected in every case at the 5% level, but not at the 1% level. Thus, there is some evidence that the IV estimates should be the preferred estimates.

All of the OLS and IV models presented in Table 2 were re-estimated without the variable measuring how long the mother had been back at work at the time of the interview. This variable is negatively correlated with the length of the mother's maternity leave, with a statistically significant correlation coefficient of -0.200. The OLS estimates from these models that exclude the length of time that the mother has been back at work are similar in magnitude to those presented in Table 2, although they are no longer statistically significant. The exclusion of the length of time back at work variable affects the magnitudes of the IV estimates, but the estimates remain negative and statistically significant. The IV estimates are the preferred estimates based on the Durbin-Wu-Hausman test even when the length of time back at work variable is excluded. Returning to work a week later is associated with a statistically significant, 9-10 percent decrease in depressive symptoms in these models, which is almost twice the 5-6 percent decrease reported in Table 2. Results are available upon request.

Table 3 shows results from all models that are estimated with a dependent variable that is a dummy variable indicating whether or not the mother had a CES-D score of at least 16. This threshold is commonly used as a cutoff for a likely clinical case of depression. In all of the OLS and IV models, returning to work later is associated with a small reduction in the probability of being a depressive case. However, the estimated effects are not statistically significant in any of the models. These findings suggest that while returning to work later may reduce the number or frequency of depressive symptoms, it is not associated with a lower probability of being a likely case of clinical depression.

When the clinical depression models are estimated without the variable measuring how long the mother has been back at work, the OLS estimates are still negative and statistically insignificant. However, when this back at work variable is excluded, the IV estimates become

statistically significant at the 0.10 level in all but the most fully specified IV model (e.g. this model includes the covariates listed in Column 6 in Table 3). The IV models suggest that returning to work a week later reduces the probability of having a CES-D score of at least 16 by 2 percentage points, which at the sample mean of 0.200 is a 10 percent reduction in the probability of being clinically depressed.

Taken together, the depression models in Tables 2 and 3 indicate that returning to work later is associated with a 5 to 6 percent reduction in depressive symptoms, but there is weaker evidence that returning to work later reduces the probability of meeting a threshold of 16 on the CES-D. These findings may suggest that the timing of returning to work affects depressive symptoms only among employed mothers who have CES-D scores less than 16 (e.g. the healthier mothers, in terms of depression). To examine this possibility, we estimate the models in Table 2 again splitting the full sample into two sub-samples – mothers with CES-D scores of at least 16 (clinically depressed) and mothers with CES-D scores less than 16 (not clinically depressed).[5]

The results in the sample of mothers who are not clinically depressed are very similar to those based on the full sample (results not shown, but are available upon request). However, among the clinically depressed mothers, there is no statistically significant relationship between returning to work and CES-D score. The inclusion or exclusion of the length of time the mother has been back at work does not affect these results. The models suggest, then, that the timing of returning to work is associated with depressive symptoms, but mainly among mothers who probably would not meet criteria for clinical depression.

We consider health care utilization in Table 4. The dependent variable in these models is a dummy variable indicating whether or not the respondent visited an outpatient physician or

[5] To keep things simple in this exercise, we ignore the complications involved in running the regression models on sub-samples that are divided based on the dependent variable.

clinic at least 3 times during the six months after childbirth. This measure is intended to proxy the mother's physical and mental status during the time period when she first returns to work. In contrast, maternal depressive symptoms, which were the focus of Tables 3 and 4, were measured on average about a year after the mother returned to work.

The OLS results in Table 4 (columns (1)-(3)) indicate that returning to work later is associated with a very small, marginally statistically significant increase in the probability of having had at least 3 outpatient visits. It is likely that these results are confounded by effect of health on the timing of returning to work – mothers in poor health may postpone their return to employment. The IV results, which address this potential problem, suggest the opposite. Returning to work later is associated with a reduction in the probability of having at least 3 outpatient visits, but the size of the effect is very small and statistically insignificant. The F-tests on the identifying instruments are statistically significant at the 0.001 level and the over-identification test suggests that the instruments can be validly excluded from the second stage equation, but the Durbin-Wu-Hausman test cannot reject the consistency of OLS estimate.

At the time the NMIHS data were collected, states that had maternal leave policies generally specified that eligible employees were entitled to a 6, 8, 12, or 16 week leave (Family & Medical Leave Commission 1995). Moreover, some states have licensing standards that prohibit daycare centers from accepting children younger than 6 weeks old (National Resource Center for Health & Safety in Child Care 2003). Daycare centers also typically have their own policies that include accepting infants starting at 6 or 8 weeks old. These state-level and daycare policies may have resulted in many mothers returning to work around the time their children have reached a particular age, such as 6 weeks old. In the analysis sample, the quartiles in the distribution of the return-to-work variable corresponded approximately to 6 weeks or less (first

quartile), 6 to 8 weeks (second quartile), 8 to 12 weeks (third quartile), and more than 12 weeks (fourth quartile).

