The Effects of Maternity Leave Benefits on Labor Market Outcomes

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This paper investigates the effects of maternity leave benefits on the labor market outcomes of mothers with newborn babies in the United States. This paper estimates the effect of maternity leave benefits after controlling for substantial intrinsic differences between maternity leave covered and uncovered workers. The fixed effects estimation method is used to analyze the wage effect. Also, more explanatory variables are added to control for heterogeneity in the analysis of the turnover and employment effects. The results support the hypothesis that maternity leave coverage is beneficial on women's labor market outcomes. Maternity leave significantly lessens turnover one year after childbirth, and is closely related with more employment outcomes after childbirth. Maternity leave also provides beneficial effect on wage profiles especially through encouraging covered women to work more hours. Maternity leave covered workers have maintained far steeper wage profiles before giving birth than uncovered workers. However, wage premium from maternity leave coverage is not large enough to cancel the negative effects of childbearing. Also, uncovered workers who start new jobs see their wages "rebound" after giving birth. This makes the slope of hourly wage profiles of uncovered workers similar with those of covered workers after giving birth.

Keywords: Maternity leave, Turnover and employment, Wage profile, Unobserved heterogeneity

JEL Classification: J1, J2, J3

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I. Introduction

The job-reinstatement rights that maternity leave benefits provide are believed to help women workers to return to their pre-birth employment. They also help to extend job tenure without fertility-related career interruption, contributing to a steeper wage profile. However, there may be an endogeneity problem between wages and maternity leave benefits. Jobs that offer these benefits may be correlated with higher wage. Women who have unobserved ability or greater labor force attachment may also self-select into jobs with such coverage. Therefore, in an assessment of the effect of maternity leave benefits, it is necessary to control for intrinsic differences between workers who are and are not covered.

Previous studies have found a wage premium from past maternity leave coverage that is large enough to offset the negative effects of childbearing. Waldfogel (1998) provides evidence that seems to be required for an argument in favor of the approach to expand maternity leave coverage. During the last two decades, maternity leave policy has also attempted to increase the number of employees with maternity leave coverage by legislative mandates that required employers to offer such benefits. However, Waldfogel (1998) does not examine the fact that regardless of prospectiveness of using that benefit there exist a significant amount of wage premium from maternity leave coverage. Also, a large premium which is found in the current wages of past maternity leave covered workers does not seem to solely come from the beneficial effects of maternity leave coverage.

This paper investigates the effects of firms' provision of maternity leave benefits on labor market outcomes such as turnover, employment, and wages. Analyzing labor supply behavior is important to figure out the effects of maternity leave policy more exactly. This clearly reveals the necessity to control for intrinsic differences among workers and shows when and how maternity leave benefits works.

Heterogeneity issue is important in analyzing the effects of maternity leave. In the maternity leave case which is related with women's work and fertility, there can be another factor besides unobserved ability that causes heterogeneity: taste. It is possible that women who select into covered jobs may differ in tastes from those who do not. Those who got covered jobs may less likely stay

at home in order to spend more time caring for children, even though they would have had uncovered jobs. This difference in tastes affects on work hours and therefore weekly earnings, even though coverage itself has no causal effect on them. To control for individual and job heterogeneity, more suitable variables are added in the labor supply model. In the wage model, the fixed effects model is used.

This paper show that the effect of maternity leave coverage on hourly wages is mainly on fixing the wage gap, which has was been extending from the time before childbirth. The effect of child bearing on wages is big negative and even maternity leave covered group realizes slower wage growth after childbirth. Also, higher wages of maternity leave covered workers partly comes from their heterogeneity that make them come up with covered jobs. However, if labor supply factor is added to this picture, then the effect of maternity leave benefits would be more clearly shown. This paper finds that maternity leave benefits maintains work hours after the childbirth, thereby tremendously extends the gap in weekly earnings that combines work hours with hourly wages. In fact, the effects of maternity leave benefits is more clearly shown on the labor supply side rather than on the wage side.

This paper proceeds as follows. Section II reviews previous studies, and Section III covers data. Section IV performs empirical analysis for the effects of maternity leave benefits on turnover, employment, and wages, using National Longitudinal Survey of Youth (NLSY). Concluding remarks follow in Section V.

II. Critical Review of Previous Studies

A substantial number of studies before the early 1990s concentrated on the question of the enactment of a nationwide leave policy. It is because the enactment of the Family and Medical Leave Act (the FMLA) took a long time from its first introduction in 1985 to its passage in 1993. Also, the enactment was late compared to other industrial nations. During that period, there was a big movement to enact the state maternity/parental/family leave statutes.

The chief goal of the state maternity leave statutes in that period was the promotion of equal employment opportunities for women.

As female labor force participation increased dramatically, gender equality in the work place became an important issue. This concept was the most recent one in the history of maternity policy, which follows the concept of the improvement of working conditions of women workers in the 19*th* century or that from the pro-natalistic motive in the 1930s.[1]

The concept of gender equality in the work place revealed in the form of job-reinstatement rights after childbirth in the implementation of state maternity leave statutes. Although the 1978 Pregnancy Discrimination Act (the PDA) can be considered as an earlier version of maternity leave policy, the perspective of the PDA was different, since it required. Maternity leave policy practiced by firms under the PDA was largely informal and discretionary especially in the perspective of the job-reinstatement right. Finally, the federal statute, the FMLA in 1993, explicitly includes the job-reinstatement right, which became an essential part of the maternity leave benefits on a national scale.

Many studies, which were inspired by the women's rights movement, strongly advocated the enactment of maternity leave statutes. They argued that a job-protected leave policy would enhance the labor market performance of women workers. They confronted the opponents by emphasizing the long-term benefits of a job-protected leave for society as well as for women.[2] In this line, Trzcinski (1991), using May 1979 and May 1983 CPS, found that wages and employment were not adversely affected in states that passed the parental leave mandates. Parental leave legislation significantly improved the labor market position of women of

[1]Maternity leave policy was originally advocated in the movement to improve working conditions of women in the early stages of industrialization in Europe, as means of protecting the health of pregnant women workers and their infants. Maternity protection was first introduced in Germany in 1883 as a part of the social insurance program by Bismarck (Kamerman 1988; and Frank and Lipner 1988). However, a more powerful motivating force for the policy was the pro-natalistic movement in the 1930s in Europe, especially in Sweden, giving rise to the second conceptualization of the policy. Therefore, some authors argued that the origin of the maternity leave policy began in Sweden (Gustafsson and Stafford 1995).

[2]A strong dissident group against the enactment of leave legislation consisted of small employers, who faced a relatively large increase in costs. Small employers argued that a mandated leave policy would hurt optimality based on the neoclassical economics.

childbearing age. This was especially the case of states with Temporary Disability Insurance (TDI). However, although she emphasized that the job-reinstatement rights were the important legislative initiative and TDI should not be directly linked to it, her empirical result was especially supportive in states with TDI. Also, her result was strongly dependent upon firm size.

