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Women's Wage and Childbearing*

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This research studies how women's hourly wages affect childbearing using data from the National Longitudinal Survey of Youth. The results of discrete time hazard model show that the relationship between women's hourly wage and fertility is dynamic. Overall relationship looks negative, but they are not consistent across education levels. Women who have a high school diploma or less have a tendency to decrease childbearing when their wages increase. But women who have some college experience or a college degree are likely to have children when their wages increase. It means that only for highly educated women who are likely to be in high paying decent jobs, the rise of income can be used as a resource for reconciling the mother's and worker's roles. Or, for less educated women who are likely to be in the low paying jobs, the rise of income is not large enough to lessen role incompatibility.

Key Words: Childbearing, Differential Fertility, Educational Attainment, Income Effect, Role Incompatibility, Substitution Effect, Value of Children, Women's Wage, Work-Family Issues

I. Introduction

Does a woman's wage influence her fertility? Does an increasing woman's wage booster or lower her fertility? Is the association the same across educational groups? This paper will research how women's wages affect childbearing considering the moderating effect of educational attainment.

Using June 1990 and June 1995 U.S. Current Population Surveys (CPS),

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Martin (2000) finds a widening educational gap in fertility. It shows that highly educated women have a higher probability of having their second child after age 30. Accepting education as a proxy of income, it implies that women's wages have a positive association with fertility at least among women who postpone their childbearing until 30. Vere (2007) finds that college-educated women born in the 1970s are having more children as well as participating less in the labor market than their counterparts born in the end of the baby boom using data from the March Supplement to the CPS 1964-2006. Increasing heterogeneity within women may imply that women in different life chances would react differently when their wages are changing. McLananhan (2004) shows that greater disparities occur in resources for childbearing in the second demographic transition that began in 1960s. She argues that the first transition is relatively universal by social class, whereas the second transition has affected classes differently. The negative relationship could change, at least to a specific group.

This research uses the discrete time hazard model using the National Longitudinal Survey of Youth 1979: 1981-2006. The data has two merits. In the NLSY79, ages at the first interview were 14-22 and they were 41-47 at 2006 wave. As the respondents reached their 40's, the data could show the entire trajectory of their fertility. It helps to answer the question - who succeeded in catching up with delayed childbearing at later ages and who did not? The other merit is that NLSY79 has detailed information on women's work history. It records the first and last week of women's job and their hourly wages at every wave. This enables to study the "time-varying" effect of women's income on their fertility.

My hypothesis is that only those who are highly compensated among highly educated women can have children at older ages, which shows that only the economically successful women who postpone their childbearing for increased education and a successful career can have as many children as less educated women who have childbearing from the earlier ages.

II. How do Women's Wages Affect Their Fertility?

1. Sociological Approach: Role Incompatibility

Many sociologists have focused on role incompatibility between workers and mothers (Eun and Park 2002; Kim et. al. 2011; McDonald 2000; Morgan 2003; Park 2008; Rindfuss and Brewster 1996; Shreffler, Pirretti, and Drago 2010; Um and Kim 2011). Women are working in two greedy institutions - their family and their job (Coser 1974). These institutions demand considerable depth of efforts which is indivisible and frequently asks a full-time commitment.

In modern societies, the workplace is not child-friendly and usually does not allow children to be present there. The workplace is geographically separated from home. It is ruled by a strict work ethic and the time regulation. Most women should leave home at a given hour and cannot take care of their child at their job.

Childrearing demands the time and attention of the caregivers. This demand is the highest in infancy and diminishes as the child grows up. Especially for the first few months after childbirth, in the United States, the Family and Medical Leave Act passed in 1993 allows workers to enjoy up to 12 weeks of unpaid leave without worrying about job security for the birth and care of the newborn child or adoption. But the regulation applies only to full-time workers (at least 1,250 hours of service during the previous year) who are employed in a business which has 50 employees or more. Workers in a small company or part-time workers are not eligible to take the leave. They are also likely to be at low-paid jobs. In the United States, maternity leave is nearly always unpaid (Waldfogel 1998). So, even among eligible workers, if they cannot afford the unpaid leave, they cannot use it. The average duration of the leave is 20 weeks on an average in the United States; (Waldfogel 1998). After the leave, mothers must decide if they wish to return to their jobs or if they wish to find alternative resources to complete a mother's work - taking care of her children.

The role incompatibility could be lessened if a mother could access

resources to aid in childbearing, childrearing and related household chores. Rindfuss et al (2007) find a positive effect of child care availability on childbearing using Norwegian register data. In the United States, child care is readily available and acceptable, but affordability is in question. According to 2011 annual report of National Association of Child Care Resource & Referral Agencies, in the United States average annual cost for a 4 year old child in a child care center is $3,900 in Mississippi to $14,050 in the District of Columbia (NACCRRA 2012). The price for an infant is even higher than that: $4,650 to $18,200. They report that the average childcare fees for two children exceed the median rent cost and average monthly mortgage payment. In order to afford to use daycare or to hire a nanny, women must postpone childbearing until after they save enough money or to move into higher-paying jobs.