Table 5 shows results from models that include dummy variables indicating that the mother returned to work 6 to 8 weeks after childbirth, 8 to 12 weeks after childbirth, or more than 12 weeks after childbirth. The baseline category includes mothers who returned to work 6 or fewer weeks after childbirth. Columns (1)–(3) show results from models that are estimated with the log CES-D score as the dependent variable, while columns (4)-(6) display estimates from models with a dummy variable indicating a score of at least 16 on the CES-D as the dependent variable. Finally, columns (7)-(9) present findings from models with a dummy variable indicating at least 3 outpatient visits as the dependent variable. OLS models are shown since the consistency of OLS could not be rejected for two of the three outcomes. However, these OLS models do not account for the potential endogeneity of the return-to-work decision and therefore should be considered lower-bound estimates of the true effects (since all previous IV estimates were larger in magnitude than the corresponding OLS estimates).

The results suggest that mothers who return to work between 6 and 8 weeks after childbirth are not statistically different in terms of their depressive symptoms compared to mothers who return within 6 weeks. However, mothers who return to work between 8 and 12 weeks of childbirth have 11 to 12 percent lower CES-D scores than mothers who return within 6 weeks (Table 5, columns (1)-(3)). Returning to work more than 12 weeks after childbirth is only slightly more beneficial than returning 8 to 12 weeks after childbirth – these mothers who take the longest leaves have CES-D scores that are about 14 to 15 percent lower than mothers who take the shortest leaves (Table 5, columns (1)-(3)). None of the return-to-work dummy

indicators are associated with meeting the threshold of a score of at least 16 on the CES-D (Table 5, columns (4)-(6)).

Columns (7)-(9) of Table 5 show that there are no statistically significant associations between the shorter lengths of maternal leave and outpatient services utilization in the first six months after childbirth. However, returning to work more than 12 weeks after child birth is associated with an increase in the probability of having at least 3 outpatient visits during the first 6 months, although this relationship is statistically significant only at the 10% level. Note that for this group of women who took the longest leave from work, it is most likely that the visits may have occurred prior to return to work, thus making it difficult to draw any firm conclusions based on this measure of return to work.

5 Conclusions

Previous economic research on maternal employment has focused on understanding how the length of maternal leave after childbirth impacts children's health and development. This study extends this literature by examining the effect of maternal leave length on the health of the mother. We focus on depression because of its very high prevalence among women of childbearing age, because of its potential negative effects on children, and because this disorder tends to be chronic. We also consider outpatient health services utilization in the first 6 months after childbirth as an alternative measure of the mother's health.

The results suggest that longer leave from work is associated with considerable declines in depressive symptoms. This finding persists regardless of model specification, or whether IV methods are used to address the potential endogeneity of returning to work. Specifically, increasing maternal leave from 6 or fewer weeks to 8 weeks or 12 weeks is

associated with an appreciable decline in depressive symptoms of approximately 11 percent and 15 percent, respectively. These magnitudes, which come from OLS models, mean that mothers are experiencing fewer symptoms of depression, or are experiencing depressive symptoms with less frequency or both.

However, there is only weak evidence that returning to work later lowers the probability of having a CES-D score of 16 or higher. Moreover, it appears that returning to work later will have mental health benefits mainly for mothers who probably are not clinically depressed (mothers with CES-D scores less than 16). There is no evidence that returning to work later alters the probability of having at least 3 outpatient visits in the 6 months after childbirth.

In sum, the findings suggest that longer maternal leave after childbirth may have lasting benefits for maternal mental health. If this effect is causal, as this paper suggests, policies that support longer maternity leave may have the added benefit of reducing depressive symptoms among employed mothers. However, there is no evidence that longer maternal leave affects potential cases of clinical depression, nor overall physical and mental health as measured by outpatient visits.

References

American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition.* Washington DC: American Psychiatric Press, 1994.

American Academy of Pediatrics and the American College of Obstetricians & Gynecologists, *Guidelines for Perinatal Care*, 4th Edition, Chapter 4-Anetnatal care, 1997.

Baum CL. Does early maternal employment harm child development? An analysis of the potential benefits of leave taking. Journal of Labor Economics 2003; 21: 409-448.

Becker GS. A theory of the allocation of time. Economics Journal 1965; 75: 493-517.

Blau FD, Grossberg AJ. Maternal labor supply and children's cognitive development. Review of Economics and Statistics 1992; 74: 474-81.

Brooks-Gunn J, Han WJ, Waldfogel J. Maternal employment and child cognitive outcomes in the first three years of life: the NICHD Study of Early Child Care. Child Development 2002; 73: 1052-72.