Trzcinski (1991)'s result was unique in that it was not compatible with the results of other studies, which found adverse effects or, in other terms, efficiency costs. After Summers (1989) mentioned about the efficiency cost of employer mandates, many studies examine the consequences of enacting the maternity leave mandates on the labor market. The treatment group was usually women of childbearing age who lived in states which passed the mandate at a certain point of time, and the control group differed by studies. Most studies confirmed Summers (1989)'s prediction, in which the wages and employment of the benefited group would be adversely affected after the implementation of the mandates (Gruber 1994; Krueger 1994; and Gardecki 1997).

Those results were somewhat surprising to many people who thought the purpose of enacting the maternity leave mandate was to help women, as there is little study how and when maternity leave programs benefited the women they cover. Waldfogel (1998) is one exception, which investigated the effect of maternity leave policy on women' wages without linking to the enactment of the mandates, using the NLSY in the United States and the National Child Development Study (NCDS) of Britain. She found a huge increase on their current wages due to the maternity leave coverage at the time of women's most recent birth, which was big enough to offset the negative wage effect from childrearing.

The positive association between wages and maternity leave coverage may not be a causal relationship. However, in my opinion, the causal relationship can be assumed, although it is hard to establish this relationship econometrically. Finding an instrument variable for testing the exogeneity of the maternity leave coverage variable is not easy. But the real problem is that the big gap in wages between two groups are not developed after childbirth.

By overlooking the issue of heterogeneity, Waldfogel (1998) got the huge beneficial effects which was enough to offset the negative effect of childbearing. This could happen, since she missed to investigate the labor supply behavior. Heterogeneity between two

groups is more conspicuous in the labor supply behaviors than in the wage profiles. Without investigating this, she could neither identify the importance of heterogeneity nor correctly assess the effect of maternity leave policy on the wages.

III. Data

This paper employs the National Longitudinal Survey of Youth 1979 (NLSY 1979). The sample is female workers who gave birth between 1988-92 and had worked prior to giving birth. This period is chosen to alleviate the heterogeneity problem. In the early 1980s, relatively competitive firms tended to provide maternity leave benefits and the number of workers covered by maternity leave benefits was relatively small. Meanwhile, after 1993, maternity leave benefits are popular and the number of covered workers was large.

If a women workers had multiple births during that period, only the most recent birth during that period is counted. From this procedure, every worker in the sample has only one birth during that period. I refer to the birth as the reference birth. The base year, or in other term the zero year, represents the year just before childbirth. The base year information was therefore collected from an interview which occurred within one year. For example, the base year wage represents pre-birth wage.

An advantage of the sample that consists of women workers who had birth and worked prior to giving birth is that they are directly affected by the job-reinstatement rights. Since the purpose of my paper is not to investigate the effect of extending maternity leave mandates, but to investigate the effect of job-reinstatement rights on mothers' labor market performance, this sample is appropriate for the question.[3] There is a disadvantage, too. In order to account for the employment effect accurately, the transition from not-working to working also should be considered. Since my data consist of women who worked at the time of giving birth, the employment effect cannot include the transition from not-working to

[3]Some state mandates includes men in a benefited group for paternity/family/medical leave. But I do not include men in the sample as a part of the control group. According to Kane (1998), men are not a good control group for women, because their labor market outcomes are little affected by this program.

working. However, the issue of extending the labor force participation can be negligible, compared to the issue of maintaining the participation after giving birth.

Among women workers who gave birth between 1988-92 and had worked prior to giving birth, wage observations of the year of full-time student status in the panel data were deleted. The low wages of full-time student status especially at the entering year of the panel data will make the slope of the wage profiles of the college educated workers upward biased. Hourly wages which are less than a dollar are excluded. Hourly wages are deflated using the CPI.

Since information of maternity leave coverage at the base year is critical to divide the treatment group and the control group, workers who did not have that information were deleted. In that case, the treatment group is workers who were covered at the time of childbirth, and the control group is workers who were not. The effects of coverage without linking to usage would be a main concern in the perspective of maternity leave policy.

After deleting those observations, the number of observations is around 850 and they worked more than part-time (20 more hours per week) at the base year.

IV. Empirical Analysis

A. Effects vs. Heterogeneity

Although maternity leave coverage is expected to give benefits through the job-reinstatement rights, this may not be randomly determined. Systematic differences in the labor market outcomes between maternity leave covered and uncovered women workers could be partly attributed to unobserved heterogeneity. In fact, the effect of current maternity leave coverage on current wages in a simple wage equation is as high as around 10 percent even among older women who do not have any prospectiveness of using the benefits. This indicates that job characteristics which provide maternity leave is good and workers who get into this job might be intrinsically different from those who do not.

Assuming that childbearing aged women favor the maternity leave covered job, women who have unobserved ability or commitment to

the labor force may self-select into the maternity leave covered job. This is the concept of individual heterogeneity in this paper. Also, jobs that offer coverage may be different or better in the ways that are correlated with higher wages. Although in a standard labor economic theory, wages and fringe benefits are interchangeable with each other within total compensation, wages of covered jobs are not lower than those of uncovered job even after controlling for usual observable characteristics. Jobs that provide maternity leave and also pay higher wages are considered to be "good" job. This is the concept of job heterogeneity in this paper.

Therefore, the main theme of the empirical analysis of this paper is whether we can identify positive significant effect after controlling for substantial intrinsic differences. The general hypothesis of this paper is that there exist beneficial effects of the maternity leave benefits after controlling for heterogeneity.

For the turnover and employment analysis, this paper adds more explanatory variables that designate a better control for heterogeneity. Adding more explanatory variables is one way to alleviate the heterogeneity problem. Factors in the error term that are correlated with maternity leave coverage variable would be controlled for to a certain degree. Of course, a potential bias problem remains, if a significant amount of heterogeneity remains uncontrolled for even after adding more explanatory variables. For analyzing the wage effect of maternity leave policy, this paper adopts the fixed effects estimation method.[4]

Heterogeneity between the covered and uncovered groups is easily detected in the labor supply phenomenon. For instance, Figure 1 shows that the proportion of working women of the maternity leave covered group is always, before as well as after giving birth, higher than that of the uncovered group. X-axis represents the time distance from the base year. This time distance uses the assump-

