An Analysis of Women's Return-to-Work Decisions Following First Birth

Lisa Barrow
Federal Reserve Bank of Chicago

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Abstract

Women's labor force participation rate has increased sharply over the last two decades. The increase has been particularly dramatic for married women with young children suggesting that women are spending less time out of the labor force for child-bearing and rearing. Using the relatively detailed information available in the National Longitudinal Survey of Youth, this paper explores women's decisions to return to work within one year of the birth of their first child, focusing particularly on the effect of child care costs. Consistent with economic theory, women who face lower child care costs are more likely to return to work after giving birth as are women with higher potential wages and lower family income from other sources.

Lisa Barrow
Economic Research Department
Federal Reserve Bank of Chicago
230 S. LaSalle St.
Chicago, IL 60604
(312) 322-5073
Lisa.Barrow@chi.frb.org

I. Introduction.

Women's labor force participation rate has increased sharply over the last two decades, particularly for married women with young children. From 1970 to 1996, the fraction of women in the labor market rose from 43.3 percent to 59.3 percent.[1] Over this same period, the participation rate of married women with preschool-aged children more than doubled, from 30.3 percent to 62.7 percent.[2] The rapid increase in participation of women with young children suggests that women are spending less time out of the labor force for child bearing and rearing. Indeed, looking at new mothers in the National Longitudinal Survey of Youth (NLSY), of those with a spouse or partner who were working prior to their first birth, three quarters were back at work within a year of the birth.[3]

An important consequence of the trend toward a more rapid reemployment of new mothers is that recent cohorts of women will have more actual labor market experience (at each age) than earlier cohorts.[4] This increase in actual work experience should be reflected in a narrowing of the gender earnings gap, and in fact, despite the growing wage inequality of the 1980's, the male-female earnings gap has been closing steadily since the late 1970's. From 1978 to 1990 the ratio of female to male earnings rose from about 0.73 to 0.85 for whites and from 0.60 to 0.70 for African-Americans.[5] According to O'Neill and Polachek(1993), about one-quarter of the closing of the male-female wage gap over the 1976-1987 period can be attributed to changes in the actual labor force experience of women, and an additional 50 percent

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[1]U.S. Bureau of the Census (1997). Table No. 621.

[2]U.S. Bureau of the Census (1997). Table No. 631.

[3]See below.

[4]Shapiro and Mott(1994) provide some evidence that labor force participation surrounding first birth is an important predictor of a woman's later labor force participation behavior, and hence greater actual work experience at all points in life.

[5]Blau and Kahn(1992)

can be accounted for by changes in returns to experience for women relative to men. Realistically, working women who choose to have children will have to take some time off of work either by taking family, sick, or vacation leave or by exiting the labor market entirely. However, given the importance of experience in determining wages, the faster women return to work following childbirth, the closer their actual experience will be to their potential experience and the smaller the average earnings penalty for women who have children.

The goal of this paper is to examine the economic determinants of a woman's decision to return to work quickly following child birth. I consider three key factors in this decision: the opportunity cost of taking time out of the labor force (i.e., the potential wage rate available to a woman), the wealth effect of other family income, and most particularly, the opportunity cost of working outside the home in terms of child care cost.

I first develop a simple theoretical model of a new mother's return-to-work decision. The model predicts that the decision to return to work will depend on a woman's wage net of hourly child care costs and other family income (including spouse or partner income). I then test the theoretical model as closely as possible. In order to get a measure of child care costs faced by women as they decide whether to return to work, I construct two indices that proxy for variation in cost across states and over time. In the models estimated, I find that women with higher wages are significantly more likely to return to work, and women facing higher child care costs or having greater other family income are significantly less likely to return to work after first birth. I also find that older women, women with more education, and women whose adult female role model was working when they were teenagers are more likely to return to work.

The remainder of the paper proceeds as follows: Section II considers some of the previous empirical work on child care costs and female labor force participation, Section III develops a simple theoretical model of a woman's employment decision as a utility maximization problem, Section IV discusses data and estimation, and Section V concludes.

II. Previous Research

Much of the previous literature on the labor supply behavior of women with young children has focused on the effect of child care costs.[6] Looking at Census Bureau estimates from the Survey of Income and Program Participation (SIPP) 1988 Panel, employed mothers spend an overall average of $73.30 per week on child care while employed women with at least one child under age one spend an average of $88.60 per week.[7] Since on average these women work about 36 hours per week, child care costs impose a $2.00 to $2.50 per hour "tax" on the work effort of mothers with young children.

Heckman(1974) is one of the earliest studies to consider the effect of child care costs on the labor supply of women with young children. He develops a specification for the marginal rate of substitution between money income and non-market time and finds that the "quality-adjusted" price of child care has a significant positive effect on the marginal rate of substitution and hence decreases mothers' labor supply.

Several more recent studies estimate probit models for the employment decision of women with children. Blau and Robins(1991), Connelly(1992a), Kimmel(1992), Powell(1997), and Ribar(1992) all include a predicted child care cost variable in their probit specifications. Powell(1997) differs from the other studies in that she focuses on Canadien women. Connelly(1992a), Kimmel(1992), Powell(1997), and Ribar(1992) find significant negative effects of child care costs on the employment probability while Blau and Robins(1991) find no employment effect. These studies also include other measures that might affect child care cost indirectly such as the number and ages of children, the presence of other adults, and child care tax credit information, but the results are not consistent across studies. Leibowitz, Klerman, and

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[6]See Nakamura and Nakamura(1992) for a review of some of the literature analyzing the effect of children on female labor supply more generally. See Leibowitz and Klerman(1995) for a more recent paper looking at the effects of children on married mothers' labor supply over time.

[7]U.S. Bureau of the Census(1992). Mean expenditures are conditional on making positive child care payments and have been converted to real 1997 dollars.

Waite(1992) take a slightly different approach and look at the determinants of work status in the two years following first birth, allowing certain effects to vary over time. They conclude that the presence of a woman's mother in her home has no real effect on employment behavior while the generosity of the child care tax credit has a significant positive effect on the employment rate that persists over the two years following birth.

Blau and Robins(1988) and Klerman and Leibowitz(1990) use multinomial logit models to look at the joint determination of employment and type of child care used (purchased or non-purchased and non-relative or relative, respectively). Blau and Robins additionally break out work alternatives by whether or not any other family member other than the husband works. Location-specific average weekly child care costs have a negative effect on the log odds of working for three of the four working categories. The number of children ages 0 to 4 also has a significant negative effect in three of the four categories. Klerman and Leibowitz estimate separate logit models for working within three months of first birth and working in 3 to 24 months of first birth. They find that average child care wages in the state have a positive effect on returning to work in the 3-24 month period using non-relative care but little effect on other outcomes. The marginal child care tax rate has a negative effect on all work categories but is only significant for returning in the first 3 months with non-relative care, and the maximum child care tax credit has a positive effect on all work categories and is significant for working in the first 3 months regardless of care type.

Finally, several other papers, although less closely related to this paper, also shed some light on the return-to-work process. Michalopoulos, Robins, and Garfinkel(1992) and Ribar(1995) estimate structural models of women's labor supply and child care demand. Both studies find that their measures of child care cost have little effect on employment and mostly affect child care expenditures or utilization of paid care. Blau and Robins(1989) estimate a hazard model of transitions from employment or non-employment. Using location-specific average weekly child care expenditures and the potential child care tax credit as

measures of child care cost, they find mixed results of the effects on employment transitions. Average cost has a positive effect on moving from employment to non-employment and a negative effect on moving from non-employment to employment while the potential child care tax credit has a negative effect on both moving from employment to non-employment and moving from non-employment to employment.