Bureau of Labor Statistics, Employment characteristics of families in 2000, ftp://ftp.bls.gov/pub/news.release/History/famee.04192001.news, Accessed 11/7/03.

Chaudron LH, Klein MH, Remington P, Palta M, Allen C, Essex MJ. Predictors, prodromes, and incidence of postpartum depression. Journal of Psychosomatic Obstetrics & Gynecology 2001; 22: 103-12.

Civic D, Holt VL. Maternal depressive symptoms and child behavior problems in a nationally representative birthweight sample. Maternal & Child Health Journal 2000; 4: 215-21.

Department of Labor, Women's Bureau, *State Maternity/Parental Leave Laws. Facts on Working Women No. 90-1.* June, 1990.

Deal LW, Holt VL. Young maternal age and depressive symptoms: results from the 1988 National Maternal and Infant Health Survey. American Journal of Public Health 1998; 88: 266-70.

Eaton WW, Muntaner C, Smith C, Tien A, Ybarra M. Center for Epidemiologic Studies Depression Scale: Review and Revision (CESD and CESDR). In: *The use of psychological testing for treatment planning and outcomes assessment*. Ed: Maruish ME, Third Edition, Chapter 40, Volume III, 2003.

Ellis D, Hewatt R. Mothers' postpartum perceptions of spousal relationships. Journal of Gynecologic and Neonatal Nursing 1985; 14: 140.

Family and Medical Leave Commission, A Workable Balance: Report to Congress on Family and Medical Leave Policies, 1995. Accessed on-line at http://www.dol.gov/esa/regs/compliance/whd/fmla/family.htm, 11/03.

Gjerdingen DK, Froberg D. Predictors of health in new mothers. Social Science & Medicine 1991; 33: 1399-407.

Gjerdingen DK, Chaloner KM. The relationship of women's postpartum mental health to employment, childbirth, and social support. Journal of Family Practice 1994;38: 465-472.

Gjerdingen DK, Froberg DG, Chaloner KM, McGovern PM. Changes in women's physical health during the first postpartum year. Archives of Family Medicine 1993; 2: 277-83.

Gjerdingen DK, McGovern PM, Chaloner KM, Street HB. Women's postpartum maternity benefits and work experience. Family Medicine 1995;27: 592-8.

Grossman M. The demand for health: a theoretical and empirical investigation. Occasional Paper No. 119, 1972. New York: National Bureau of Economic Research.

Hyde JS. Women and maternity leave: Empirical data and public policy. Psychology of Women Quarterly 1995; 19: 299-313.

Hyde JS, Klein MH, Essex MJ, Clark R. Maternity leave and women's mental health. Psychology of Women Quarterly 1995; 19: 257-285.

Klerman JA, Leibowitz A. The work-employment distinction among new mothers. Journal of Human Resources 1994; 29: 277-303.

Klerman JA, Leibowitz A. Job continuity among new mothers. Demography 1999; 36: 145-55.

Mandl KD, Tronick EZ, Brennan TA, Alpert HR, Homer CJ. Infant health care use and maternal depression. Archives of Pediatrics & Adolescent Medicine 1999;153: 808-13.

Martins C, Gaffan EA. Effects of early maternal depression on patterns if infant-mother attachment: a meta-analytic investigation. Journal of Child Psychology and Psychiatry 2000; 41: 737-46.

Mercer R. The process of maternal role attainment over the first year. Nursing Research 1985; 34: 198.

McGovern P, Dowd B, Gjerdingen D, Moscovice I, Kochevar L, Lohman W. Time off work and the postpartum health of employed women. Medical Care 1997; 35: 507-21.

McLennan JD, Kotelchuck M, Cho H. Prevalence, persistence, and correlates of depressive symptoms in a national sample of mothers. Journal of the American Academy of Child & Adolescent Psychiatry 2001;40: 1316-23.

Miller LJ. Postpartum depression. JAMA 2002;287: 762-765.

Murray CJL, Lopez AD, eds. The global burden of disease and injury series, volume 1: a comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020. Cambridge, MA: Published by the Harvard School of Public Health on behalf of the World Health Organization and the World Bank, Harvard University Press, 1996.

National Resource Center for Health & Safety in Child Care, website accessed 12/1/03 at http://nrc.uchsc.edu/.

RAND Labor and Population Program Research Brief. Time-out for new mothers: Some issues for maternity leave policy. December 1995, Accessed on-line at http://www.rand.org/publications/RB/RB5009/RB5009.html, 11/03.

Ruhm CJ. Parental leave and child health. Journal of Health Economics 2000;19: 931-60.

United States Department of Health & Human Services, National Center for Health Statistics. *National Maternal and Infant Health Survey 1988* [computer file]. Hyattsville MD: US Department of Health and Human Services, National Center for Health Statistics [producer], 1991. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor], 1992.