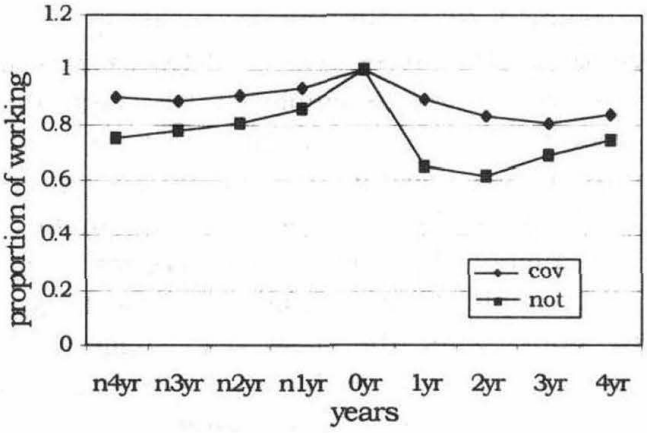
[4]The fixed effects model for turnover or employment analysis is not plausible. For example, assume that we estimate the effect of maternity leave coverage on employment a year after giving birth by the random effects logit model. A hypothetical panel data set may consist of women who had multiple births and worked at the time of childbirth. This hypothetical sample may underrepresent career oriented women who have fewer births. Also, the estimate would be affected by the proportion of the first birth or the other birth, since this would affect a woman's decision to work after giving birth.

tion of time invariance. For example, a covered women ***A*** of 1989 base year is assumed to be in the same group in 1993 with a covered women ***B*** of 1990 base year in 1994. *Y*-axis indicates the proportion of the sample that is employed. The large difference after giving birth represents the beneficial effect of maternity leave benefits on employment. However, the significant difference between two groups before giving birth suggests a systematic difference in labor force attachment between these groups. Figure 2 also suggests the same implications as Figure 1. The large difference in weekly working hours after the base year suggests the beneficial effect of maternity leave coverage. Meanwhile, weekly working hours of the covered group were always larger than those of the uncovered group.

The simple profiles for hourly wage in Figure 3 and those for weekly earnings in Figure 4 also implies the broad picture for heterogeneity as well as for the beneficial effects. Those figures also uses the assumption of time invariance. These pictures show that the average wages of the covered group is always higher than those of the uncovered groups. The gap in the wage level between covered and uncovered groups after giving birth reflects benefical effects from maternity leave coverage. There can be another possibility of beneficial effects: higher human capital investment. Women who, anticipating having maternity leave coverage at the time of childbirth, feel secure that they will continue at their current job will invest more resources into career. By removing involuntary fertility-related job separation, having jobs covered by maternity leave benefits in their earlier career provides young women with the incentive to increase human capital investment. This can make their wage profiles steep. However, in this paper, this possibility of higher human capital investment will be overlooked.

The main observation from Figure 3 is that the effects of maternity leave on hourly wages is to maintain the wages around the time of giving birth. This effect will be more significant in the profiles for weekly earnings in Figure 4 which work hours as well as hourly wages are combined.

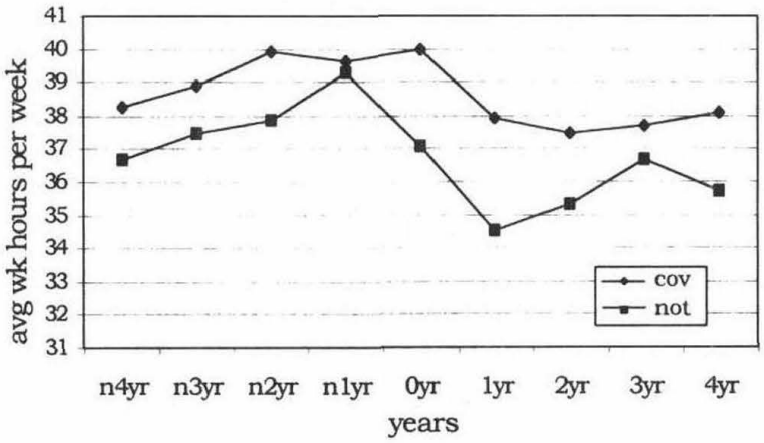
On the other hand, the significant difference in the slope as well as the level of the wage profile before giving birth suggests heterogeneity from the following reason. Maternity leave covered workers have much longer tenure than uncovered workers at the time of childbirth. Average tenure years for the former is 3.6 years



cov: proportion of working women to all women in the covered group.
not: proportion of working women to all women in the uncovered group.
Data for 3yr only includes women with reference birth year of 1988, 1989, 1990, 1991, since the 1994 data is the latest one. Data for 4yr only includes women with reference birth year of 1988, 1989, 1990.

FIGURE 1

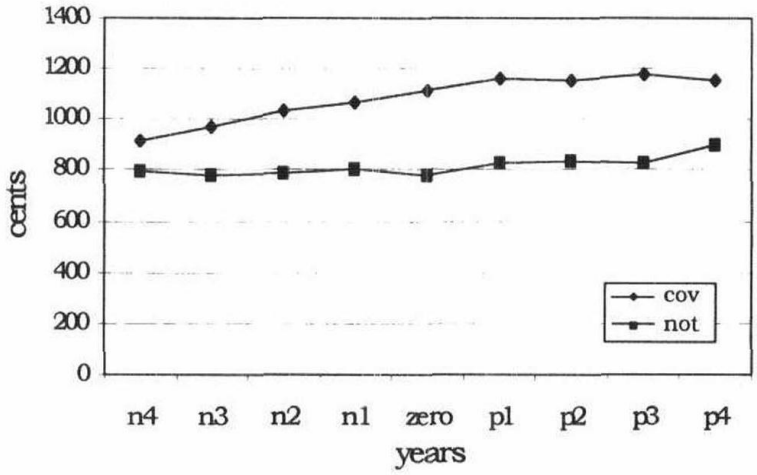
PROPORTION OF WORKING (NON-ZERO EARNINGS) BY GROUPS



cov: covered group.
not: uncovered group.
Data for 3yr only includes women with reference birth year of 1988, 1989, 1990, 1991, since the 1994 data is the latest one. Data for 4yr only includes women with reference birth year of 1988, 1989, 1990.

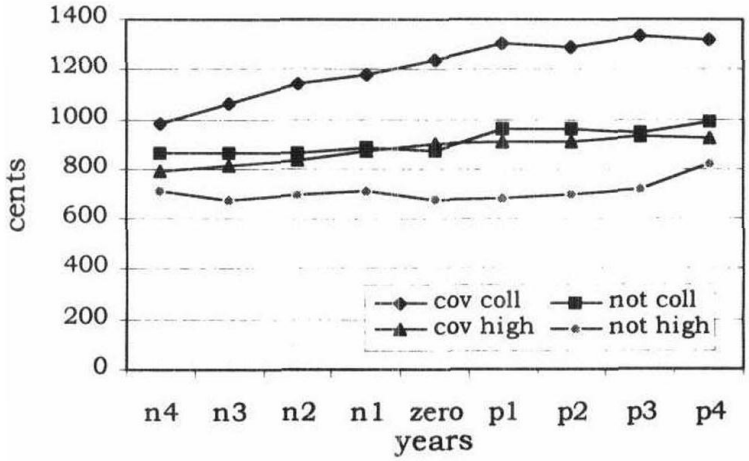
FIGURE 2

AVERAGE WORK HOURS PER WEEK BY GROUPS



cov: covered group.
not: uncovered group.