In summary, although the previous literature finds fairly consistent positive effects of wages and negative effects of other family or husband income on employment, the conclusions about the role of child care costs are mixed. The approach taken in this paper builds on several of the earlier studies while attempting to improve on the data and methods in several respects. First, I use the relatively detailed information available in the NLSY. Although some of the earlier studies--Blau and Robins(1991), Leibowitz, Klerman, and Waite(1992), and Klerman and Leibowitz(1990)--use NLSY data as well, their data are less current and hence less representative of women at first birth. The most recent data used in the non-NLSY studies discussed are data from the 1987 SIPP panel. Second, to focus specifically on the return-to-work decision, I use the subset of new mothers who were working in the period before their first birth. Finally, I construct and compare two alternative indices of child care cost that may be better proxies than some of the indices used in the previous studies.

III. Theoretical Model

I model a woman's return-to-work decision as a utility maximization problem with child care expenditures entering the budget constraint and hence affecting the employment decision.[8] First, I assume a woman makes her labor force participation decision by maximizing her utility, taking her husband's labor force participation and income as given.[9]

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[8]A more complete discussion of the theoretical model is included in the Appendix.

[9]The validity of this assumption is certainly debatable, and future analyses could model the labor supply decisions of a woman and her spouse/partner as a joint decision.

For simplicity, I assume a utility function consistent with linear labor supply,

$$H_i = b_1(w_i - p_{di}) + b_2 Y_i + Z_i b_3 + g_i \quad (1)$$

for individual *i* where w_i is the woman's wage, p_{di} is the hourly cost of child care the woman faces, Y_i is her husband's income plus other unearned income, Z_i is a vector of demographic characteristics and $?_i$ is an error term. The linear labor supply function restricts the coefficient on the wage net of child care costs to be the same regardless of the level of the wage. This is the easiest form to model empirically; however given that my measures of cost are indices of the true cost of child care, I will not impose the additional restriction during estimation that the coefficients on wages and costs are equal.

The probability that a woman returns to work is the probability that her wage net of child care costs exceeds her reservation wage. Thus, higher child care costs and lower wages will decrease the probability that a woman will go back to work. Assuming that leisure is a normal good, higher other family income will also decrease the probability of returning to work.

An important consideration is that there may be unobserved taste shifters that have not been specified in the model. For example, let t reflect taste for work and enter the model by affecting the marginal rate of substitution between leisure and money, i.e. let U=U(X, $t^{!1}$L), where X is a composite good excluding day care and leisure and L is hours of leisure. The greater the taste for work(the greater t), the lower the net wage needed to exceed the reservation wage. Thus, correlations between t and wages or child care costs can lead to biased estimates of their effects on the probability of returning to work. This issue will be further discussed in light of the estimation results that follow.

IV. Data and Estimation.

A. Child Care Prices.

I estimate two state and year level indices of child care cost to proxy for child care prices actually faced by women in the NLSY data set. One would expect to see differences in the cost of child care across

states due to differences in the state minimum wage and differences in the supply of low-wage labor, among other possibilities. Because these differences may change over time, I calculate measures of child care cost by state and year. Differences in child care cost across states could also arise because of differences in demand for child care. However, if states in which more women work have higher child care costs because there is more demand for child care, this will bias the estimates against finding the expected negative effect of child care cost on the probability a woman returns to work after first birth.

As a first measure of child care cost, I calculate average hourly wages for child care workers by state and year from the 1979-1993 NBER Current Population Survey (CPS) Labor Extract, Annual Earnings File Extracts.[10] The average is the weighted average of hourly earnings of all surveyed workers who report a three-digit occupation code for child care workers, private household, or for child care workers, except private households.[11] Hourly earnings are calculated as edited hourly earnings when paid hourly and edited or computed usual weekly earnings divided by edited usual weekly hours otherwise. Hourly earnings less than \$0.50 and above the 95th percentile in each year are dropped.[12] The mean state average child care worker wage over the period is \$4.43 with a standard deviation of 0.85.

As a comparative measure of cost, I estimate a regression adjusted state average weekly child care expenditure using the 1984-1993 panels of the SIPP.[13] The SIPP surveys a nationally representative sample of households every four months for 2½ years with a core set of questions and various "topical

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[10]Less populated states are identified only in regional groups by SIPP. For 1985 on, the groups are (1) Maine and Vermont, (2) Iowa, N. Dakota, and S. Dakota, and (3) Alaska, Idaho, Montana, and Wyoming. I use these same groups throughout for both the CPS cost index.

[11]Weights used are the earnings weights provided in the CPS data.

[12]990 observations were dropped leaving 19,295 wage observations for child care workers in 45 states or state groups over 15 years.

[13]1984 is the first year of the survey so for women with children born in 1979-1983 I use the 1984 SIPP data.

modules" over the panel. At least one wave of each panel includes questions on child care usage and expenditure for the youngest three children under 15 years of age. I use the information on total child care expenditures, sources of child care, and hours of child care needed to estimate a state index of child care cost.

Ideally, one would like to use total child care expenditure to get a cost index that is independent of such factors as how much child care is purchased, quality of care, number of children covered, etc. To achieve this, I estimate the following linear regression of total weekly child care expenditure:

$$TE = H_c\gamma_1 + H_c^2\gamma_2 + N_{<5}\gamma_3 + N_{6\&10}\gamma_4 + I_{NR}\gamma_5 + I_S\gamma_6 + I_H\gamma_7 + I_{st,yr}\gamma_{st,yr} + \nu, \quad (2)$$

where TE is total weekly child care expenditure, H_c is total weekly child care hours, H_c^2 is total weekly child care hours squared, $N_{<5}$ and $N_{6\text{-}10}$ are the number of children under five years of age and the number 6-10 years of age, I_{NR}, I_S, I_H, and $I_{st,yr}$ are indicators for the use of non-relative care as one source of child care, the use of school as one source of child care, the child's home as one place care is provided, and a set of state-year indicator variables.[14] By controlling for the source of child care and the number of children in different age categories, I hope to purge the expenditure data of some of the variation due to quality differences. The coefficients on the state-year variables, $\gamma_{st,yr}$, are then used as the child care price index in the return-to-work equation.

Figure 1 plots the regression adjusted SIPP weekly child care expenditure (by state and year) versus the average child care worker wage. From this preliminary look at the cost data, it is reassuring that the two measures are positively correlated (correlation of 0.30) since child care worker wages are likely to be a major portion of the cost of providing child care. In the estimation below, I use both measures to explore the effects of child care cost on the return-to-employment behavior of new mothers.

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[14]Coefficients on hours, hours squared, number of children, non-relative care, school-based care, and home care are also allowed to vary by year.