Waldfogel J. The family gap for young women in the US and Britian: can maternity leave make a difference? Journal of Labor Economics 1998; 16: 505-45.

Waldfogel J. Family leave coverage in the 1990s. Monthly Labor Review October 1999; 13-21.

Waldfogel J, Han WJ, Brooks-Gunn J. The effects of early maternal employment on child cognitive development. Demography 2002; 39: 369-92.

Winegarden CR, Bracy PM. Demographic consequences of maternal-leave programs in industrial countries: Evidence from fixed-effects models. Southern Economic Journal 1995; 61: 1020-35.

Table 1: Sample Means and Standard Deviations
(N = 1,762)

Variable	Definition	Mean (standard deviation)
	Maternal Health	
CES-D Depression Score	Score on Center for Epidemiologic Studies Depression screener	9.47 (9.37)
Depressive Case	Dummy variable =1 if respondent reports a score of at least 16 on the CES-D, 0 otherwise	0.198
At least 3 outpatient visits in first six months after childbirth	Dummy variable =1 if respondent reports having visited a clinic or physician for mental or physical health problems at least 3 times in the first 6 months after childbirth, 0 otherwise	0.184
	Length of Maternal Leave	
Number of weeks since birth when mother returned to work	The infant's age in weeks when the respondent returned to work	9.18 (4.99)
Mother returned to work 6 weeks after childbirth or sooner	Dummy variable = 1 if respondent returned to work when infant was 6 weeks old or younger, 0 otherwise	0.256
Mother returned to work between 6 and 8 weeks after childbirth	Dummy variable = 1 if respondent returned to work when infant was between 6 and 8 weeks old, 0 otherwise	0.251
Mother returned to work between 8 and 12 weeks after childbirth	Dummy variable = 1 if respondent returned to work when infant between 8 and 12 weeks old, 0 otherwise	0.264
Mother returned to work more than 12 weeks after childbirth	Dummy variable = 1 if respondent returned to work when infant was older than 12 weeks, 0 otherwise	0.230
	Other Independent Variables	
Mother's age	Mother's age in years	27.81 (5.03)
High school dropout	Dummy variable =1 if respondent is a high school dropout, 0 otherwise	0.034
Some college	Dummy variable =1 if respondent completed some college but did not graduate, 0 otherwise	0.242
College graduate	Dummy variable =1 if respondent is a college graduate, 0 otherwise	0.192
Income	Household income	31,064

Hispanic	Dummy variable =1 if respondent is Hispanic, 0 otherwise	0.053
African-American	Dummy variable = 1 if respondent is African-American, 0 otherwise	0.389
Asian	Dummy variable = 1 if respondent is Asian, 0 otherwise	0.025
Married	Dummy variable = 1 if respondent is married, 0 otherwise	0.775
Number of children	Number of children in household	1.50
Time between return to work date and interview date	How long in months the mother has been back at work at the time of the interview	13.12 (4.29)
Welfare recipient	Dummy variable = 1 if respondent receives AFDC, 0 otherwise	0.026
Physician advised bed rest	Dummy variable =1 if respondent reports that her physician advised her to stay in bed for at least one week during her pregnancy, 0 otherwise	0.236
Premature infant	Dummy variable = 1 if respondent's child was born earlier than 37 weeks gestation, 0 otherwise	0.210
Low birth-weight	Dummy variable = 1 if respondent's child was low birth-weight, 0 otherwise	0.228
Prenatal care in first trimester	Dummy variable = 1 if respondent initiated prenatal care during first trimester, 0 otherwise	0.895
Insured	Dummy variable = 1 if respondent has health insurance, 0 otherwise	0.850
Smoked daily during pregnancy	Dummy variable = 1 if respondent smoked daily during pregnancy, 0 otherwise	0.178
Mother currently works part-time	Dummy variable = 1 if respondent worked less than 35 hours per week at the time of the interview, 0 otherwise	0.231
Manager	Dummy variable = 1 if respondent has a managerial occupation, 0 otherwise	0.261
Technical	Dummy variable = 1 if respondent has a technical occupation, 0 otherwise	0.460
Service	Dummy variable = 1 if respondent has a service occupation, 0 otherwise	0.148
Relative babysitter	Dummy variable =1 if respondent has a relative who watches child on workdays, 0 otherwise	0.487
Non-related babysitter	Dummy variable =1 if respondent has a babysitter (not a relative) who watches child on workdays, 0 otherwise	0.310
Other child care	Dummy variable =1 if respondent uses other child care arrangements	0.071
State unemployment rate	State unemployment rate in 1988	5.62
State female labor force participation	State female labor force participation in 1988	0.568

State college degree	% of state population with college degree or higher	0.189
State income	Average real per capita income in state in 1988	16,924 (2,475)
State leave law	Dummy variable =1 if state had passed by 1988 any type of maternity leave law that applies to private sector employees (not just state employees), 0 otherwise	0.187
State temporary disability law	Dummy variable =1 if state had passed by 1988 a temporary disability law, 0 otherwise	0.145