FIGURE 3
SIMPLE WAGE PROFILES OF ALL WORKERS (CPI ADJUSTED)



cov coll: college educated covered group.
not coll: college educated uncovered group.
cov high: high school educated covered group.
not high: high school educated uncovered group.

FIGURE 4
SIMPLE WAGE PROFILES BY GROUPS (CPI ADJUSTED)

TABLE 1

SUMMARY STATISTICS: WOMEN WHO HAD BIRTH DURING 1988-92 AND WORKED JUST BEFORE CHILDBIRTH

	Covered	Uncovered
(All)		
N of Obs	709	166
Age	28.0 (0.09)	27.6 (0.19)
Education (years)	13.1 (0.07)	12.4 (0.14)
Tenure (years)	3.8 (0.11)	1.7 (0.18)
Pre-birth wage (hourly, wage, cents)	1,113.2 (18.50)	785.8 (32.65)
N of Children	0.98 (0.03)	1.03 (0.08)
Experience (years)	5.54 (0.03)	4.95 (0.10)
(College Educated)		
N of Obs	344	55
Age	28.6 (0.13)	28.4 (0.32)
Education	14.8 (0.08)	14.5 (0.16)
Tenure	4.0 (0.17)	1.9 (0.31)
Pre-birth wage (hourly, wage, cents)	1,318.6 (29.28)	948.9 (65.96)
N of Children	0.79 (0.04)	0.78 (0.14)
Experience	5.74 (0.03)	5.07 (0.17)
(High School Educated)		
N of Obs	365	111
Age	27.4 (0.13)	27.2 (0.23)
Education	11.6 (0.06)	11.5 (0.11)
Tenure	3.6 (0.16)	1.8 (0.24)
Pre-birth wage (hourly, wage, cents)	919.7 (17.86)	705.0 (32.88)
N of Children	1.16 (0.05)	1.16 (0.10)
Experience	5.36 (0.05)	4.90 (0.12)

and those for the latter is 1.5 years in Table 1. Except in tenure, maternity leave covered group has little differences in the education level, number of children, and ages from the uncovered group.[5] This means during four years before childbirth, the covered group enjoyed wage growth by adding up their tenure, but the uncovered group changed their jobs and realized little wage growth. Then, this raises the question that who get into the covered jobs: someone who has unobserved characteristics.

B. Effects on Turnover and Employment

a) Model and Variables

For analyzing the effect of maternity leave on workers' turnover and employment, the model (1) estimates the effect of maternity leave on turnover and employment using the maximum likelihood probit estimation method. All women workers in the sample worked at the base year. The turnover model estimates the probability of returning to the pre-birth employer after one year. There are two categories of women workers in the turnover model: those who returned to the pre-birth job and those who did not. On the other hand, the employment model estimates the probability of working after childbirth and it additionally includes women who did not work at the point of the first year after childbirth. To avoid ambiguity in handling "employed but absent from work" status, I assume that a woman was working when her wage was observed.

$$Y_i = \boldsymbol{X}\varphi + \beta_1 \mathrm{COV}_i + \beta_2 \mathrm{MED}_i + \beta_3 \mathrm{PREWAGE}_i + \beta_4 \mathrm{UNION}_i + \beta_5 \mathrm{SIZE}_i + \sum_{k=88}^{k=91} \gamma_k \mathrm{COHORT}_i^k + \sum_{k=1}^{k=8} \theta_k D_i^{-k} + \varepsilon_i \quad (1)$$

where Y is a dummy variable for turnover or employment. In the case of turnover, Y is one if a worker returned to her pre-birth employer one year after giving birth, but zero if she changed her employer at that time. In the case of employment, Y is one if a worker worked one year after giving birth, but zero if she did not work at that time.

The maternity leave coverage variable (COV), a dummy variable which is one if a woman is covered by maternity leave benefits at

[5]All variables refer to the base year.

the base year but zero otherwise is the main concern of this paper. Starting in 1985, the NLSY collects maternity leave coverage information. NLSY questionnaire asks whether women have a job with maternity leave that allows them to go back to their old job or that pays the same amount of wages as the old one. Women who answered "yes" to this question for the base year job are classified as covered.

X is a vector of individual characteristics or, in other terms, a vector of control variables for individual heterogeneity. This includes dummy variables for college education, SMSA, marital status, actual experiences, and tenure years. Also, three dummy variables for children are included: a dummy variable of existence for children under age two except the reference child, that for children of age two to five, and that for children of age six to seventeen. Three dummy variables can be better controls than one variable of the number of children, since additional young children under age two may deter their mothers from working. Since five years of data are pooled, five cohorts (COHORT) are controlled for. Although tenure is also related with job characteristics, I include tenure in the individual characteristics. All variables are pertaining to the base year.

To control for job heterogeneity, dummy variables of medical insurance (MED), firm size (SIZE) and union membership (UNION), seven industry dummy variables, six occupation dummy variables, and the log of pre-birth wages (PREWAGE) are included.[6] Having a medical insurance indicates a "good" job. The firm size dummy variable is one if the number of employees is larger than 200 but zero otherwise. The pre-birth wages (PREWAGE) could be regarded as a measure of individual heterogeneity. Women who earned more money with the same characteristics might have unobserved ability in market work, while higher wages, holding human capital variables constant, may also reflect job heterogeneity. In this subsection, the pre-birth wage is included in the job heterogeneity

[6]I make seven industry dummy variables from 13 categories of industry for CPS job. Those are the primary industries; manufacturing; transportation and communication; whole sale and retail trade; finance, insurance, and real estate; services; and public administration. Also, I make six occupation dummy variables from 10 categories of occupation for the CPS job. Those are: managerial and professional specialties; technical; sales; administrative support/clerical; services; operator and others.

variables.

Finally, the model includes eight dummy variables indicating recent employment histories ($\sum_{k=1}^{k=8} D^{-k}$), representing part-time working or not-working during four years before the base year.[7] These eight variables indicate whether a worker has a stronger propensity to work. For example, a worker who worked part-time a year before reference birth may have less incentive to return to work after childbirth compared to workers who worked full-time at that year, even though she has the same characteristics with those. These variables may be correlated with each other. For example, a part-time worker a year before the childbirth might have worked part-time two years before. Despite of these restrictions, these variables are expected to capture the additional effect that actual experience cannot do.

b) Findings for Turnover

Table 2 reports the marginal effects from the coefficients. The marginal effect indicates the impact of a small change in the independent variable on the probability of observing the outcome. In this subsection, the maternity leave coverage variable is such independent variable and the outcome variable is returning behavior: whether she returned to the pre-birth employer. Then, the marginal effect indicates how much the coverage variable being true (=one) changes the outcome probability of returning over that of the coverage variable being false (=zero).