2. Sociological Approach: Value of Children

How can it be explained that low income women decide to have children, even though they must pay a sizable amount of costs? Friedman and her colleagues (Friedman, Hechter, and Kanazawa 1994) answer this puzzle using the parent's desire for children. They maintain that having a child gives parents many values such as uncertainty reduction and enhancement of marital solidarity. Becoming a parent is an irreversible event and it will reduce uncertainty by establishing recurrent and tied social relations. Children might reduce some types of uncertainty, although at the same time they could generate a new source of anxiety. When people become parents, they would start to worry about their children's health, academic achievement, his or her career and so forth. However, there is a biased cognitive tendency that actors downplay risks or hazards which they experience voluntarily and/or are somewhat controllable. Most parents choose to become parents before conception or during pregnancy. Parents believe they could help their children and guide them in the right direction. In this way, the perceived reduction of uncertainty could be larger than the concerns on newly

generated uncertainty.

Becker's economic theory on fertility concerns the fertility of "people who already have decided to have children". But, before the decision, "rational people must compare the expected value of a child with that of other goods" (Friedman et al. 1996). Another interesting argument is that the need for this value is different across actor's economic situations. Low income women who have fewer alternative pathways for reducing uncertainty may be more vulnerable to external changes. It may lead them to bear children in early ages. The more the value of children is preferred, the more women decide to have children. Friedman and her colleagues apply this theory only to developed countries where children represent a net economic cost to their parent.

3. Economic Approach: Substitution Effect (Opportunity Cost) vs. Income Effect

The question of how each woman distributes her time between childbearing and market work can be analyzed within a framework of the New Home Economics (Becker 1974; Becker 1991). The New Home Economics maintains that the time of the family member is a scarce resource and that economic theory could be applicable to behavior outside of the monetary market, for example, the decision to have children. The factors affecting childbearing could be divided into demand side and supply side.

On the demand side, women's income has two kinds of effects on fertility, which have opposing directional effect. The one is income effect and the other is substitution effect. Children are not free. Parents need to buy food and clothes for their children. They may need to hire a babysitter, pay the fee for a daycare center, and visit medical services. An increasing woman's income means she has more power to afford such resources and therefore increase the likelihood of having more children.

At the same time, growing women's income could lower the likelihood of having more children. Substitution effect is that when the price of one good increases, a consumer will buy different goods since the first one has become

relatively expensive. In the New Home Economics, the former is the price of having a child measured by opportunity cost. That is, the relative price of childbearing is mainly decided by changes in the value of the mother's time, because mother's time and efforts are the major component of the cost for the childbearing and rearing. If the value of the mother's time is increasing, the relative price of children will rise. If a mother is expecting an increase in her wages, the relative price of children will go up and therefore, she will be likely to reduce her fertility. Women's opportunity cost consists of current wage as well as future wages which may be penalized by motherhood. During the leave for childrearing, her human capital could depreciate and her skills could become out-dated. This could cause her to lose a matching-job rent, which she enjoys at the current job. If the substitution effect is bigger than the income effect, a woman would decide not to have children when her wage grows and vice versa.

Usually less educated women have a larger substitution effect. This may originate from the fact that the weight of the substitution effect is different. The expected income of less educated women will be smaller. They are more prone to marry less educated men who also suffer from low wages. Then, working for the woman may not be an option but mandatory in order to make two ends meet. But if her husband already has enough income to support them both, or if the family had enough income from their wealth, the increased amount of women's wage does not have the substitution effect at the full degree. That is, substitution effect is a function of not only women's income but also the degree of significance of women's income on total family income. For less educated women, growing income may be fully reflected in the substitution effect, which is bigger than the income effect. It makes them have fewer children when they earn more. To highly educated women, growing income will have substitution effect in part, so their substitution effect could be smaller than the income effect. This will make them have more children when they earn more.

III. Data and Method

In analysis described here I use the data from National Longitudinal Survey of Youth 1979. It is a national longitudinal sample of 12,686 men and women in the United States. The data has been collected annually until 1993 and then bi-annually from then on. At every round, it asks for the respondents' work history - the first and the last days of the jobs they have had between surveys and their hourly wages, and fertility history - date of each childbearing.

The data is limited to women with 22 or over. Considering 2 years of a wait time until the conception and gestation period, childbearing before 22 is assumed to be intended before 20. As the purpose of this study is to find a causal effect of wage on fertility, unintentional childbearing should not be