Figure 1: Distribution of Length of Maternal Leave in Weeks

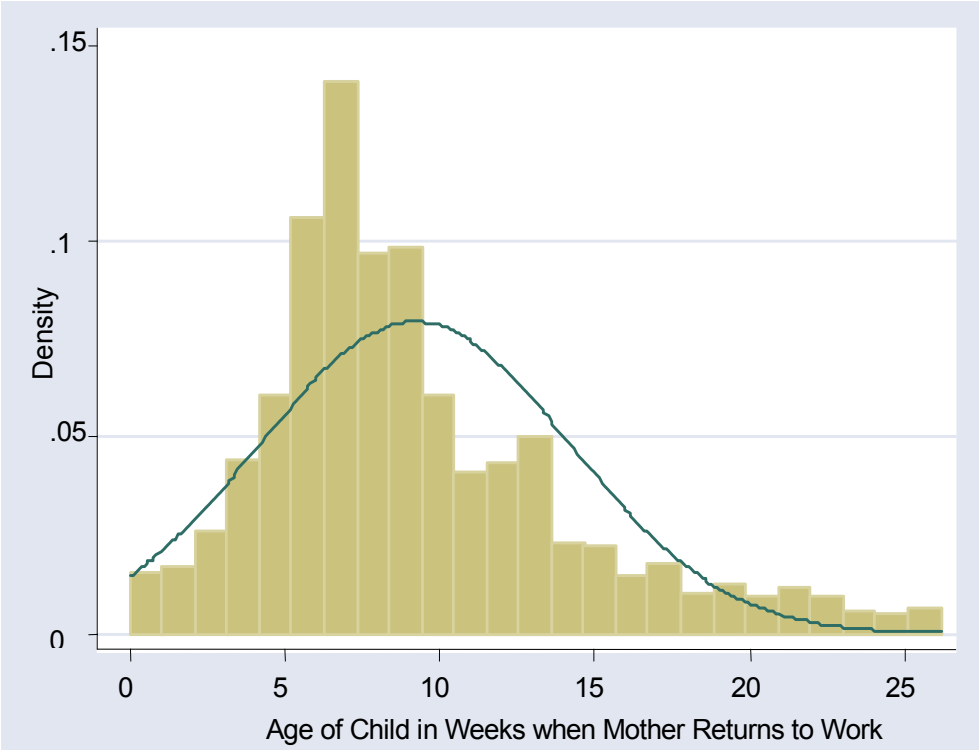

Table 2: Depression Score and Length of Maternal Leave **Estimate** **(T-Statistic)**						
	Dependent Variable: Log CES-D Score					
	OLS			IV		
	(1) Basic Covariates	(2) Full set of covariates	(3) Model (2) plus occupation and child care variables	(4) Basic Covariates	(5) Full set of covariates	(6) Model (5) plus occupation and child care variables
Number of weeks since birth when mother returned to work	-0.010 (-1.94)	-0.010 (-1.84)	-0.010 (-1.90)	-0.051 (-2.39)	-0.052 (-2.41)	-0.055 (-2.32)
Mother's age	-0.009 (-1.74)	-0.009 (-1.80)	-0.009 (-1.77)	-0.005 (-0.910)	-0.005 (-1.02)	-0.005 (-0.860)
High school dropout	0.195 (1.87)	0.141 (1.31)	0.119 (1.12)	0.177 (1.57)	0.128 (1.08)	0.104 (0.870)
Some college	-0.098 (-1.69)	-0.094 (-1.66)	-0.084 (-1.37)	-0.106 (-1.95)	-0.104 (-1.95)	-0.099 (-1.71)
College graduate	-0.140 (-2.01)	-0.127 (-1.79)	-0.104 (-1.32)	-0.154 (-2.40)	-0.145 (-2.22)	-0.123 (-1.63)
Income in low-middle quartile	-0.237 (-2.96)	-0.231 (-2.99)	-0.224 (-2.84)	-0.252 (-3.20)	-0.255 (-3.40)	-0.247 (-3.23)
Income in high-middle quartile	-0.202 (-2.49)	-0.197 (-2.30)	-0.185 (-2.17)	-0.185 (-2.29)	-0.191 (-2.31)	-0.180 (-2.17)
Income in highest quartile	-0.416 (-4.49)	-0.415 (-4.25)	-0.392 (-3.78)	-0.369 (-4.14)	-0.379 (-4.06)	-0.355 (-3.49)
Hispanic	0.299 (2.88)	0.302 (2.74)	0.304 (2.70)	0.344 (2.97)	0.350 (2.86)	0.357 (2.85)
African-American	0.288 (4.98)	0.280 (4.72)	0.278 (4.24)	0.335 (4.94)	0.326 (4.73)	0.332 (4.22)
Asian	0.191 (2.00)	0.187 (1.81)	0.189 (1.81)	0.237 (2.58)	0.231 (2.32)	0.239 (2.34)
Married	-0.138 (-2.15)	-0.119 (-1.98)	-0.119 (-1.97)	-0.118 (-1.70)	-0.108 (-1.64)	-0.107 (-1.59)
Number of children	-0.034 (-1.52)	-0.033 (-1.50)	-0.035 (-1.70)	-0.047 (-2.04)	-0.045 (-1.96)	-0.050 (-2.21)
Time between return to work date and interview data	-0.018 (-3.47)	-0.017 (-3.24)	-0.017 (-3.11)	-0.028 (-3.94)	-0.027 (-3.77)	-0.028 (-3.68)
Welfare recipient		0.356 (2.26)	0.345 (2.24)		0.314 (2.04)	0.288 (1.91)
Prescribed bed rest		0.142 (2.45)	0.142 (2.45)		0.153 (2.60)	0.152 (2.57)
Premature infant		-0.007 (-0..080)	-0.006 (-0.070)		-0.025 (-0.270)	-0.024 (-0.270)
Low birth-weight		-0.016 (0.840)	-0.015 (-0.190)		-0.006 (-0.080)	-0.006 (-0.080)
Prenatal care in first trimester		-0.102 (-1.27)	-0.098 (-1.17)		-0.064 (-0.700)	-0.060 (-0.630)
Insured		0.055 (0.950)	0.063 (1.04)		0.082 (1.39)	0.092 (1.48)