The estimation results indicates that the maternity leave benefits help workers to return to their pre-birth employer one year after giving birth. Without any control variables in the column [1] of all workers in Table 2, the probability that maternity leave covered workers stay with the former employers one year after childbirth is 0.216 higher than the probability that uncovered workers do so. However, this difference decreases to 0.167 after controlling for individual heterogeneity in the column (2). Women who live in the SMSA are more likely to return to the former job. Since SMSA is closely related with job characteristics, the marginal effect of this variable largely decreases after controlling for job characteristics in

[7]Eight variables are: not-working a year (D^{1}), two years (D^{2}), three years (D^{3}), or four years (D^{4}) before giving birth, and part-time-working a year (D^{5}), two years (D^{6}), three years (D^{7}), or four years (D^{8}) before giving birth.

TABLE 2

TURNOVER ONE YEAR AFTER CHILDBIRTH (THE PROBIT MODEL)

	(1) dF/dx s.err.	(2) dF/dx s.err.	(3) dF/dx s.err.	(4) dF/dx s.err.
COV	0.216(0.041)	0.167(0.040)	0.156(0.048)	0.151(0.047)
DCOLL		-0.014(0.024)	-0.025(0.026)	-0.039(0.026)
TENBASE		0.015(0.004)	0.013(0.004)	0.012(0.005)
EXPBASE		-0.001(0.006)	-0.002(0.006)	-0.003(0.006)
DRACE		-0.057(0.025)	-0.049(0.025)	-0.050(0.024)
SMSA		0.043(0.032)	0.021(0.030)	0.018(0.030)
MARRIED		0.060(0.033)	0.047(0.033)	0.055(0.033)
CHILD1		-0.072(0.036)	-0.056(0.035)	-0.053(0.034)
CHILD2		0.008(0.029)	0.009(0.029)	0.019(0.028)
CHILD3		-0.039(0.026)	-0.034(0.026)	-0.014(0.025)
MED			-0.010(0.030)	-0.006(0.030)
PREWAGE			0.031(0.031)	0.028(0.031)
SIZE			0.041(0.025)	0.036(0.024)
UNION			0.002(0.032)	-0.001(0.032)
D^{-4} (NOTN4)				0.057(0.034)
D^{-3} (NOTN3)				-0.271(0.115)
D^{-2} (NOTN2)				0.066(0.036)
D^{-1} (NOTN1)				0.085(0.026)
D^{-8} (PARTN4)				0.005(0.033)
D^{-7} (PARTN3)				-0.106(0.048)
D^{-6} (PARTN2)				0.003(0.038)
D^{-5} (PARTN1)				-0.008(0.038)
COHORT DUM.	No	Yes	Yes	Yes
INDUSTRY DUM.	No	No	Yes	Yes
OCCUP. DUM.	No	No	Yes	Yes
N of Obs	808	808	793	793
Sig of eight Dummies*				significant

Notes: * Joint significance test for eight work history dummy variables with 90 percent significance level. This is the same as Table 3.

** Not-working a year before giving birth (D^{-1}), not-working two years before giving birth (D^{-2}), not-working three years before giving birth (D^{-3}), not-working four years before giving birth (D^{-4}), part-time-working a year before giving birth (D^{-5}), part-time-working two years before giving birth (D^{-6}), part-time-working three years before giving birth (D^{-7}), part-timenot-working four years before giving birth (D^{-8}). This is the same as Table 3.

*** COHORT DUM. represents whether the model includes cohort dummy variables. INDUSGRY DUM. represents whether the model includes industry dummy variables. OCCUPATION DUM. represents whether the model includes occupation dummy variables. This is the same as Table 3.

the column (3). Marital status is also highly correlated with the returning behavior. Married workers are more likely to be older and to return to the former job. Presence of young children under age two besides reference baby deters their mothers from returning to the pre-birth job. Another important element that affects the returning behavior is tenure. As we expected, the effect of tenure is highly significant through the columns (1) to (4). The effect of experience is negligible after controlling for tenure. What matters in returning to the former job is tenure, not actual experience.

In the column (3) with job heterogeneity control variables, the marginal effect of firm size is large and highly significant. Women who work in the large firm are more likely to return to the former job. However, having a medical insurance or union coverage that indicates a "good" job adds little explanation to the returning behavior.[8] This may be because having a medical insurance is highly correlated with having a maternity leave benefit. The effect of pre-birth wage is not significant on the returning to the employer.[9]

Since the column (3) is the main model in this paper, I evaluate the effects of maternity leave coverage on returning behavior with this model. The marginal effect is as large as 0.156 and highly significant after controlling for individual and job heterogeneities. Additionally, the column (4) shows the effect of maternity leave coverage after including eight recent work history dummy variables (D^{-1} to D^{-8}). Although these eight variables are jointly significant at the 90 percent significance level, they barely affect the marginal effect from maternity leave coverage. This implies that these variables play little role in controlling for propensity to job attachment or career orientation.

In sum, changes in the marginal effects from the maternity leave coverage by adding more explanatory variables shows that there exits heterogeneity. However, the marginal effect of maternity leave

[8]Since medical insurance is significantly correlated with maternity leave benefit, the effect of medical insurance may be small.

[9]However, this result mainly comes from high school educated workers. The effect is large and significant among college educated women. College educated women who earned large sum prior to giving birth are highly likely to return to the former employer after giving birth compared to those who earned small sum. However, the effect is negligible among high school educated. Their wages may be universally low and wage difference might be too small to induce different returning behavior.

coverage on the dependent variable, whether the woman returns to the pre-birth employer, is still substantial and significant even after controlling for those variables. This result indicates that maternity leave benefits contribute to help women to return to the former job after giving birth.

c) Findings for Employment

The estimation results are shown in Table 3. Although the above association between maternity leave coverage and turnover can be interpreted as a causal relationship, the interpretation for the association between maternity leave coverage and employment is rather vague. However, this relationship can still be thought as a causal relationship. Women who do not have a right to return to their pre-birth job may have more trouble in finding new employment after giving birth. They more likely simply do not return to work.

The marginal effect from maternity leave coverage is 0.244 in the column (1) in Table 3 without any control variables. After including individual heterogeneity control variables in the column (2), the effect is almost halved. In the column (3) of the main model with individual and job heterogeneity control variables, the effect further decreases to 0.129. The method of adding variables to control for heterogeneity works in the employment model like the turnover model. The coefficient for the maternity leave coverage decreases after including additional heterogeneity controls. But the extent of decreases through the column (2) to the column (4) is small. After controlling for individual heterogeneity, controlling for job heterogeneity hardly change the marginal effects. This indicates that individual heterogeneity primarily affects labor force participation behavior.