B. NLSY Data

My empirical strategy is to study the determinants of the return-to-work decision for new mothers who were working prior to the birth of their first child. I limit the sample to women giving birth to their first child for simplification of the return-to-work decision. This group is more uniform in the sense that all mothers face a first birth but not all will face a subsequent birth. Additionally, these women are all facing the decision to return to work with the need to hire child care for a child under age one only, not for multiple children at various ages. Limiting the sample to women who worked in the year before birth defines a more homogenous group of women since they all exhibit at least some attachment to the labor force prior to their first birth in addition to enabling me to use pre-birth wage information as a proxy for post-birth offered wages. I also conjecture that women with spouses or partners living in their household are reasonably similar to each other but unlike women without spouses or partners who tend to be younger and are more likely to live in their parents' household. In particular, it seems that women with spouses or partners may be facing more similar constraints on their labor market decisions than women without spouses or partners.

The original NLSY sample contains 5,842 women, excluding the military sample that was dropped in 1985.[15] In this study, I primarily use the 1994 Child file of the NLSY which provides detailed information on the children of the original NLSY sample women, including some relevant information on their mothers. In addition, I use the 1993 NLSY Youth file to get geographic and family income information for the mothers. According to the 1994 Child file, there are 3,468 women whose first-born

[15]The NLSY is a nationally representative sample of 12,686 men and women who were between the ages of 14 and 21 in 1979 including a military sample and an over sample of African-Americans, Hispanics, and poor non-African-Americans and non-Hispanics. See Center for Human Resource Research(1989) and (1993) for more information on the survey.

child was born between 1979 and 1994 and resided in the mother's household the first year of birth.[16] Characteristics of these women are reported in the first column of Table 1a.[17]

As noted above, I further limit the sample to women who report having a spouse or partner present at the time of their child's birth and women who were working at some time during the year before giving birth. The restriction to women with a spouse present before the birth of their child gives rise to the sample of 2,707 individuals (78 percent of the full sample) shown in column (2) of Table 1a. Comparing columns (1) and (2), women with spouses or partners are slightly older, more educated, and less likely to have a parent, step-parent, or grandparent in their household. They are also much less likely to be African-American. Column (3), the base sample, includes all women in column (2) who worked before first birth and have complete data for all variables used in the regression analysis with the exception of other income.

The NLSY reports the number of weeks before and after birth that a woman left and began employment. The women of the NLSY have high employment rates before giving birth; 76 percent of all mothers and 79 percent of mothers with spouses present were working within 51 weeks prior to their first child's birth. Those who worked tend to have higher other family income and are older and better educated (13.0 versus 11.5 years of education).

In addition to the standard variables included in a labor force participation equation--wages, unemployment rates, age, education, and race--I also include an indicator for the mother having had a working female role model when she was 14 and one for the presence of a woman's mother/father/step-mother/step-father/grandmother/grandfather in the household around the birth year. The role model variable is intended to help capture a woman's attitude about being a working mother. Although a woman may have different feelings about working when she has young children versus when her children are

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[16]For the 918 women with first-births before 1979 there are no birth year data available.

[17]The appendix contains more details of how the data set is constructed.

teenagers, this is the only information available on whether a woman lived in a household with a working female role model. The "grandparent" indicator is included to reflect a woman having greater access to low-cost child care. As shown in rows (11) and (12) of Table 1a, 52 percent of the NLSY women's role models worked when they were 14, and 30 percent of the overall sample of new mothers lived with their own parent, step-parent, or grandparent. Among women in the regression sample who worked in the year before childbirth and had a spouse present, however, the fraction living with a parent or grandparent is much lower at 15 percent.

As shown by the variable in row (3) of Table 1a, 77 percent of the mothers who were working and lived with a spouse returned to work within 51 weeks following their child's birth. A more detailed picture of the process is provided in Figure 2, which shows the fraction of the sample from column (3) of Table 1a who were working in each week before and after childbirth. Expectant mothers gradually withdraw from employment in the months before their delivery and then gradually return.[18] The pattern for all women who worked in the year before their first birth is also shown in Figure 2 and is very similar to that of the regression sample.

Columns (4) and (5) of Table 1a show the characteristics of women in the base sample (i.e. the column (3) sample) who were and were not back at work within a year of childbirth. A simple comparison across the columns suggests that women with higher wages, those with lower other income, older women, those with more education, and those whose mother worked are more likely to return to work quickly. Column (6) presents absolute t-values for the hypothesis that the means in columns (4) and (5) are equal. As predicted by the model, women who return to work have higher wages on average; however, differences in average child care costs and in average other family income for returners and non-returners are not statistically significant. The differences in age, education, race, share having had a working female role

[18]Though a larger percentage of NLSY women return to work after first-birth, the employment patterns are very similar to those of NLS-Young Women presented in McLaughlin(1982).

model, and the unemployment rates are also statistically significant. Women who return to work are older, more educated, more likely to have had a working role model, more likely to be African-American, and are living in counties with lower average unemployment rates.

The theoretical model suggests that spouse or partner income and other unearned income should be included in the empirical model of the return-to-work decision. However, 122 observations (7.2 percent) of the base sample have missing information on some component of other family income. In some of the specifications below I use the full sample excluding unearned income.[19] In others, I use the restricted sub-sample shown in column (1) of Table 1b. In general, the characteristics of the sub-sample are very similar to the overall sample; in particular, the fraction who return to work within a year is very similar (78 percent). Moreover, the characteristics of returners and non-returners in the sub-sample (columns (2) and (3), Table 1b) mirror those of the returners and non-returners in the base sample. Column (4) provides absolute t-values for the test that the means in columns (2) and (3) are identical. Once again, returners are older, more educated, more likely to live with a working female role model, and more likely to be African-American. They also have higher pre-birth wages and live in counties with lower average unemployment rates. Once again, the differences in average child care cost between returners and non-returners are not statistically significant.

C. Return-to-Work.

I approach estimation of the model of return-to-work in three ways. First I estimate a simple linear probability model of employment using each of the two measures of child care cost and excluding spouse or partner income.[20] Next, I speculate that the child care cost indices measure the true cost of child care faced

[19]It should also be noted that if work decisions are made jointly by a woman and her spouse or partner, this other income measure is potentially endogenous.

[20]At this stage I estimate a linear probability model so that the results may be easily compared to the IV estimation results. Results from estimation with a probit model are qualitatively unchanged except

by these women with some error and thus use each as an instrument for the other while continuing to omit spouse or partner income. Finally, I reestimate the OLS model on the sub-sample with spouse or partner income data, controlling for other family income.

The employment pattern illustrated by Figure 2 suggests estimating a more "dynamic" model of weeks to return to work following birth such as a tobit or hazard model. The results from estimating a tobit model of weeks to return to work censored at 52 weeks, although not reported in this paper, are consistent with the OLS estimates discussed below. Women with higher wages and more education return to work more quickly following birth, and women facing higher child care costs and having higher other family income delay their return to work longer after birth. This should not be surprising, however, since none of the variables vary over the weeks following birth.

1. Ordinary least squares model, excluding spouse or partner income.

Building on equation (4) I use OLS to estimate the best linear approximation of the following model, using the pre-birth wage as a proxy for the post-birth offered wage[21]:

$$Pr[working\ 1\ year\ after\ birth] = \eta_0 + \eta_1 wage + \eta_2 C + Z\eta_3 + \eta_4 UR + \eta_5 URpost + \mu, \qquad (3)$$

where *wage* is the wage in the fourth quarter before birth, *C* is the child care cost variable, *Z* is a matrix including age, education, and indicator variables for having a working female role model, being African-American, and having one of the child's grandparents in the household, *UR* is the county unemployment rate in the birth year, and *URpost* is the county unemployment rate in the year following the birth year, .