<Table 1> Descriptive Statistics of Variables

	Mean	S.D.	Min	Max
Year	1992	6.63	1981	2006
Age	30.19	6.45	22	47
First Childbearing	0.07	0.26	0	1
Second Childbearing	0.05	0.21	0	1
Hourly Wage, time-varying	13.38	9.01	0	98.5
Hourly Wage at 40	18.20	11.94	0	97.8
Attitude				
Number of Desired Children	2.24	1.35	0	16
Attitude on Traditional Family:1=least, 4=strong	1.99	0.51	1	4
Expectation at 35: 0=job, 1=family	0.20	0.40	0	1
Expected Ability for Aspired Occupation at 35 (1=excellent, 4=poor)	2.07	0.79	1	4
Race				
Hispanic	0.16	0.37	0	1
Black	0.27	0.44	0	1
White: reference category	0.57	0.50	0	1
Education				
Less than High School	0.08	0.27	0	1
High School: reference category	0.38	0.48	0	1
Some College Experience	0.28	0.45	0	1
College Degree or Higher	0.26	0.44	0	1
Number of Women	3,544			
Number of Measures	42,197			

considered. Assuming that most teenage pregnancies are unintentionally, many teenagers are not employed and therefore there is lack of wage information, any childbearing before the age of 22 is excluded from the sample. After further excluding military oversample, the final sample size is 3,544 women and 42,197 measures.

It should be noted that the data has a specific time span of cohorts who were born during the years 1957 through 1964. At the first survey in 1979, they were 14 to 21 and at the most recent survey in 2006, they were 41 to 47. Many of them have reached menopause or are very close to it. It is a very unique opportunity which enables the researcher to trace if a respondent simply postpone childbearing to her later ages or whether she has forgone having children altogether until she arrives at the end of the fecundible period.

Left-truncation could be problematic because of the observational study setting. Left-truncation happens where "the times individuals become at risk do not necessarily coincide with the start of the observation period" (Rabe-Hesketh and Skrondal 2005). Respondents, who have previously had a child, are not eligible for the study. If there is no correction, there will be sample selection - the sample will consist only of survivors and it will make the hazard of childbearing underestimated. To avoid this bias, women who were older than 22 at the start of the observation period are excluded from the sample.

1. Model Specification and Measures

$$\text{logit } h(t_{ij}) = \beta_0 + [\alpha_1(Age_{ij}-21) + \alpha_2(Age_{ij}-21)^2] + \beta_1 X_i + \beta_2 Z_{ij}$$

where i indexes individual women and j indexes time.

X_i are time-invariant covariates and are Z_{ij} time-varying covariates.

I use a discrete time hazard model which regards time as a discrete units. It enables to analyze the data similar to logistic regression model with indicator variables for each of the time periods.

The duration begins at age 22, which is equivalent to the first year of

duration. As the baseline hazard increases toward their mid-20s then decreases thereafter, squared duration is added. It is simpler and shows a statistically significant better fit than the model with age-dummy variables according to log likelihood test.

Variables are constructed as of May 1st instead of the interview date to balance the data. As NLSY79 recorded each week of employment status and their wage, and the exact date of childbearing, the variable modification can be accomplished easily.

The dependent variable is the probability of having the first and the second child separately. Women who suffer from economic hardship or who expect a higher standard of living compared to their wages may have one child but fail to have a second. Having a second child means achieving average fertility in the United States. In this sense, the second birth should draw more notice (Torr and Short 2004). Among 3544 women, 2825 women have experienced their first birth during the survey period and 2098 women have experienced their second birth. 185 women who reports inconsistent dates of childbearing are dropped.

As independent covariates, race and education will be used. Race is categorized into three groups - Hispanic, Black, and Non-Hispanic & Non-Black. The reference category will be Non-Hispanic & Non-Black.

Educational attainment measured at respondents' age 30. Assuming that most young women, who past their 20s, can predict how long they plan to be in school and can adjust their life plan including childbearing accordingly, education at 30 can be a better measure of expected education. There is also less change in education over 30. Education is categorized into four groups - Less than high school (less than 12 years), high school diploma (12 years), some college experience (13 to 15 years), and college degree or higher (more than 16 years).

2. How to Measure Wages: Current Income vs. Permanent Income

A key independent covariate will be women's wage. Women's wage can be measured in two ways - current wage and permanent wage. The wages

are converted to log hourly wages in 2006 dollars. If the hourly wage is less than 1 dollar or more than 200 dollars in 2006 dollars, they are regarded as an outlier.

There is a disagreement over which income is more critical to decide a current consumption. Keynes postulates that a current consumption depends only on a current income, while Milton Friedman postulates that a permanent income is the relevant determinant of a current consumption (Bhalla 1979; Friedman 1957).

Freedman and Thornton (Freedman and Thornton 1982) study the relationship between husband's current income and expected fertility. They point out the complexity in formulating a permanent income because young couples may give different values to the expected income at different points in time. Heckman and Walker (Heckman and Walker 1990) study the relationship between current female wage and the timing and spacing of births. They maintain that wages are uncertain and current wages are sufficient for measuring future wages.

On the contrary, Friedman (Friedman 1957) notices the volatile characteristics of wages and argues that the changing wage consists of two parts - permanent and transitory. An individual tends to maintain a steady standard of living offsetting temporarily fluctuation. If an individual expects to her wage to increase in the future, her living standard could be higher than if a rise income were not expected. He called such an income as a permanent income.