C. Effects on Wage Profiles

a) Model and Hypotheses

This section investigates the effects of maternity leave coverage at the time of giving birth on hourly wages and weekly earnings. Any difference in the results between the hourly wages model and weekly earnings model reflects the difference on the work hours decision rather than the participation decision. The weekly earnings, which has two components of hourly wages and weekly work

TABLE 3

EMPLOYMENT ONE YEAR AFTER CHILDBIRTH (THE PROBIT MODEL)

	(1) dF/dx s.err.	(2) dF/dx s.err.	(3) dF/dx s.err.	(4) dF/dx s.err.
COV				
DCOLL	0.244(0.035)	0.158(0.035)	0.129(0.040)	0.114(0.039)
TENBASE		0.049(0.023)	-0.001(0.025)	-0.003(0.026)
EXPBASE		0.018(0.005)	0.012(0.005)	0.008(0.005)
DRACE		0.015(0.005)	0.013(0.005)	0.011(0.006)
SMSA		-0.014(0.024)	-0.019(0.024)	-0.010(0.024)
MARRIED		-0.030(0.025)	-0.055(0.022)	-0.056(0.022)
CHILD1		0.051(0.030)	0.045(0.029)	0.040(0.030)
CHILD2		-0.057(0.033)	-0.051(0.031)	-0.038(0.031)
CHILD3		-0.017(0.029)	-0.009(0.028)	0.014(0.027)
MED		0.012(0.024)	0.007(0.023)	0.020(0.024)
PREWAGE			-0.004(0.028)	-0.010(0.028)
SIZE			0.058(0.029)	0.046(0.029)
UNION			0.003(0.025)	0.004(0.025)
D^{-4} (NOTN4)			0.064(0.024)	0.062(0.024)
D^{-3} (NOTN3)				0.002(0.045)
D^{-2} (NOTN2)				0.014(0.046)
D^{-1} (NOTN1)				-0.069(0.071)
D^{-8} (PARTN4)				-0.028(0.061)
D^{-7} (PARTN3)				-0.004(0.032)
D^{-6} (PARTN2)				0.018(0.030)
D^{-5} (PARTN1)				-0.110(0.049)
COHORT DUM.	No	Yes	Yes	-0.091(0.042)
INDUSTRY DUM.	No	No	Yes	Yes
OCCUP. DUM.	No	No	Yes	Yes
N of Obs	928	921	898	898
Sig of eight Dummies				significant

hours, can explain the combined effect that comes from different work hours as well as different hourly wages. Meanwhile, the hourly wages model reflects changes in productivity.

The fixed effects model (2) that is designed to control for the unobserved heterogeneity examines the effects of maternity leave benefits.

$$W_{it} = f_i + \boldsymbol{X}\varphi + \beta_1 \mathrm{EXP}_{it} + \beta_2 \mathrm{EXPSQ}_{it} + \beta_3 \mathrm{EXP}_{it}{*}\mathrm{COV}_i + \beta_4 \mathrm{EXPSQ}_{it}{*}\mathrm{COV}_i$$
$$+ \sum_{k=1}^{k=5} \theta_k D^k_{it} + \sum_{k=1}^{k=5} \delta_k D^k_{it}{*}\mathrm{COV}_i + \varepsilon_{it}, \qquad (2)$$

W is the log of hourly wages or the log of weekly earnings. f is the fixed effect that summarizes intrinsic, time invariant differences among women in observed and unobserved characteristics. $\boldsymbol{X}$ is a vector of individual characteristics such as education, marital status, and the number of children. EXP and EXPSQ are the experience years and experience years squared, respectively. Since the slope of the experience earnings profile of the covered group can be different from that of the uncovered group, I include interactions of EXP*COV and EXPSQ*COV that only apply to the covered group.

D^k is a set of dummy variables for time passage since childbirth. D^k_{it} is one if k years have passed for a worker i in the year of t. As is in the simple wage profiles' case, the model uses the assumption of time invariance. A dummy variable for the fourth year is one in 1993 for worker $\boldsymbol{A}$ ($D^4_{A,1993} = 1$) whose reference birth year is 1989. This is also one in 1994 for worker $\boldsymbol{B}$ ($D^4_{B,1994} = 1$) whose reference birth year is 1990. Therefore, the coefficient for the time-passage-since-birth dummy variable (θ_4 in this case) captures the effect of childbirth on wages four years after childbirth. Since the number of observations gets progressively smaller as the profile approaches the extreme, the profiles of later years are less accurate.[10] The wage series are adjusted by CPI. Since one of the key hypotheses about the wage profiles is that maternity leave coverage might alter the impact of childbirth on wages, I include interactions, D^k*COV that only applies to the covered group. Finally, ε is the error term that is assumed to have constant variance and to be uncorrelated across individuals and time.

Based on the estimates of the coefficients of the model (2), four hypotheses for the effects of maternity leave policy on the wage profile will be tested. The first hypothesis is that maternity leave coverage makes the covered group realize higher wage growth than

[10]The dummy variable for the third year after childbirth ($D3$) includes four cohorts (1988, 1989, 1990, and 1991). That of the fourth year ($D4$) includes three cohorts (1988, 1989, and 1990). That of the fifth year ($D5$) includes two cohorts (1988 and 1989).

the uncovered group. Although, as we discussed before, steeper wage profiles of maternity leave covered group implies not only beneficial effects from coverage but also heterogeneity, the former is more influential here, because the fixed effects model is expected to control for heterogeneity. Specifically, I test whether the difference between the log of the wages of the covered group and that of the uncovered group with five years of experience is positive. The null hypothesis is,

Hypothesis 1: H_0: $5\beta_2+25\beta_4=0$.

The second hypothesis is that childbirth negatively affects wages in the absence of maternity leave coverage. Specifically, for a year after giving birth, the null hypothesis is

Hypothesis 2: H_0: $\theta_1 \geq 0$.

The third hypothesis is that the impact of childbirth on earnings is different for the covered group compared to the uncovered group. Specifically, for a year after giving birth, the null hypothesis is

Hypothesis 3: H_0: $\delta_1=0$.

The fourth hypothesis is whether childbirth causes the maternity leave covered group to depart significantly from their pre-childbirth earnings profile. Maternity leave coverage at the time of giving birth may cancel some of negative effect of childbearing, but not all of them. Specifically, for a year after giving birth, the combined effect of childbearing and maternity leave coverage can be zero.