Smoked daily during pregnancy		0.059 (1.20)	0.054 (1.10)		0.038 (0.800)	0.033 (0.690)
Works part-time			0.042 (0.620)			0.068 (0.960)
Manager			-0.051 (-0.540)			-0.027 (-0.270)
Technical			-0.031 (-0.430)			-0.007 (-0.100)
Service			0.039 (0.530)			0.064 (0.810)
Relative babysitter			-0.015 (-0.220)			0.023 (0.310)
Non-related babysitter			-0.073 (-0.940)			-0.045 (-0.510)
Other child care			-0.061 (-0.630)			-0.084 (-0.810)
Over-identification test (test stat and p-value)				2.36 (0.798)	2.52 (0.773)	2.27 (0.812)
Hausman test (test stat and p-value)				5.26 (0.022)	5.30 (0.021)	5.59 (0.018)
F-test on instruments (test stat and p-value)				12.74 (0.000)	12.24 (0.000)	10.62 (0.000)
N	1,762					

T-statistics computed from Huber-White standard errors with adjustment for clustering on state of residence.

Table 3: Depressive Case and Length of Maternal Leave **Estimate** **(T-Statistic)**						
	Dependent Variable: Dummy variable indicating a score of at least 16 on CES-D					
	OLS (Linear Probability Model)			IV		
	(1) Basic Covariates	(2) Full set of covariates	(3) Model (2) plus occupation and child care variables	(4) Basic Covariates	(5) Full set of covariates	(6) Model (5) plus occupation and child care variables
Number of weeks since birth when mother returned to work	-0.001 (-0.730)	-0.001 (-0.660)	-0.001 (-0.670)	-0.012 (-1.38)	-0.013 (-1.40)	-0.013 (-1.33)
Mother's age	-0.002 (-0.890)	-0.002 (-0.780)	-0.002 (-0.800)	-0.001 (-0.390)	-0.001 (-0.340)	-0.001 (-0.310)
High school dropout	0.060 (0.920)	0.050 (0.760)	0.043 (0.640)	0.055 (0.830)	0.047 (0.690)	0.039 (0.570)
Some college	-0.030 (-1.12)	-0.029 (-1.08)	-0.026 (-0.950)	-0.032 (-1.22)	-0.032 (-1.21)	-0.030 (-1.10)
College graduate	-0.029 (-1.26)	-0.026 (-1.12)	-0.022 (-0.890)	-0.032 (-1.52)	-0.031 (-1.42)	-0.027 (-1.14)
Income in low-middle quartile	-0.039 (-1.19)	-0.037 (-1.13)	-0.033 (-1.00)	-0.043 (-1.32)	-0.044 (-1.32)	-0.039 (-1.17)
Income in high-middle quartile	-0.046 (-1.48)	-0.045 (-1.36)	-0.040 (-1.18)	-0.041 (-1.35)	-0.044 (-1.35)	-0.039 (-1.17)
Income in highest quartile	-0.095 (-2.43)	-0.095 (-2.29)	-0.089 (-1.95)	-0.082 (-2.07)	-0.086 (-2.03)	-0.080 (-1.71)
Hispanic	0.019 (0.610)	0.019 (0.590)	0.022 (0.700)	0.031 (1.04)	0.032 (1.02)	0.035 (1.14)
African-American	0.074 (2.83)	0.072 (2.74)	0.075 (2.75)	0.086 (3.17)	0.085 (3.05)	0.089 (2.91)
Asian	0.019 (0.340)	0.019 (0.330)	0.017 (0.280)	0.032 (0.600)	0.031 (0.570)	0.030 (0.520)
Married	-0.083 (-2.30)	-0.078 (-2.22)	-0.077 (-2.14)	-0.078 (-2.09)	-0.075 (-2.06)	-0.074 (-1.98)
Number of children	0.005 (0.590)	0.005 (0.600)	0.004 (0.490)	0.001 (0.170)	0.002 (0.200)	0.000 (0.050)
Time between return to work date and interview data	-0.003 (-1.29)	-0.003 (-1.20)	-0.003 (-1.10)	-0.006 (-1.98)	-0.006 (-1.94)	-0.005 (-1.87)
Welfare recipient		0.095 (0.930)	0.097 (0.980)		0.084 (0.820)	0.082 (0.830)
Prescribed bed rest		0.025 (1.06)	0.026 (1.14)		0.028 (1.24)	0.029 (1.30)
Premature infant		-0.003 (-0.110)	-0.003 (-0.110)		-0.008 (-0.270)	-0.008 (-0.260)
Low birth-weight		-0.011 (-0.310)	-0.011 (-0.330)		-0.008 (-0.230)	-0.009 (-0.260)
Prenatal care in first trimester		-0.007 (-0.180)	-0.004 (-0.110)		0.004 (0.090)	0.006 (0.130)
Insured		0.005 (0.150)	0.005 (0.150)		0.012 (0.390)	0.013 (0.390)