There are many ways to measure a permanent income. The accumulated total wage till age 40 is one way. The expected wage at age 40 is another. Fleisher and Rhodes (Fleisher and Rhodes Jr 1979) use an average lifetime wage. They measure women's median earnings in the longest held job prior to the first child's birth as permanent income. Bollen et al. (Bollen, Glanville, and Stecklov 2002) suggest using the latent variable to measure the permanent income.

It is problematic to use a wage at a specific later age as a permanent income, for example wage at age 40. There are reversed causality. The overall negative relationship between wage and childbearing may happen not

because high wages yield less childbearing but because motherhood lowers women's wages. It is known that having a baby has a negative effect on woman's wage that is called motherhood wage penalty (Anderson, Binder, and Krause 2002; Budig and England 2001; Choi 2011; Waldfogel 1997). Anderson et al (Anderson, Binder, and Krause 2002) find that college graduates suffer from a large motherhood wage penalty while women who do not have a high school diploma do not receive much of the penalty. Most childbearing happens before age 40. So it is illogical to assume that future income affects any past decisions of childbearing.

On the contrary, current wage is likely to be unstable and transitory. But the volatile characteristic of current income suggests that the future is uncertain, and any decision should be made based on the current situation. When a woman suffers from the economic hardship, it is be a reasonable assumption that she will postpone or lessen expenditures.

In this sense, current wage is preferred to trace the causality with childbearing as they appear in a timely fashion. Current wage will lag by two year considering a 9 month gestation period plus several months of waiting until conception to avoid simultaneity of cause and effect.

Another reason that current (lagged) wage is not popular in studying the relationship between wage and fertility is data availability. It is not available in cross sectional data. Even in a longitudinal data, wage variable is likely to be not answered. Fortunately, NLSY79 is a longitudinal data set with a relatively small number of missing at hourly wage. Among measures of which age is 20 or more and employed, only 3.2% is missing.

Two methods are adapted to estimate current hourly wage when it is not available. One is used when a respondent is not employed. In this case, it is assumed that her earning potential is the same as the most recent wage job. For example if she earned 8 dollars per hour 2 years ago from the most recent previous job and has not employed hereafter, her current earning potential will be 8 dollars per hour. As her human capital is likely to depreciate during the leave from the labor market, it could exaggerate her earning potential. If she has never held a wage paying job in any previous years, her wage will be 0. The other is used when a respondent does not

provide an answer for her wage even though she has paid jobs. In this case, if her previous and next wages are available, her current wage will be the average of them. If her wage is missing more than two rounds in a row, she will be dropped from the sample.

3. What if There is an Extraneous Variable Which Affect Her Wages and Childbearing: Endogeneity Issue

Endogeneity happens when an independent variable is correlated with the error term. Wages could be endogenous to fertility if extraneous variables affect the childbearing and women's wages. NLSY79 contains variables which measure attitude on respondents' future fertility and job aspiration. I will use 4 of them. Except for the desired number of children which was measured in 1982, all other variables are measured in 1979. The desired number of children by a respondent measures fertility expectation by asking the question: "HOW MANY CHILDREN DO YOU WANT TO HAVE ALTOGETHER?" The average is 2.24 children. Attitude on traditional family role is rated by the woman's response to the statement: "IT IS MUCH BETTER FOR EVERYONE CONCERNED IF THE MAN IS THE ACHIEVER OUTSIDE THE HOME AND THE WOMAN TAKES CARE OF THE HOME AND FAMILY." If she strongly disagrees, she should choose 1. If strongly agrees, she should choose 4. The average score is 1.99 which is the middle of the two stances. The question to measure future expectation is "WHAT WOULD YOU LIKE TO BE DOING WHEN YOU ARE 35 YEARS OLD?" Zero is coded for having a job and one is coded for married, stay with family. Most respondents choose zero and only 20% choose MARRIED, FAMILY. The question to measure ability expectation to achieve occupation aspiration at age 35 is "WHAT DO YOU THINK YOUR CHANCES ARE OF GETTING INTO THIS TYPE OF WORK /DO YOU THINK THEY ARE EXCELLENT, GOOD, FAIR OR POOR?" 1 represents excellent and 4 represents poor. The average score is 2.07.

By adding these variables, I expect attitudes, which could affect fertility and career aspiration, are controlled.

III. Results

Table 2 shows the Pearson correlation coefficients between number of births and women's hourly wages by education from National Longitudinal Study of Youth79 (NLSY79): 1979-2006. As they include the observations after the events of interest such as the second birth, the number of measures is much larger than that in the regression model. The first two rows are from longitudinal data of which age is limited to 22 or over. This signifies that respondents could be counted multiple times. Wages at 40 and 2 year lagged wages are negatively associated with number of births but, the decreasing linear relationship is weaker in 2 year lagged wage. When the data is broken down by education, the negative correlation of wage at 40 and fertility is the largest for the least educated group and the smallest for the group with only a high school diploma. The correlation between 2 year lagged wage and fertility shows monotonous trends by education. The least educated group shows the most negative relationship and its effect decreases towards the more educated group. The group with a college degree or higher even shows a positive correlation.