First, I estimate the model specified in equation (3). These results are presented in columns (1) and

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that the wage effect is larger when evaluated at the means.

[21]Pre-birth wage is the best approximation I have of the wage women actually face when making their return-to-work decision. Because I am looking at these women over such a small time frame, I assume that there is minimal wage erosion over the period.

(2) of Table 2. In both OLS models the cost variables have a negative effect on the probability that a woman returns to work after birth although only the average child care worker wage measure of cost has a statistically significant effect. In both specifications, wages have a positive and significant effect, and all other results are very similar. Having more education and having had a working female role model both increase the probability that a woman will return to work after giving birth.[22]

Considering columns (1) and (2) of Table 2, the child care worker wage reflects an hourly cost while the SIPP child care expenditure measures a weekly cost. Therefore, in order to compare the coefficient on the hourly child care worker wage measure to the weekly expenditure measure, the SIPP cost coefficient needs to be scaled by average weekly hours. In addition, hourly child care costs are likely to be some portion of the average child care worker wage. First, assuming these women need an average of 36 hours of childcare per week, the SIPP cost coefficient is scaled up by a factor of 36 making the coefficient estimates from the two cost measures quite similar.[23] However, given the Census Bureau estimates from SIPP cited above, hourly child care cost would be predicted to be at most 56 percent of average child care worker wages.[24] Thus, the cost coefficient estimate from average child care worker wages is nearly doubled moving the coefficient estimates further apart.

To compare the effects of the different child care cost measures on the probability of returning to work, I calculate the difference in probability of returning to work while living in an average cost state

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[22]If the model is estimated including the women who do not live with a spouse or partner, the sample size rises from 1,700 to 2,048, the wage and child care cost coefficients increase slightly in magnitude, and the coefficient on the regression adjusted weekly child care expenditure is statistically significant.

[23]Women whose youngest child is under one year work an average of 36 hours per week according to U.S. Bureau of Census(1992) estimates from the SIPP, Fall 1988.

[24]As noted above, U.S. Bureau of Census(1992) estimates women with at least one child under age one spend an average of $88.60 on child care per week and work an average of 36 hours per week. This $2.46 per hour cost in 1997 dollars is 56 percent of the mean state average child care worker wage of $4.43.

versus living in a high cost state defined as being one standard deviation above the mean. Moving from Pennsylvania to California in 1988, the probability of returning to work decreases about 2.4 percentage points using the average child care worker wage measure of cost. The SIPP average weekly expenditure estimates a decrease of only 0.6 percentage points in probability for this same move from Pennsylvania to California. More generally, a move from an average SIPP expenditure state to one standard deviation above implies about a 1.4 percentage point decrease in probability of returning to work.

The theoretical model predicts that offered wage and child care price should have coefficients equal in magnitude and opposite in sign. In comparing the wage and cost coefficients, the wage is measured in pre-tax dollars while the child care costs are measured in after-tax dollars. Assuming the coefficient on after-tax wages and child care cost equals 0.036, the tax rate would have to be 75 percent to generate the observed wage coefficient. This result can be partially reconciled if other costs of working are correlated with child care costs and thus the child care cost coefficient estimates are negatively biased.

In the theory section, I briefly discussed the problems of misspecification due to an unobserved taste variable that affects the marginal rate of substitution between leisure and money. If there is an unobserved taste-for-work variable of this type, the lower wage women observed are likely to have greater taste for work (higher t) on average than the higher wage women. As a result, wages and t will be negatively correlated in the sample, and the estimated effect of wages on the probability of working may be biased toward zero. This is just one possible explanation for the large differences in wage and cost coefficients. Additionally, problems with measurement error in the wage variable could also bias the wage coefficient toward zero. This bias could be exacerbated by the inclusion of age and education which are highly correlated with wages and may be measured with less error. On the other hand, age and education may be important independent predictors of returning to work and omitting them may bias upward the

wage coefficient.[25]

2. Instrumental variables estimation, excluding spouse or partner income.

Given that the above measures of child care cost measure true child care cost with some error, I am concerned that the OLS estimates may be biased. However, assuming that the measurement errors in the two cost indicators are uncorrelated with each other in the limit, instrumental variable estimation may be used to get consistent parameter estimates. Therefore, I reestimate columns (1) and (2) of Table 2 using each cost measure as an instrument for the other. Column (3) of Table 2 presents the results from instrumenting for the child care worker wage measure with the SIPP average weekly expenditure measure, and column (4) presents the results of instrumenting for the SIPP weekly expenditure measure with the child care worker wage measure. As expected, the cost coefficient increases in magnitude in both equations; however, because the results are broadly consistent with the OLS results and have much larger standard errors, I continue the analysis using OLS results.

3. Estimates including spouse or partner income.

To address the importance of omitting spouse/partner income, I begin by reestimating the models of columns (1) and (2) of Table 2 using the sample that has complete income information while continuing to exclude spouse/partner income from the model. The results are presented in columns (1) and (3) of Table 3. Excluding these observations slightly increases the effect of average child care worker wages on the decision to return to work but has little effect on any other coefficients. Columns (2) and (4) then reestimate columns (1) and (3) including the measure of other income. The cost coefficient is diminished slightly in column (2) relative to column (1), and the coefficients on wage, age, and education increase

[25]Even excluding age and education from the estimation, the wage coefficient never increases enough to eliminate this difference. The difference in the wage coefficient estimates between the probit and linear probability models also will not account for the difference.

slightly in magnitude. Spouse/partner income behaves as predicted by the model: the higher a woman's partner's income, the less likely she is to return to work.[26] If other income is allowed to enter separately for women with spouses and women with partners, spouse other income has a coefficient of !0.004 with a standard error of 0.001 with either child care cost measure. The partner other income variable has a coefficient of !0.005 in both equations and standard errors of 0.004 and 0.005. Finally, sixty-four observations have other income calculated to be $0. When these observations are excluded, average child care worker wages becomes slightly more important. The coefficient falls to !0.034 with a standard error equal to 0.015. The child care expenditure coefficient remains unchanged while the coefficients on other income, female role model, and African-American increase in magnitude across both columns, and the education coefficient decreases slightly.[27]

The calculated child care cost, wage, and family income elasticities of employment provide one way to compare the results of this study to others. The column (2) specification of Table 3 implies a child care cost elasticity of !0.36.[28] This estimate is very similar to the average price elasticities of employment of !0.38 by Blau and Robins(1988) calculated over a range of child care costs, !0.31 by Kimmel(1992) for married women using her preferred child care cost measure, and -0.38 by Powell(1997) for married women using predicted cost of child care. Ribar(1995) and Connelly(1992a) calculate much smaller elasticities of !0.09 and !0.20, respectively, while that of Ribar(1992) is much higher at !0.74.[29]

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[26]Very few observations are affected by the income top-coding, and including an indicator for the presence of a top-coded income measure has no important effects on the results and is statistically significant only at the 10 percent level.

[27]I have explored including indicators for the birth year of the child. The results are qualitatively unchanged.

[28]Elasticities are calculated at the mean employment rate and the mean average child care worker wage across observations or the mean weekly child care expenditure (unadjusted).

[29]When the column (4) specification is used, the elasticity is smaller than even the smallest estimates of Ribar(1995) and Connelly(1992a) at !0.03.