Hypothesis 4: H_0: $\theta_1+\delta_1=0$.

b) Findings

The estimation result of the model (2) is shown in Table 4. To investigate the effects of maternity leave coverage, I also construct the predicted experience-earnings profiles from the estimated coefficients in Table 4. One year of actual experience raises the hourly wages of the covered group by 9.7 percent and that of the uncovered group by 3.3 percent. This effect is larger among college

TABLE 4

THE EFFECTS OF COVERAGE AT THE TIME OF CHILDBIRTH ON THE WAGE PROFILES (THE FIXED EFFECTS ESTIMATION)

Dep. Var. = Hourly Wages

	(1) All Workers		(2) Coll Wkrs		(3) High S. Wkrs	
	Coeff.	std.err.	Coeff.	std.err.	Coeff.	std.err.
EDU	0.070	(0.007)	0.073	(0.008)	0.007	(0.019)
NUMCD	-0.033	(0.008)	-0.069	(0.011)	0.006	(0.011)
MARR_D	-0.002	(0.014)	0.006	(0.022)	0.000	(0.019)
MARR_N	-0.016	(0.013)	-0.012	(0.016)	-0.002	(0.020)
EXP	0.033	(0.009)	0.031	(0.013)	0.038	(0.014)
EXP*COV	0.064	(0.010)	0.079	(0.013)	0.031	(0.016)
EXPSQ	-0.001	(0.001)	0.000	(0.001)	-0.002	(0.001)
EXPSQ*COV	-0.004	(0.001)	-0.005	(0.001)	-0.001	(0.001)
D^1	-0.051	(0.031)	-0.089	(0.048)	-0.023	(0.041)
D^1*COV	0.066	(0.035)	0.102	(0.052)	0.043	(0.048)
D^2	-0.020	(0.036)	-0.028	(0.052)	-0.020	(0.049)
D^2*COV	0.042	(0.039)	0.071	(0.056)	0.020	(0.055)
D^3	-0.079	(0.041)	-0.063	(0.060)	-0.095	(0.058)
D^3*COV	0.054	(0.045)	0.069	(0.065)	0.035	(0.064)
D^4	-0.093	(0.044)	-0.088	(0.065)	-0.100	(0.059)
D^4*COV	0.058	(0.049)	0.084	(0.071)	0.033	(0.068)
D^5	-0.035	(0.048)	-0.081	(0.072)	-0.004	(0.064)
D^5*COV	-0.026	(0.054)	0.066	(0.079)	-0.103	(0.074)
CONSTANT	5.555	(0.095)	5.519	(0.115)	6.280	(0.216)
N of Groups	1,025		559		466	
N of Obs	9,708		5,437		4,271	
Obs per Grp (avg)	9.5		9.7		9.2	
	F(18,8665) = 75.43		F(18,4860) = 68.80		F(18,3787) = 11.90	

(Table Continued)

Dep. Var. = Weekly Earnings

	(1) All Workers		(2) Coll Wkrs		(3) High S. Wkrs	
	Coeff.	std.err.	Coeff.	std.err.	Coeff.	std.err.
EDU	0.018	(0.014)	0.215	(0.016)	-0.010	(0.032)
NUMCD	-0.099	(0.014)	-0.138	(0.020)	-0.042	(0.020)
MARR_D	0.078	(0.025)	0.097	(0.041)	0.075	(0.031)
MARR_N	0.043	(0.022)	0.018	(0.030)	0.106	(0.033)
EXP	0.083	(0.018)	0.066	(0.025)	0.133	(0.026)
EXP*COV	0.088	(0.019)	0.118	(0.026)	0.001	(0.029)
EXPSQ	-0.004	(0.001)	-0.003	(0.002)	-0.006	(0.002)
EXPSQ*COV	-0.005	(0.001)	-0.006	(0.002)	0.001	(0.002)
D^1	-0.100	(0.065)	-0.098	(0.094)	-0.108	(0.089)
D^1*COV	0.110	(0.071)	0.091	(0.101)	0.143	(0.097)
D^2	-0.129	(0.079)	-0.129	(0.114)	-0.149	(0.106)
D^2*COV	0.060	(0.085)	0.050	(0.122)	0.101	(0.117)
D^3	-0.104	(0.076)	-0.131	(0.116)	-0.105	(0.096)
D^3*COV	0.065	(0.082)	0.139	(0.124)	0.008	(0.106)
D^4	-0.128	(0.079)	-0.330	(0.118)	0.034	(0.102)
D^4*COV	0.053	(0.087)	0.342	(0.129)	-0.204	(0.115)
D^5	0.081	(0.096)	0.000	(0.141)	0.144	(0.126)
D^5*COV	-0.164	(0.106)	-0.010	(0.155)	-0.299	(0.140)
CONSTANT	7.469	(0.180)	6.870	(0.227)	9.822	(0.380)
N of Groups	1,020		557		463	
N of Obs	7,597		4,331		3,266	
Obs per Grp (avg)	7.4		7.8		7.1	
	F(18,6559) = 56.34		F(18,3756) = 48.91		F(18,2785) = 10.67	

Notes: The number of groups and observations are progressively smaller after the third year. The third year after giving birth (D^3) includes only 1988, 1989, 1990, and 1991 cohorts. The fourth year (D^4) includes only 1988, 1989, and 1990 cohorts. The fifth year (D^5) includes only 1988 and 1989 cohorts.

educated than among high school educated. The negative coefficient for the interaction with quadratic term of experience, EXPSQ*COV, suggests that the profile of the covered group will be slightly more concave than that of the uncovered group.

Figure 5 and Figure 6 show the predicted profiles that are constructed from the coefficients in Table 4. These profiles compare two workers with the same fixed effects and the same values for the observable characteristics (X's), both of whom entered the labor force six years before childbirth.[11] Thus, based on this assumption, both have the same earnings six years prior to childbirth. After childbirth, the coefficients for the time-passage-since-birth dummy variables (θ_k) and interactions between these variables with the coverage variable (δ_k) capture any discrepancy from the above predicted profiles.[12]

The constructed experience-earnings profile of the covered group is much steeper than that of the uncovered group during the whole observation period. Although the maternity leave covered group generally maintains the faster wage growth, this is especially true before childbirth. After childbirth, the slope of the predicted profile of the covered group is much less steeper than that before childbirth, though the slope of the covered group is still steeper than that of the uncovered group.

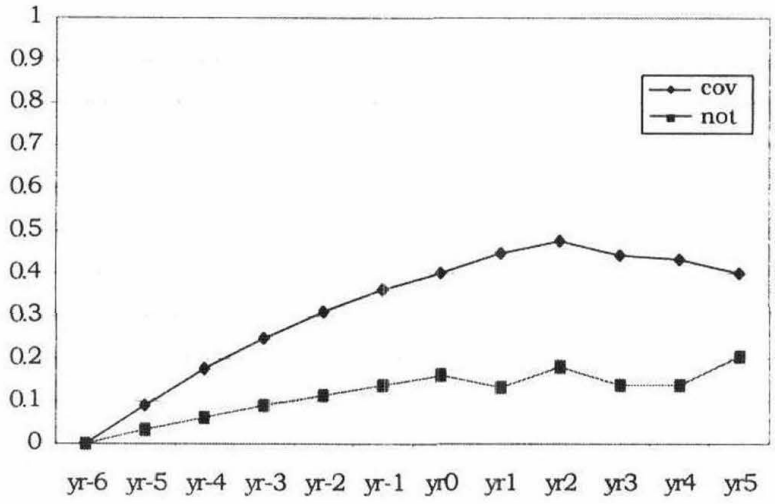
Although the predicted profile of hourly wages does not capture the wage setback of the uncovered group, that of weekly earnings does. This is because the uncovered group worked fewer hours than the covered group.