The next three rows shows correlations gauged in three points at age 30, 35, and 40. As it is a correlation of a specific age, respondents are counted only once. Overall it is clear that there is a negative association. The relationship is stronger at a younger age. The shrinking negative correlation implies that women with a higher income may postpone their childbearing until after building their career or until after they can lessen the difficulty of childbearing using their earned income in later years. Interestingly, the correlations are different by education. Among the least educated women, the correlation is neither substantially nor statistically significant at age 30 and 35. Unlike other groups, the negative correlation grows toward old ages. The largest correlation is found for women with some college experience. They spend their early 20s in the school but may not be rewarded for their investment in the labor market. High school graduates who enter the labor market in early ages could build their careers and families quickly.

<Table 2> Pearson Correlation Coefficients between Number of Births and Women's Hourly Wages

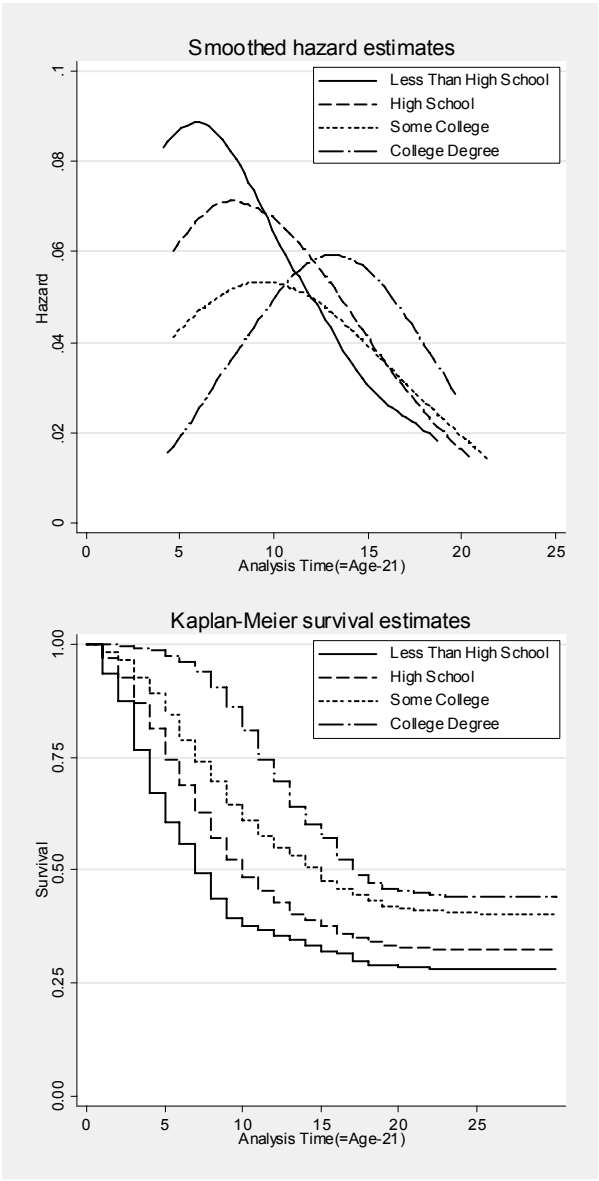
	All	Less than High	High School	Some College	College
At Longitudinal Setting					
Wage at 40	-.24***	-.14***	-.09***	-.12***	-.12***
2 Year Lagged	-.11***	-.08***	-.03***	-.02*	.17***
At A Specific Age					
At 30	-.24***	-.02	-.14***	-.17***	-.14***
At 35	-.18***	-.04	-.10***	-.17***	-.07*
At 40	-.16***	-.13*	-.09**	-.14***	-.08*
Number of Women / Measures					
Wage at 40	68,173	9,277	29,125	17,338	12,219
2 Year Lagged	80,307	10,640	32,730	19,506	14,815
30	4,444	459	1,838	1,171	976
35	3,797	379	1,591	1,042	785
40	3,474	350	1,474	945	705

* p<.05; ** p<.01; *** p<.001

Figure 1 shows the smoothed hazard estimates and Kaplan-Meier survival estimates of having a second child by education. The plot of smoothed hazard estimates shows that all four estimates draw unimodal trend. The difference is when the peak is and how big it is. Women who have less than a high school education have the highest hazard estimates of second childbearing at their mid 20s (.1349 at 25), which is approximately four times larger than the hazard of women with a college degree or higher until 27 (.122 vs. .037 at 27). In their late 20s, high school graduates and some college experienced women record the peak of hazard (.093 at 27 vs. .074 at 28) and then the modest declines of a similar magnitude. Unlike the other three groups of whose graphs are positively skewed with the long right tales, women with a college degree or higher show low hazard estimates in their 20s. Instead, from the age of 30, their hazard estimates are the largest. After recording the peak at 32, their hazard estimates remain notably larger than the other three groups' for all of the 30s.