The wage elasticity of labor force participation is much smaller at 0.12 than those estimated by Ribar(1992) and (1995) of 0.68 and 0.53, Kimmel(1992) of 0.58, and Powell(1997) of 0.85, but is larger than the 0.04 calculated by Michalopoulos, Robins, and Garfinkel(1992)[30]. Finally, the other-income elasticity of !0.04, is very similar to the estimates of Michalopoulos, Robins, and Garfinkel(1992) and Ribar(1995): !0.01 and !0.05, respectively.

Although more education seems to increase the probability that a woman will return to work after first-birth, this result has several possible interpretations. It may be that women who get more education do so because they are more committed to the labor force and thus are more likely to go back to work. Alternatively, it may be that women with more education are more likely to hold jobs from which they can take leave as opposed to having to quit and hence they face lower costs of returning to work after birth. Finally, as discussed above, this may be reflecting part of the wage effect due to the high correlation of education with wages and possible measurement error in the wage variable.

The working female role model variable was included to capture the idea that women may have different views about the appropriateness of working when they have children. Although a woman may view working when she has a young child differently than when she has a child aged 14, this is the only role model information available. Across all estimated equations, this variable has a consistent positive and significant coefficient. One might be concerned that this variable is reflecting an inter-generational correlation in income status rather than a role model effect per se. For example, poor women may be more likely to work, and their children may be more likely to be poor and hence more likely to work, also. However, including other family income should help control for wealth, and the role model coefficient remains virtually unchanged when unearned income is included.

As for other variables in the model, older women are more likely to return to work after birth once

[30]Even if mother's age and education at child's birth are omitted from the estimation, the wage coefficient is never large enough to generate an elasticity as large as the cited studies.

other income is controlled for, although again this may partially be picking up part of the wage effect. Contrary to expectations, having a parent or grandparent in the household does not seem to affect the reemployment rate suggesting that parents and grandparents may not serve as a major source of child care. While having a parent or grandparent in the home and the decision to return to work may be simultaneously determined, omitting the grandparent indicator does not change the coefficient estimates significantly. A more ideal indicator of access to lower cost child care would be a measure of having relatives in close proximity, but this information is only available for one year of the NLSY. Finally, at the 10 percent level of significance, African-American women in this sample are more likely than the other women in this sample to go back to work, but neither higher county unemployment rates nor rising unemployment rates seem to significantly affect the probability that a woman returns to work after first-birth.

4. Implications of the Estimates

Using column (2) in Table 3 to explore some of the implications of the estimates, I simulate the effects of various external factors on the probability of returning to work. First, considering potential increases in child care subsidization, I look at the probability of returning to work evaluated at the twenty-fifth percentile cost relative to the mean cost. This amounts to a 12 percent decrease in cost and a 2 percent increase in the probability of returning to work.

Next, as women delay child bearing they are more likely to return to work quickly holding wage constant. Since wages generally increase over those years of delayed child bearing, older mothers will have an additional tendency to return to work quickly due to the higher opportunity cost of not working. On average the probability of returning to work is 0.78. The probability of returning for a twenty-year-old earning the average wage of twenty-year-old mothers in this sample is 0.72. For a thirty-year-old mother earning average wages for a thirty-year-old in this sample, the probability increases to 0.87.

Finally, from 1988 to 1991 the percent of preschoolers cared for by their father rose from 15 to

20.[31] This number fell back to 16 percent in 1993 according to the most recent Census report.[32] As suggested by the Census Bureau, this temporary rise in percent of children being cared for by their fathers in 1991 may be attributed to higher unemployment and underemployment of fathers. This is consistent with the possibility that worsening employment opportunities for women's spouses and partners during part of the sample period have encouraged more women to return to work sooner after child birth. Looking at a high wage woman (wage at the seventy-fifth percentile) with a high level of other family income (at the seventy-fifth percentile), her probability of returning to work in the first year is 0.79. If instead she faces low other family income (in the twenty-fifth percentile), the probability she returns within a year rises to 0.82.

From these crude estimates it looks as though delayed child bearing will play a much more important role in increasing women's labor force participation shortly after child birth, and hence their overall actual work experience accumulation, than small increases in child care cost subsidization or the effects of changing employment opportunities for their spouses and partners. Another interesting long-term implication of the increased labor force participation of mothers today is that their daughters may be additionally more likely to participate in the labor force. Thus we should expect to see continued participation rate increases with new cohorts entering the labor force.

IV. Conclusion.

This paper attempts to analyze the effects of child care cost, potential wages, and other family income on a woman's decision to return to work shortly following the birth of her first child. The model developed from a utility maximization framework predicts that child care cost and other family income will have a negative effect on the probability of returning to work while potential wages will have a positive

[31]U.S. Bureau of the Census(1994).

[32]U.S. Bureau of the Census(1996).

effect. A simple comparison of means of cost, wages, and other income for returners and non-returners shows differences as predicted by the model that are significant for the wage measure. Further multivariate analysis confirms these results for wages and indicates that child care costs and other family income also have statistically significant effects on the probability of returning to work. The estimates suggest that the elasticity of the re-employment rate for new mothers with respect to child-care costs is about -0.36, while the elasticity with respect to other family income is about ! 0.04. Finally, the elasticity with respect to the mother's wage is about 0.12. Additionally, mother's education and having had a working female role model have statistically significant positive effects on the probability a woman returns to work.

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Table 1a. Data description for mothers at the time of their first birth.

Variable Description	Full Sample	Spouse or partner	Regression sample	Return: yes	Return: no	t-value
Woman reports having a spouse or partner present.	0.78 (0.41)	1 (0)	1 (0)	1 (0)	1 (0)	---
Worked within 51 weeks before birth.	0.76 (0.42)	0.79 (0.40)	1 (0)	1 (0)	1 (0)	---
Returned to work within 51 weeks after birth.	0.62 (0.49)	0.64 (0.48)	0.77 (0.42)	1 (0)	0 (0)	---
State average wage for child care workers	4.38 (0.76) N=3302	4.40 (0.77) N=2565	4.46 (0.78)	4.47 (0.78)	4.42 (0.79)	1.21
Regression adjusted, state average weekly child care expenditure	!6.20 (11.92) N=3211	!5.68 (11.48) N=2529	!5.12 (11.60)	!5.03 (11.56)	!5.45 (11.72)	0.63
Hourly wage fourth quarter before birth.	9.27 (5.04) N=2237	9.61 (5.16) N=1863	9.57 (5.05)	9.98 (5.26)	8.15 (3.96)	7.39
Hourly wage fourth quarter after birth.	9.66 (5.88) N=1625	10.04 (6.13) N=1332	10.64 (6.41) N=1056	10.64 (6.41) N=1056	---	---
Spouse or partner income divided by 1000.	2.55 (3.52) N=2446	2.55 (3.52) N=2446	2.92 (3.75) N=1578	2.87 (3.39) N=1231	3.09 (4.82) N=347	0.79
Mother's age in years at child's birth.	23.23 (4.20)	23.85 (4.09)	24.67 (3.94)	24.92 (3.91)	23.77 (3.91)	5.10
Mother's education in years by the birth year.	12.42 (2.29) N=3466	12.69 (2.31) N=2706	13.10 (2.16)	13.27 (2.17)	12.53 (2.00)	6.26
Equals 1 if adult female in mother's household worked when mother was 14.	0.52 (0.50) N=3395	0.53 (0.50) N=2653	0.54 (0.50)	0.56 (0.50)	0.49 (0.50)	2.45
Parent, step-parent, or grandparent of mother resides in household in birth year.	0.30 (0.46)	0.17 (0.38)	0.15 (0.36)	0.15 (0.35)	0.18 (0.38)	1.42
Mother's race is black.	0.23 (0.42)	0.13 (0.34)	0.12 (0.33)	0.13 (0.34)	0.09 (0.29)	2.11
County unemployment rate in birth year.	7.88 (3.27) N=3248	7.82 (3.27) N=2516	7.67 (3.18)	7.54 (3.09)	8.12 (3.43)	3.00
County unemployment rate in year following the birth year.	8.07 (3.33) N=3159	7.95 (3.33) N=2437	7.75 (3.29)	7.62 (3.16)	8.20 (3.66)	2.85
Observations	3468	2707	1700	1314	386	

Notes: All means are unweighted. N is noted where different from the base sample size. Wages and income are in real 1997 dollars. Standard deviations are in parentheses.