The first hypothesis about whether the covered group maintains higher wage growth is well supported by the estimation results in Table 4. The predicted profiles in Figure 5 and Figure 6 also show this. The null hypothesis that the difference in the log of the wages of the covered group and that of the uncovered group with five years of experience is zero is rejected at the 90 percent significance level. This is true with both hourly wages and weekly earnings models. Also, this is true for college educated workers, high school educated workers, and among all workers.

For the second hypothesis, the coefficients for D^1 are all negative in the hourly wages model in Table 4, but only for college educated

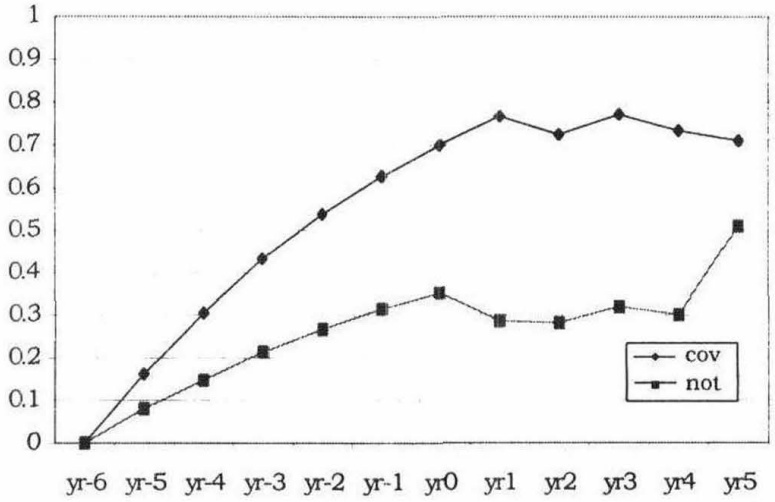
[11]To concentrate the difference between the profiles of the covered group and that of the uncovered group, contributions to the wage profiles of other observable characteristics except experience are assumed to be zero in the profiles.

[12]For example, two years after the base year, the log of the wage level will be $(\beta_1+\beta_3)*7+(\beta_2+\beta_4)*49+\theta_2+\delta_2$ for the covered group and that for the uncovered group will be $\beta_1*7+\beta_2*49+\theta_2$.



X axis: years, Y axis: the log of hourly wages.
cov: covered group, not: uncovered group.

FIGURE 5
PREDICTED HOURLY WAGE PROFILES (ALL WORKERS)



X axis: years, Y axis: the log of weekly earnings.
cov: covered group, not: uncovered group.

FIGURE 6
PREDICTED WEEKLY EARNINGS PROFILES (ALL WORKERS)

women's hourly earnings is this coefficient significant. The null hypothesis is rejected at 90 percent significance level in that case. The subsequent tests for θ_k generally suggest that the effect of giving birth on both hourly and weekly earnings is negative. Most coefficients (θ_k) are negative, several are significant, and taken together all the negative signs suggest a cumulative negative effect.

For the third hypothesis, the coefficients for D^1*COV(δ_1) are all positive in Table 4, but significant only for all women and college educated women in the hourly wages model. The null hypothesis can be rejected in those cases. In the sample of all workers and of college educated workers, δ_k is almost always positive and often significant.

The fourth hypothesis is rejected only for the fifth year after childbirth in the hourly wages model. The profile of the covered group is almost on the pre-birth trajectory until the second year after the birth.[13] In the weekly earnings model for all women, covered women do not seem to maintain their pre-birth wage profile after giving birth. The after-birth profile is significantly below the pre-birth trajectory in the second, fourth, and fifth year, as is shown in Figure 6.[14] It is clear that this result is being driven by the results for the high school educated workers, in which the weekly earnings profile of the covered workers falls below that of the uncovered workers. In the sample of college educated workers, there is only one significant deviation from the pre-birth earnings.

Overall, this section confirms the general hypothesis that maternity leave coverage brings the beneficial effect on wages of women workers. Even after controlling for heterogeneity, the wage profiles of the covered group was always above those of the uncovered group. The former realizes much higher wage growth before childbirth. After childbirth, both the covered and uncovered groups, especially the former, realizes much slower wage growth. The beneficial effect is at peak around the time of childbirth and during two or three years after childbirth. But, those effects are not

[13]With the sample of the college educated women, the covered group seems to maintain the pre-birth slope. (Column (2) in Table 4). With the sample of the high school educated women, covered workers maintain the pre-birth trajectory until the second year after birth, but after that their profile is significantly below the pre-birth trajectory. (Column (3) in Table 4).

[14]The p-value for the first year is 0.71, for the second year is 0.04, the third year is 0.24, the fourth year is 0.05, and for the fifth year is 0.06.

strong enough to cancel the negative effect of childbearing. Their post-childbearing hourly wages are growing but with slower rates. In the weekly earnings model, the negative effect of childbearing is very big for both the covered group and the uncovered group, and especially the latter. Larger gap in the weekly earnings profiles between two groups after childbirth than the gap in the hourly wages profiles suggests that the substantial parts of the effect of maternity leave coverage comes from the work hour decisions.

V. Conclusion

The empirical findings of this paper support the general hypothesis that maternity leave coverage at the time of childbirth has beneficial effects on women's labor market outcomes even after controlling for heterogeneity. By preventing involuntary job separation around that time, maternity leave benefits significantly lessen turnover one year after childbirth. Also, in the broad perspective, maternity leave covered workers have higher propensity to work that time.

The method of adding more appropriate variables to control for heterogeneity, though not perfect, works well in the turnover and employment models. By doing this, the effects of maternity leave coverage significantly decrease. However, even after controlling for substantial heterogeneity between two groups, the beneficial effects on turnover and employment are still significant.

The results of analyzing the wage profiles are also consistent with the general hypothesis. The women who had covered jobs at the time of childbirth maintain steeper wage profiles all the time. However, a wage premium for maternity leave coverage at the time of giving birth is not large enough to cancel the negative effects of childbearing. Even maternity leave covered group suffers slower wage growth after childbirth. Indeed, the basic nature of the effect of maternity leave coverage on the wage profile is that it preserves rather than extends the gap. The beneficial effects on wages are more conspicuous in the weekly earnings model in which both wages and working hours are combined. Maternity leave covered workers work more hours and the gap between two groups is therefore bigger in the weekly earnings model than in the hourly wages model. On the whole, maternity leave coverage at the time of

giving birth does help women to return to pre-birth jobs, but the effect of this on the wage profile is only secondary.

This paper adds to the literature by analyzing the effects of maternity leave coverage on the labor market performances of women workers explicit and direct controls for heterogeneity. Although much effort has been made to control for heterogeneity that can bias the estimation result, it is possible that some heterogeneity between covered and uncovered women workers remains uncontrolled for. Also, the beneficial effects of maternity leave on maintaining the working hours just after childbirth can be controversial mainly from the view point of child development. These limits expect further studies.

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