Kaplan-Meier survival estimates show that the number of women not

<Figure 1> Plots of Women's Hazard Estimates and Survival Estimates of Second Childbearing by Education



having a second child decreases sharply as education decreases. It generates a sizable gap between highly educated women and less educated women during their late 20s and early 30s. From their 30s, women with a college degree or higher lower their survival estimates. Therefore, from the late 30s the gap gets smaller, even though more education connects to the higher probability of remaining not-having second childbearing.

Table 3 and Table4 show the coefficients from the discrete hazard model of first/second childbearing on hourly wage and other control variables. At discrete hazard model, each individual's survival event is broken down into a set of discrete time units. The basic idea is the same as a binary logit regression model. The coefficients can be interpreted as in a binary logit regression model.

At each table, model 1 is the basic model including wage, duration and race dummy variables. The overall wage effect on childbearing can be found there. Model 2 includes attitude variables additionally. It depicts wage effect controlling for career aspiration at young ages. Model 3 adds the education dummy variables excluding wage variable. Model 4 incorporates wage and education at the same time. Model 5 has the interaction terms between wage and education assuming that wage effects are different by education.

At table 3, I regress the probability of having a first childbearing on time-varying and 2 year-lagged wage. It turns out that wage is positively associated with first birth at model 1. The coefficient of wage is .013 and it is statistically highly significant ($p<.001$). The wage effect is almost the same after controlling for attitude variables additionally as shown in model 2. Model 3 shows that how education is associated with the probability of having a first childbearing. To some college experienced women, the estimated odds of having a first childbearing are 83%($\exp(-0.191)=0.826$, 83%) of the odds for women with a high school diploma. Women with a college degree or higher are more negatively associated with fertility when compared to high school graduates($\exp(-0.39)=0.677$, 68%). The odds for the least educated women are not significant statistically. At model 4, wage effect is positive and statistically significant, whereas at model 5, it is statistically meaningless.

At Table 4, wage effect to second childbearing is analyzed. Unlike first

<Table 3> Coefficients from Discrete Hazard Model of First Birth on Lagged Hourly Wage and Control Variables

	Model 1	Model 2	Model 3	Model 4	Model 5
Hourly Wage, 2 Year Lagged	0.013***	0.014***		0.018***	-0.012
	(0.003)	(0.003)		(0.003)	(0.008)
(Age-21)	0.099***	0.106***	0.129***	0.108***	0.111***
	(0.018)	(0.020)	(0.019)	(0.020)	(0.020)
$(Age-21)^2$	-0.010***	-0.010***	-0.011***	-0.010***	-0.011***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Black	-0.120	-0.106	-0.172*	-0.134	-0.159*
	(0.065)	(0.070)	(0.070)	(0.071)	(0.071)
Hispanic	0.100	0.082	0.04	0.043	0.052
	(0.069)	(0.076)	(0.077)	(0.077)	(0.077)
White (Reference Category)		-	-	-	-
Number of Expected Birth		0.061**	0.078***	0.076***	0.077***
		(0.019)	(0.019)	(0.019)	(0.019)
Attitdue on Traditional Family		0.150**	0.064	0.089	0.069
		(0.056)	(0.057)	(0.057)	(0.057)
Expectation at Age 35		0.161*	0.126	0.121	0.132
		(0.069)	(0.069)	(0.069)	(0.069)
Expected Ability at Age 35		-0.062	-0.099**	-0.090*	-0.096**
		(0.035)	(0.036)	(0.036)	(0.036)
Less than High School			0.013	0.062	0.048
			(0.134)	(0.135)	(0.257)
High School (Reference Category)			-	-	-
Some College Experience			-0.191**	-0.210**	-0.402**
			(0.069)	(0.069)	(0.141)
College Degree or Higher			-0.390***	-0.449***	-1.125***
			(0.070)	(0.071)	(0.132)
Wage * Less than High School					-0.009
					(0.027)
*Wage * High School (Reference Category)*					-
Wage * Some College Experience					0.019
					(0.010)
Wage * College Degree or Higher					0.049***
					(0.009)
Constant	-2.680***	-3.072***	-2.578***	-2.759***	-2.371***
	(0.072)	(0.155)	(0.160)	(0.163)	(0.183)
N	24597	21335	21335	21335	21335
LL	-6048	-5232	-5223	-5210	-5188

Note: Standard errors in parentheses. *p<.05, **p<.01, ***p<.001

<Table 4> Coefficients from Discrete Hazard Model of Second Birth on Lagged Hourly Wage and Control Variables