Table 1b. Data description for mothers at the time of their first birth. Sub-sample with other income available for all observations.

Description	Regression sample	Return: Yes	Return: no	t-value
Woman reports having a spouse or partner present.	1 (0)	1 (0)	1 (0)	—
Worked within 51 weeks before birth.	1 (0)	1 (0)	1 (0)	—
Returned to work within 51 weeks after birth.	0.78 (0.41)	1 (0)	0 (0)	—
State average wage for child care workers	4.46 (0.78)	4.46 (0.78)	4.43 (0.79)	0.68
Regression adjusted, state average weekly child care expenditure	!5.18 (11.78)	!5.09 (11.72)	!5.50 (12.01)	0.57
Hourly wage fourth quarter before birth.	9.63 (5.09)	10.02 (5.31)	8.23 (3.95)	6.89
Hourly wage fourth quarter after birth.	10.64 (6.43) N=1001	10.64 (6.43) N=1001	—	—
Spouse or partner income divided by 10000.	2.92 (3.75)	2.87 (3.39)	3.09 (4.82)	0.79
Mother's age in years at child's birth.	24.69 (3.86)	24.92 (3.82)	23.86 (3.91)	4.50
Mother's education in years by the birth year.	13.15 (2.15)	13.31 (2.17)	12.62 (2.00)	5.57
Equals 1 if adult female in mother's household worked when mother was 14.	0.53 (0.50)	0.55 (0.50)	0.48 (0.50)	2.24
Parent, step-parent, or grandparent of mother resides in household in birth year.	0.14 (0.35)	0.13 (0.34)	0.16 (0.37)	1.24
Mother's race is black.	0.11 (0.31)	0.12 (0.32)	0.08 (0.28)	2.05
County unemployment rate in birth year.	7.66 (3.21)	7.54 (3.13)	8.10 (3.43)	2.73
County unemployment rate in year following the birth year.	7.72 (3.31)	7.59 (3.19)	8.19 (3.67)	2.75
	1578	1231	347	—

Notes: All means are unweighted. N is noted where different from the base sample size. Wages and income are in real 1997 dollars. Standard deviations are in parentheses.

Table 2. OLS and Instrumental Variable Estimates of the Labor Force Participation Model.

	OLS		IV	
	(1)[a]	(2)[a]	(1)[b]	(2)[b]
State average child care worker wages	!0.031 (0.015)	—	!0.059 (0.050)	—
Regression adjusted weekly child care expenditure	—	!0.001 (0.001)	—	!0.006 (0.003)
Pre-birth wage	0.009 (0.003)	0.009 (0.003)	0.010 (0.003)	0.010 (0.003)
Mother's age in birth year	0.006 (0.004)	0.005 (0.003)	0.008 (0.005)	0.009 (0.004)
Mother's education at birth year	0.015 (0.006)	0.015 (0.006)	0.014 (0.006)	0.014 (0.005)
Role model work	0.049 (0.020)	0.049 (0.020)	0.050 (0.022)	0.049 (0.022)
Grandparent	0.014 (0.031)	0.009 (0.031)	0.020 (0.028)	0.019 (0.028)
African-American	0.054 (0.029)	0.052 (0.029)	0.055 (0.028)	0.044 (0.029)
Unemployment rate in birth year	!0.006 (0.006)	!0.006 (0.006)	!0.008 (0.006)	!0.010 (0.006)
Unemployment rate in year following birth year	<0.001 (0.006)	<0.001 (0.006)	<0.001 (0.006)	0.003 (0.006)
Intercept	0.500 (0.103)	0.384 (0.095)	0.582 (0.182)	0.281 (0.116)
N	1700	1700	1700	1700

Note: Standard errors are in parentheses.

[a] Standard errors have estimated using the two-sample correction suggested by Murphy and Topel(1985) and take into account heteroskedasticity. They have not been corrected for cost varying only across states and over time.

[b] Standard errors have not been corrected for using estimated cost measures but have been corrected for heteroskedasticity and cost varying only across states and over time.

Table 3. OLS Estimates of the Labor Force Participation Model, Controlling for Spouse or Partner Income.

	(1)[a]	(2)[a]	(3)[a]	(4)[a]
Child care worker wage	!0.036 (0.015)	!0.032 (0.015)	—	—
Weekly child care expenditures	—	—	!0.001 (0.001)	!0.001 (0.001)
Pre-birth wage	0.009 (0.003)	0.010 (0.003)	0.008 (0.003)	0.010 (0.003)
Spouse or partner income divided by 10000	—	!0.010 (0.004)	—	!0.010 (0.004)
Mother's age in birth year	0.006 (0.004)	0.007 (0.004)	0.004 (0.004)	0.006 (0.004)
Mother's education at birth year	0.013 (0.006)	0.014 (0.006)	0.013 (0.006)	0.014 (0.006)
Role model work	0.046 (0.021)	0.045 (0.021)	0.046 (0.021)	0.045 (0.021)
Grandparent	0.013 (0.032)	0.009 (0.032)	0.008 (0.032)	0.004 (0.032)
African-American	0.055 (0.030)	0.052 (0.031)	0.053 (0.031)	0.050 (0.031)
Unemployment rate in birth year	!0.005 (0.006)	!0.005 (0.006)	!0.004 (0.006)	!0.004 (0.006)
Unemployment rate in year following birth year	!0.002 (0.006)	!0.002 (0.006)	!0.001 (0.006)	!0.001 (0.006)
Intercept	0.559 (0.107)	0.504 (0.108)	0.430 (0.098)	0.385 (0.099)
N	1578	1578	1578	1578

Note: Standard errors are in parentheses.

[a] Standard errors have estimated using the two-sample correction suggested by Murphy and Topel(1985) and take into account heteroskedasticity. They have not been corrected for cost varying only across states and over time.