Smoked daily during pregnancy		0.009 (0.330)	0.008 (0.300)		0.003 (0.130)	0.003 (0.110)
Works part-time			0.007 (0.260)			0.014 (0.500)
Manager			-0.031 (-0.940)			-0.025 (-0.720)
Technical			-0.032 (-1.18)			-0.025 (-0.890)
Service			-0.003 (-0.080)			0.004 (0.120)
Relative babysitter			0.005 (0.150)			0.015 (0.430)
Non-related babysitter			0.032 (0.920)			0.040 (1.08)
Other child care			0.006 (0.130)			-0.001 (-0.020)
Over-identification test (test stat and p-value)				4.79 (0.443)	4.80 (0.443)	4.27 (0.511)
Hausman test (test stat and p-value)				2.24 (0.135)	2.29 (0.130)	2.28 (0.131)
F-test on instruments (test stat and p-value)				12.74 (0.000)	12.24 (0.000)	10.62 (0.000)
N	1,762					

T-statistics computed from Huber-White standard errors with adjustment for clustering on state of residence.

Table 4: At Least Three Outpatient Visits and Length of Maternal Leave **Estimate** **(T-Statistic)**						
	Dependent Variable: Dummy variable indicating at least 3 outpatient visits during 6 months after childbirth					
	OLS (Linear Probability Model)			IV		
	(1) Basic Covariates	(2) Full set of covariates	(3) Model (2) plus occupation and child care variables	(4) Basic Covariates	(5) Full set of covariates	(6) Model (5) plus occupation and child care variables
Number of weeks since birth when mother returned to work	0.004 (1.91)	0.004 (1.79)	0.003 (1.72)	-0.002 (-0.310)	-0.002 (-0.250)	-0.004 (-0.460)
Mother's age	-0.001 (-0.370)	-0.001 (-0.350)	-0.001 (-0.460)	-0.000 (-0.080)	-0.000 (-0.130)	-0.004 (-0.180)
High school dropout	0.043 (0.780)	0.024 (0.450)	0.033 (0.620)	0.040 (0.740)	0.023 (0.420)	0.030 (0.580)
Some college	0.010 (0.440)	0.011 (0.490)	0.005 (0.210)	0.009 (0.390)	0.010 (0.440)	0.003 (0.120)
College graduate	0.008 (0.320)	0.009 (0.370)	-0.007 (-0.250)	0.006 (0.240)	0.007 (0.280)	-0.010 (-0.370
Income in low-middle quartile	0.027 (1.07)	0.034 (1.31)	0.033 (1.25)	0.024 (1.00)	0.031 (1.23)	0.029 (1.14)
Income in high-middle quartile	0.016 (0.850)	0.022 (0.980)	0.016 (0.640)	0.019 (0.970)	0.022 (1.02)	0.016 (0.680)
Income in highest quartile	0.053 (1.58)	0.057 (1.57)	0.044 (1.21)	0.060 (1.58)	0.062 (1.57)	0.050 (1.27)
Hispanic	-0.030 (-0.570)	-0.034 (-0.710)	-0.024 (-0.470)	-0.023 (-0.410)	-0.028 (-0.530)	-0.016 (-0.300)
African-American	-0.010 (-0.530)	-0.015 (-0.730)	-0.005 (-0.240)	-0.003 (-0.130)	-0.009 (-0.380)	0.004 (0.150)
Asian	0.071 (1.30)	0.061 (1.09)	0.069 (1.16)	0.078 (1.36)	0.067 (1.15)	0.077 (1.22)
Married	-0.063 (-2.77)	-0.058 (-2.39)	-0.058 (-2.40)	-0.060 (-2.54)	-0.056 (-2.27)	-0.056 (-2.24)
Number of children	0.002 (0.200)	0.004 (0.520)	0.005 (0.600)	-0.000 (-0.050)	0.003 (0.320)	0.003 (0.320)
Time between return to work date and interview data	-0.002 (-1.04)	-0.002 (-0.910)	-0.002 (-1.05)	-0.004 (-1.50)	-0.003 (-1.30)	-0.004 (-1.54)
Welfare recipient		0.118 (1.66)	0.108 (1.50)		0.112 (1.52)	0.099 (1.31)
Prescribed bed rest		0.053 (2.34)	0.051 (2.28)		0.054 (2.38)	0.053 (2.30)
Premature infant		-0.010 (-0.340)	-0.008 (-0.280)		-0.013 (-0.400)	-0.011 (-0.360)
Low birth-weight		0.062 (2.07)	0.062 (2.04)		0.063 (2.08)	0.063 (2.07)
Prenatal care in first trimester		0.010 (0.340)	0.008 (0.280)		0.015 (0.510)	0.014 (0.480)
Insured		-0.012	-0.010		-0.008	-0.005