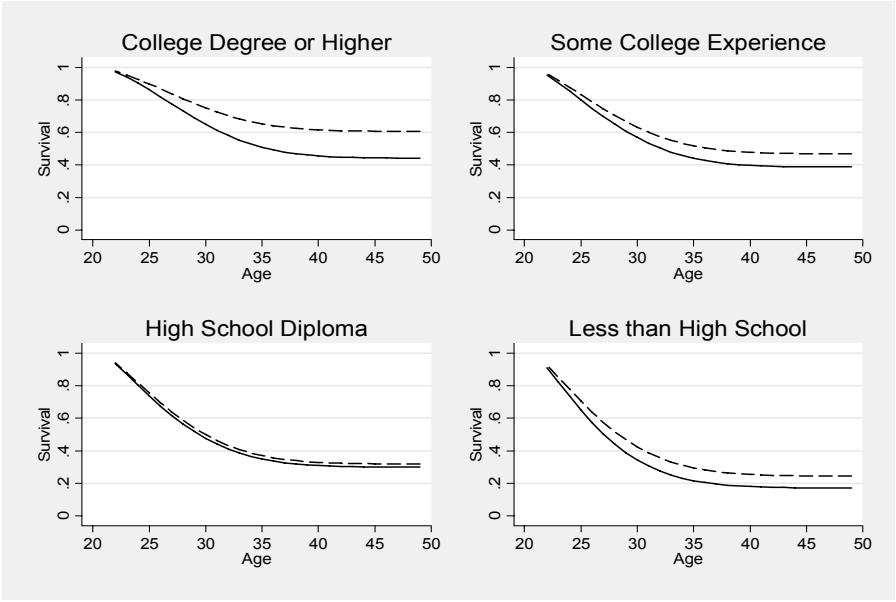
	Model 1	Model 2	Model 3	Model 4	Model 5
Hourly Wage, 2 Year Lagged	0.003	0.004		0.013***	-0.018**
	(0.003)	(0.003)		(0.003)	(0.007)
(Age-21)	0.148***	0.159***	0.172***	0.160***	0.164***
	(0.017)	(0.018)	(0.018)	(0.018)	(0.018)
$(Age-21)^2$	-0.012***	-0.012***	-0.012***	-0.012***	-0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Black	-0.027	-0.042	-0.092	-0.064	-0.093
	(0.056)	(0.061)	(0.061)	(0.061)	(0.061)
Hispanic	0.181**	0.134*	0.08	0.083	0.085
	(0.061)	(0.067)	(0.068)	(0.068)	(0.068)
White (Reference Category)		-	-	-	-
Number of Expected Birth		0.077***	0.099***	0.098***	0.099***
		(0.017)	(0.017)	(0.017)	(0.017)
Attitdue on Traditional Family		0.243***	0.128*	0.145**	0.128*
		(0.051)	(0.052)	(0.052)	(0.053)
Expectation at Age 35		0.138*	0.087	0.084	0.095
		(0.061)	(0.062)	(0.062)	(0.062)
Expected Ability at Age 35		0.04	-0.009	-0.004	-0.008
		(0.032)	(0.032)	(0.032)	(0.032)
Less than High School			0.235**	0.266**	0.087
			(0.089)	(0.090)	(0.162)
High School (Reference Category)			-	-	-
Some College Experience			-0.299***	-0.319***	-0.609***
			(0.062)	(0.062)	(0.124)
College Degree or Higher			-0.538***	-0.595***	-1.326***
			(0.069)	(0.070)	(0.128)
Wage * Less than High School					0.012
					(0.016)
*Wage * High School (Reference Category)*					-
Wage * Some College Experience					0.028**
					(0.009)
Wage * College Degree or Higher					0.052***
					(0.008)
Constant	-3.164***	-3.990***	-3.485***	-3.614***	-3.247***
	(0.070)	(0.148)	(0.149)	(0.153)	(0.167)
N	42197	36241	36241	36241	36241
LL	-7875	-6758	-6715	-6707	-6682

Note: Standard errors in parentheses. *p<.05, **p<.01, ***p<.001

childbearing, time-varying wage shows a small positive but statistically insignificant effect at model 1 and 2. An interesting finding is at model 4 and 5. At model 4, hourly wage has a positive effect (β= .013, p<.001). But after adding the interaction terms, the coefficient changes to the negative effect (β= -.018, p=.009). The model fit of model 5 is significantly improved from model 4 according to the Log Likelihood test (p<.001). Considering the interaction terms, the direction of hourly wage is different from education. The combined coefficient is at the lowest for women with a high school diploma (β= -.018). For women with less than a high school diploma, the combined coefficient is still negative (β= -.006). For women with some college experience, the combined coefficient is positive (β= .010). For women with a college degree or higher, the positive effect is more larger (β= .034)

Plots of survival function of a second childbearing for the high (75th percentile) and the low (25th percentile) wages among the same education level are presented in figure 2. It is a predicted probability made from the model 5 in table 4. It is not recommended to use observed distribution among the remaining women in each time period because it could artificially lower the hazard in the later years by sample selection (Singer and Willett 2003). Instead, the 75th percentile and the 25th percentile wages in each education category are obtained not from the person-period data but from the original full data which does not remove any individual who experiences the event - second childbearing. Race is set to Non-Hispanic Non-Black, and attitudes are set to the average of each education group. The solid line represents the 75th percentile hourly wage and the dashed line represents the 25th percentile hourly wage from the bottom in the same educational attainment group. The survival functions of the 75th percentile and the 25th percentile earner are not much different except for women with a college degree or higher. Among women with a college degree or higher, a 75th percentile earner would have sizably lower predicted probability of having second child than a 25th percentile earner.

<Figure 2> Predicted Probability of Remaining Not-Having Second Childbearing of Women from Table 4, Model 5.