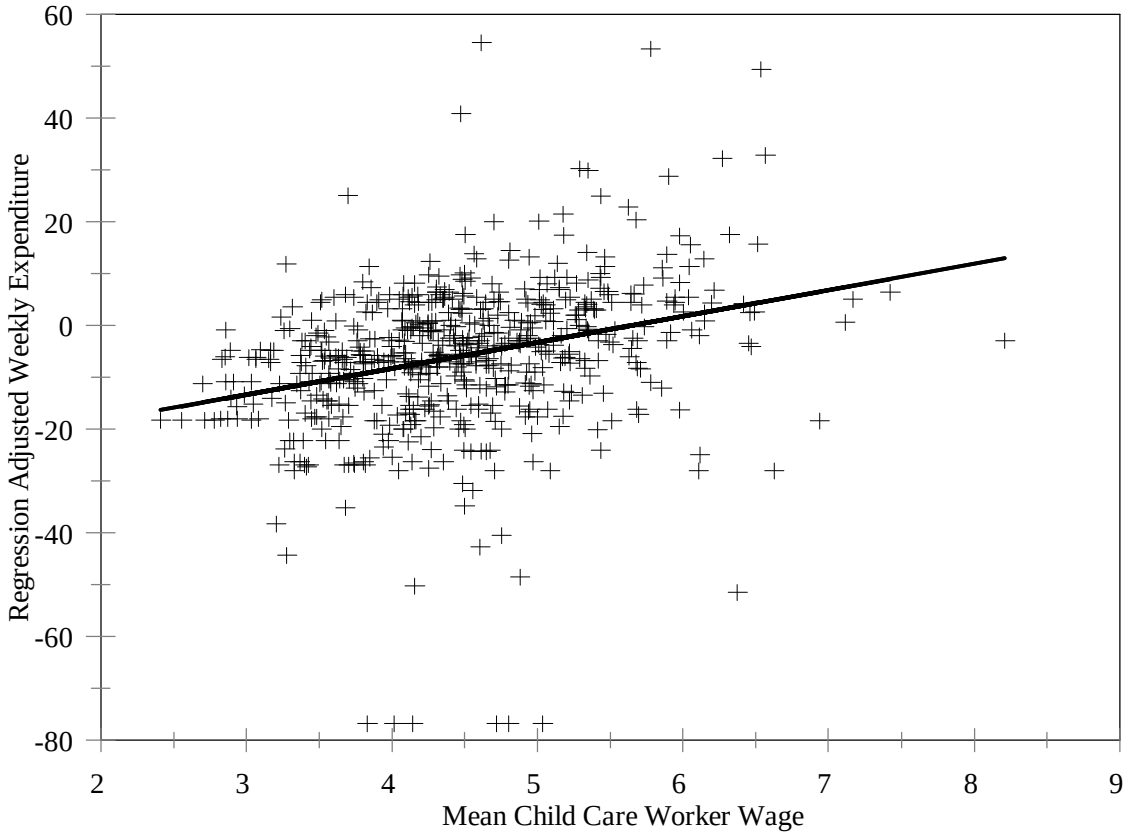

Figure 1. Weekly child care expenditure versus average child care worker wages by state and year.
Notes: Correlation between measures is 0.30.

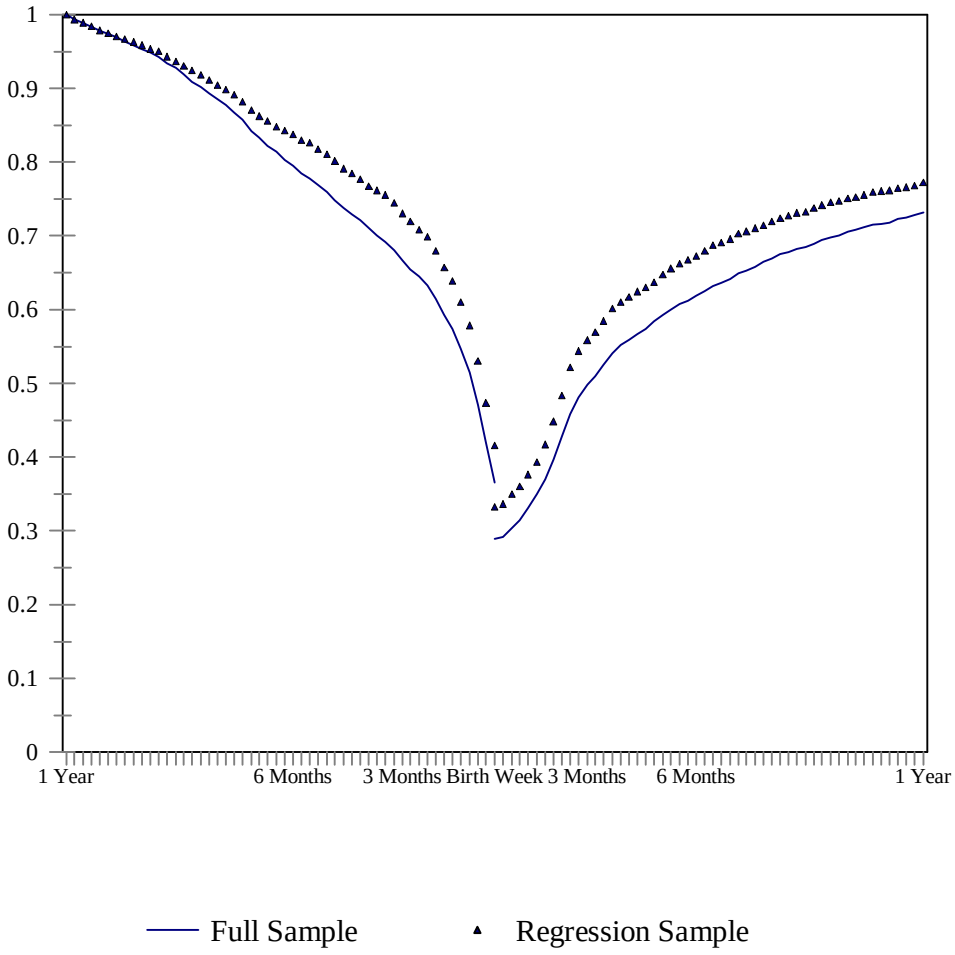

Figure 2. Employment rate by weeks surrounding first birth for all women who worked before first birth and for the regression sample.
N=2495, N=1700

Appendix

I. Theoretical Model

I model a woman's return-to-work decision as a utility maximization problem with child care expenditures entering the budget constraint and hence affecting the employment decision. First, I assume a woman makes her labor force participation decision by maximizing her utility, taking her husband's labor force participation and income as given.[1] Her problem is to maximize:

$$U(X,D,L) s.t. \quad (a)\ p_x X + p_d D \le wH + Y$$
$$(b)\ H + L = T$$
$$(c)\ 0 \le H \le T, 0 \le L \le T.$$

where X is a composite good excluding day care and leisure, p_x is the price of X, D is the hours of day care demanded, p_d is the hourly price of day care, H is the number of hours the woman works, w is the wage rate, Y is her husband's income plus other unearned income, T is the total time constraint, and L is the number of leisure hours.[2] In modeling the decision this way, I am implicitly assuming that maternal and market child care are good substitutes.

Assuming additionally that $H < T$ and $D=H$, the optimization problem can be written[3],

$$\ell = U(X,L) - \lambda\left[p_x X + (w - p_d)L - ((w - p_d)T + Y)\right] + \delta(T - L), \tag{1}$$

with the associated conditions:

$$(a)\quad U_1 - \lambda p_x = 0,$$
$$(b)\quad U_2 - \lambda(w - p_d) - \delta = 0,$$
$$(c)\quad \lambda[p_x X + (w - p_d)L - ((w - p_d)T + Y)] = 0,$$
$$(d)\quad \delta(T - L) = 0,$$

where $\lambda > 0$ is the marginal utility of wealth and δ is a non-negative slack variable associated with the woman's hours of work decision. From condition (b), $w - p_d = U_2/\lambda - \delta/\lambda$. Calling U_2/λ the reservation wage, $w^*(H)$, the first order condition can be rewritten as $w - p_d = w^*(H) - \delta/\lambda$. If the woman works, $\delta=0$, the net wage exceeds the reservation wage evaluated at $H=0$, and hours of work are chosen such that $w - p_d = w^*(H)$ when $H>0$.