		(-0.380)	(-0.320)		(-0.270)	(-0.170)
Smoked daily during pregnancy		-0.023 (-1.03)	-0.019 (-0.840)		-0.026 (-1.17)	-0.022 (-1.00)
Works part-time			0.019 (0.930)			0.023 (1.09)
Manager			0.059 (1.81)			0.063 (1.92)
Technical			0.038 (1.67)			0.042 (1.83)
Service			0.036 (1.10)			0.040 (1.20)
Relative babysitter			0.003 (0.120)			0.009 (0.340)
Non-related babysitter			0.028 (1.01)			0.033 (1.13)
Other child care			0.019 (0.550)			0.015 (0.450)
Over-identification test (test stat and p-value)				8.78 (0.118)	6.88 (0.230)	6.45 (0.265)
Hausman test (test stat and p-value)				0.700 (0.402)	0.550 (0.460)	0.820 (0.366)
F-test on instruments (test stat and p-value)				12.74 (0.000)	12.24 (0.000)	10.62 (0.000)
N	1,762					

T-statistics computed from Huber-White standard errors with adjustment for clustering on state of residence.

Table 5: Summary of Maternal Health and Length of Maternal Leave Models
OLS Estimate
(T-Statistic)

	Dependent Variable: Log CES-D Score			Dependent Variable: Dummy variable indicating a score of at least 16 on CES-D			Dependent Variable: Dummy variable indicating at least 3 outpatient visits during 6 months after birth		
	(1) Basic Covariates	(2) Full set of covariates	(3) Model (2) plus occupation and child care variables	(4) Basic Covariates	(5) Full set of covariates	(6) Model (5) plus occupation and child care variables	(7) Basic Covariates	(8) Full set of covariates	(9) Model (8) plus occupation and child care variables
Returned to work 6-8 weeks after childbirth	-0.025 (-0.430)	-0.020 (-0.320)	-0.018 (-0.300)	-0.013 (-0.690)	-0.014 (-0.700)	-0.013 (-0.660)	0.0001 (0.0004)	0.005 (0.220)	0.006 (0.260)
Returned to work 8-12 weeks after childbirth	-0.120 (-2.01)	-0.111 (-1.86)	-0.109 (-1.85)	-0.030 (-1.14)	-0.029 (-1.08)	-0.030 (-1.10)	0.005 (0.190)	0.007 (0.280)	0.007 (0.250)
Returned to work more than 12 weeks after birth	-0.149 (-1.97)	-0.144 (-1.91)	-0.146 (-1.97)	-0.016 (-0.570)	-0.015 (-0.540)	-0.015 (-0.520)	0.055 (1.90)	0.053 (1.78)	0.050 (1.72)
N	1,762								

T-statistics computed from Huber-White standard errors with adjustment for clustering on state of residence.
All models also include mother's age, education, income, race, marital status, number of children, and timing of interview. Models 2, 3, 5, 6, 8 and 9 also include welfare, child health status, prenatal care, insurance, maternal bed rest during pregnancy, and smoking. Models 3, 6 and 9 also include part-time work, occupation, and child care arrangements.