*The Solid line is for 75th Hourly Wage and the Dashed line is for 25th Hourly Wage from the Bottom in the Same Educational Attainment Group, using NLSY79: 1979-2006.

IV. Discussion

Using a nationally representative data from NLSY79: 1979-2006, I have researched how women's hourly wages are associated with their childbearing. The relationship between women's hourly wage and fertility are not consistent across education levels. Women who have a high school diploma or less are less likely to have children when their wages increase. But women who have some college experience or a college degree are likely to have children when their wages increase. In other words, when their income rises, less educated women have a bigger substitution effect, whereas highly educated women have a bigger income effect. Or, for less educated women who are likely to be in the low paying jobs, the rise of income is not large

enough to lessen role incompatibility. Only for highly educated women who are likely to be in high paying decent jobs, the rise of income can be used as a resource for reconciling the mother's and worker's roles.

Less educated women are likely to start having children in their earlier ages and have a larger number of children altogether. Some college-experienced or college-educated women are likely to postpone the childbearing and have a smaller number of children. Among them, only highly compensated women are likely to have children at older ages. It is much clearer among college educated women. The gap of predicted probability to have a second child between high earner (75th percentile from the bottom within the same education category) and low earner (25th percentile) is the largest in the group with college degree or higher.

The findings mainly come from the relationship between second childbearing and 2 year lagged wage. The effects of independent variables look similar between first and second childbearing except that the effects are stronger at second childbearing. The second childbearing is a key concern because the transition to second birth is more difficult and sensitive to conditions women should overcome.

This study shows relationship from women's wage to childbearing considering moderating effect of educational attainment. But we need to be cautious when setting the causality. The reasons are first, current wage is a changeable and unstable concept. If a woman decides her fertility based on expected stable income level - permanent income, current wage measures would exaggerate the measurement error of income level. Secondly there may be a third factor affecting wage and childbearing together. I assumes that the aspiration or plan to future life could be a third factor. Fertility expectation and attitude on family-work norm is used as a proxy of a third factor. These variables can explain only a part of aspiration. If there is a uncontrolled third factor, the relationship is spurious. Thirdly, 2 year lagged - current wage may be affected by the first childbearing. If she has the first child or is being pregnant, it would negatively affect her wages. The motherhood wage penalty originated from the first child could lower her wage. For example, a pregnant woman could not choose the best offer but

accept less wages with a less duty for saving energy or lessening stress. So the effect should be understood as relationship instead of causality.

Women's wage is a measure of her economic activity. The size of resources for lessening role incompatibility is usually decided her wage as well as husband's wages. To understand the monetary resources effect, family income will be a better measure. This study tries to depict the direct effect of women's wage only.

Finally it should be noted that this study is built on the data of which respondents were born in 1957-1964 in the United States. They were 41-47 years old as of 2006, at the last year of the survey. The younger cohorts may have different response when their income changes.

Though this study uses data from the United States, it has implications on low fertility issue in South Korea. In South Korea, many young women are college-educated and are postponing their childbearing(Woo 2009). It is important to know that, among late starters, who can catch up with the fertility of women who have children at early ages and who cannot. If the pattern of the hazard having the second childbearing is similar in the United States, the success at the labor market is beneficial to college-educated women in the view of fertility.

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여성임금과 출산력

최슬기

이 논문에서는 여성 임금과 출산율의 관계를 미국자료(NLSY79)를 통해 분석하였다. 여성임금은 사회학적 시각에서는 역할충돌을 완화하는 기제로, 경제학적 시각에서는 소득효과와 대체효과가 혼재되어 있는 것으로 이해될 수 있다. 분석 결과, 여성의 시간당 임금과 출산수준은 대체로 부의 상관관계를 보였다. 정의 관계를 보인 경우는 대졸여성의 자녀수와 그녀의 2년 전 시간당 임금의 경우 뿐이었다. 연령대별로 나누어 살펴보면, 나이가 들어갈수록 부의 관계는 약화되는 것으로 나타났다. 하지만 이산형 위험모델을 통한 분석결과, 이러한 관계는 교육수준에 따라 다르게 나타났다. 고졸이하의 여성은 임금이 상승할 때 출산을 줄이는 경향이 나타났지만, 그이상의 학력을 가진 여성은 임금이 상승할 때 오히려 출산을 늘이는 경향이 나타났다. 이는 상대적으로 고소득이 기대되는 고등교육을 바진 여성에게서만 임금상승이 역할 충돌을 완화하는 작용을 성공적으로 하고 있다고 볼 수 있다. 또한 임금상승의 의미가 저학력 여성에겐 대체효과가 더 크고, 고학력 여성에겐 소득효과가 더 크다고 해석될 수 있다. 이는 출산을 미룬 대졸여성들에겐 노동시장에서 성공이 출산에 긍정적 관계를 갖는다는 의미를 보여준다.

핵심단어: 출산율, 학력별 차별출산력, 소득효과, 대체효과, 역할충돌, 자녀의 가치, 여성임금