For simplicity, I assume a utility function consistent with linear labor supply,

$$H_i = \beta_1(w_i - p_{di}) + \beta_2 Y_i + Z_i\beta_3 + \gamma_i \tag{2}$$

for individual i where Z is a vector of demographic characteristics and γ is an error term. The linear labor

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[1]The validity of this assumption is certainly debatable, and future analyses could model the labor supply decisions of a woman and her spouse/partner as a joint decision.

[2]Below I will assume a linear labor supply function. See Stern (1984) for discussion of the form of the utility function and more on the implications of the assumption.

[3]I am assuming that day care is specifically purchased to cover hours worked and that a woman's leisure time includes time she spends caring for her children. Certainly, women may hire child care during their leisure hours, but I consider these non-work child care hours to be a separate good included in the composite good.

supply function restricts the coefficient on the wage net of child care costs to be the same regardless of the level of the wage. This is the easiest form to model empirically; however given that my measures of cost are indices of the true cost of child care, I will not impose the additional restriction during estimation that the coefficients on wages and costs are equal. Substituting the budget constraint into (2) and solving for the reservation wage,

$$w_i^*(0) = a_1 Y_i + Z_i a_2 + m_i \tag{3}$$

where $a_1 = !ß_2/ß_1$, $a_2 = !ß_3/ß_1$, and $\mu_i = !?_i/ß_1$. The probability that a woman works can be represented by

$$\Pr(H_i > 0) = \Pr\left[(w_i - p_{di}) > w_i^*(0)\right] = \Pr\left[m_i < (w_i - p_{di}) - a_1 Y_i - Z_i a_2\right]. \tag{4}$$

Thus, higher child care costs and lower wages will decrease the probability that a woman will go back to work. Assuming that leisure is a normal good, higher other family income will also decrease the probability of returning to work.

An important consideration is that there may be unobserved taste shifters that have not been specified in the model. For example, let t reflect taste for work and enter the model by affecting the marginal rate of substitution between leisure and money, i.e. let U=U(X, $t^{!1}$L). Condition (b) then becomes $w!p_d=(t^{!1})U_2/?!d/?$, where d=0 if a woman works. The greater the taste for work(the greater t), the lower the net wage needed to exceed $(t^{!1})U_2/?$. Thus, correlations between t and wages or child care costs can lead to biased estimates of their effects on the probability of returning to work. This issue is further discussed in light of the estimation results.

II. Data

A. Child Care Cost Measures.

The state average child care worker wage is the weighted average by state and year of hourly earnings of all surveyed workers in the 1979-1993 NBER CPS Annual Earnings File Extracts who report a three-digit occupation code for child care workers, private household, or for child care workers, except private households. Hourly earnings are calculated as hourly earnings where reported and as edited usual weekly earnings divided by edited usual weekly hours, otherwise. Hourly earnings less than $0.50 and above the 95th percentile for the year are dropped. Weights used are the earnings weights provided in the CPS data.

The second measure of child care cost is regression adjusted average weekly child care expenditure by state and year using child care expenditure data from the 1984-1993 SIPP topical modules.[4] Because the survey does not exist before 1984, women with first births before 1984 are assigned the 1984 regression adjusted state mean child care expenditure for their state of residence in the birth year. For the 1984 SIPP, the grouped states are slightly different than in subsequent survey years. For 1984, the grouped states are: (1) Maine and Vermont, (2) Idaho, New Mexico, S. Dakota, and Wyoming, and (3) Mississippi and West Virginia. After 1984, the grouped states are: (1) Maine and Vermont, (2) Iowa, North Dakota, and South Dakota, and (3) Alaska, Idaho, Montana, and Wyoming. Also, the data collected before 1988 only provide information on hours cared for under the primary child care arrangement, and only information on total child care expenditure on all children is collected. As a result, no hours information is provided for secondary child care arrangements and thus hourly child care costs cannot be calculated directly. Finally, data from the 1984, 1985, and 1992 panels ask topical module questions on child care expenditure in the fifth and sixth waves; all other years ask in the third wave. As a result, the

[4]For a more detailed discussion of the SIPP child care data see Connelly(1992b).

reference months for these panels are actually in the year following the panel year for at least some rotation groups. I use these data for calculating the regression adjusted averages for the birth years equal to these panel years.

The averages are calculated controlling for hours, hours squared, number of children age 0 to 5, number of children age 6-10, and indicators for the use of non-relative care as one source of child care, the use of school as one source of child care, and the child's home as one place care is provided. Across most years, hours, number of children under 5 years of age, and using non-relative care have significant, positive effects on weekly child care expenditure while hours squared and having care received in the child's home have significant, negative effects on weekly child care expenditure. Finally, in later years utilizing school-based care also significantly reduces weekly child care expenditure.

B. NLSY Data.

The wage and employment data before and after birth and mother's age at birth come from the NLSY 1994 Child file and were constructed or measured in relation to the birth of the child. The pre-birth wage is the wage recorded for the fourth quarter before birth, and the post-birth wage is the wage recorded for the fourth quarter after birth. All wages are in real 1997 dollars. Wages less than $1 and greater than $160 are recoded to missing. Other variables I use come from the Youth file and relate to the survey year which may or may not match up well with the birth year depending on the month of birth. For determining the usual residence of the child, I count the child as living with the mother if his or her usual residence is coded as in the mother's household either in the survey year of the birth year or in the survey year after the birth year. Similarly, a spouse or partner or mother's mother/grandmother/step-mother/father/grandfather/step-father is present if the mother reports so either in the birth year or in the survey year following the birth year. Mother's education is the highest grade completed in the survey year of the birth year or the most recent available record from previous years since the variable is missing unless the status has changed from the previous year. If highest grade completed is ungraded it is considered missing.

The unemployment rate data included in the Youth geographic data are county unemployment data from the *County and City Data Book*. The unemployment rate at birth is measured as the unemployment rate in the birth year, and the unemployment rate after birth is measured as the unemployment rate in the survey year after the birth year. The state of residence is the residence reported in the survey year of the birth year unless the code is missing in which case it is the state reported in the survey year following the birth year. The child care cost variable is then matched by these state codes.

From 1979 to 1989, respondents were asked for total income for their partner in the previous year. After 1989 respondents are asked for partner income broken down into several categories. Spouse income for all years is reported broken down into several categories. Other income for women with partners from 1979 to 1989 is partner income as reported in the following survey year. Other income for women with spouses for all years is calculated as annual spouse income from wages and salary plus any farm or own business income plus spouse unemployment compensation plus respondent or spouse income from food stamps and other sources. Other income for women with partners from 1990 to 1993 is calculated as total partner income from wages and salary plus any farm or own business income plus partner's total welfare income. To minimize the loss of observations from missing information, other income is used as calculated for the year of the birth or the year after birth. All income is top-coded at $75,001 for 1979-1984 and at $100,001 for 1985-1993. Income is in real 1997 dollars.