THE EFFECT OF CHILDREN ON WOMEN'S WAGES*

Jane Waldfogel
Columbia University

I use data from the 1968–1988 National Longitudinal Survey of Young Women to investigate the lower wages of mothers. In pooled cross-sectional models, difference models, and fixed-effects models, the negative effect of children on women's wages is not entirely explained by differences in labor market experience. I consider two alternative explanations for the residual penalties associated with having children: unobserved pay-relevant differences between mothers and non-mothers, which fixed-effects models show do not account for the child penalty; and part-time employment, which does account for some of the child penalty. However, even after controlling for part-time employment, a negative effect of children on women's pay remains.

Despite the recent narrowing of the wage gap between women and men, women still have lower average hourly earnings than men. Although women are now employed more continuously over the life cycle, the tendency for women to have less labor market experience than men with otherwise comparable characteristics has been, and continues to be, an important factor explaining this gender wage gap (Goldin 1990; O'Neill and Polachek 1993; Sorensen 1991; Wellington 1993).

There is also a persistent "family gap"; that is, mothers earn lower hourly wages than do women without children (Fuchs 1988; Waldfogel 1994). Prior research has established that at least some portion of this unexplained wage difference between mothers and women without children can in fact be accounted for by the fact that mothers have less labor market experience (Hill 1979). Yet two important questions remain unanswered. First, does labor market experience (in addition to other observable characteristics) explain the entire wage gap between mothers and other women? Second, if a portion of the wage gap between mothers and other women is not accounted for by differences in experience, what does explain the gap? I consider two possible explanations: unobserved heterogeneity and part-time employment.

I use the National Longitudinal Survey of Young Women (the NLS-YW) from 1968 to 1988 to address these questions. This paper differs from previous research in several key respects. First, unlike previous research, I consider the effects of family status—both marital status and parental status—on women's earnings. This is important, because the effects of marriage on wages may (and in fact do) differ from the effects of children on wages. Second, I demonstrate that the estimated effects of children on wages are sensitive to specification, and that the short first-difference models used in prior research may underestimate the negative effects of children on women's pay, in comparison with the long first-difference and fixed-effects models I use here. Third, in contrast with previous research, I include part-time employees and specifically explore the effects of part-time employment and part-time experience on wages—in addition to the effects of children.

TWO ALTERNATIVE HYPOTHESES EXPLAINING THE LOWER PAY OF MOTHERS

Human capital theory (Becker 1985) predicts that, to the extent that mothers spend more time outside the labor market (for childbear-

* Direct correspondence to Jane Waldfogel, Columbia University School of Social Work, 622 West 113th Street, New York, NY 10025, jw205@columbia.edu. I am grateful to Mary Jo Bane, Francine Blau, David Ellwood, Richard Freeman, and Lawrence Katz for helpful comments. The Center for Human Resources Research at Ohio State provided access to and assistance with the NLS-YW.

ing and childrearing), labor market experience will explain much of the wage gap between mothers and other women. This prediction has been confirmed by several studies, which established that when employment experience is taken into account the unexplained difference in wages between mothers and other women narrows substantially. Hill (1979) found that controlling for employment experience (and related variables such as job tenure) eliminated all of the otherwise unexplained effects of children on women's pay. More recently, Jacobsen and Levin (1995), Korenman and Neumark (1992), and Waldfogel (1994) found that controlling for labor market experience eliminated much of the wage effects of children, but that unexplained effects of children remained. Studies in Australia (Baxter 1992) and Britain (Joshi and Newell 1989) also found that controlling for employment experience does not account for the entire wage gap between mothers and other women.

Several explanations have been advanced to account for the residual wage gap between mothers and other women. Two are considered here.[1] (1) One hypothesis attributes the wage gap to unobserved heterogeneity—differences in characteristics that are not observed in the data, such as motivation or commitment to paid work. Previous research has yielded conflicting results. Korenman and Neumark (1992), using short first-difference models, found some evidence of bias due to unobserved heterogeneity; but in research using differences across sisters, they found no heterogeneity bias (Neumark and Korenman 1994). (2) According to a second hypothesis, part-time employment explains the otherwise unexplained wage differential between mothers and other women. Past part-time employment could lead to lower current wages because it entails the accumulation of less human capital or because employers do not grant raises in part-time jobs. Current part-time employment generally is associated with lower pay, although not for all workers (Blank 1990).

DATA

Data come from the National Longitudinal Survey of Young Women (NLS-YW), 1968 to 1988. This panel data set contains detailed employment and family status histories for a nationally representative sample of women who have been surveyed since 1968. In 1988, the sample contained 2,133 employed women between the ages of 34 and 44.

The NLS-YW interviewed the women in the sample 15 times between 1968 and 1988. Thus, for each woman, the survey includes from 0 to 15 different wage observations, depending on how many of the survey years the woman was employed. I use these observed wages, and the associated observations of age, experience, and family status, to create a pooled data set, with a sample size of over 30,000 woman-year observations.

DOES LABOR MARKET EXPERIENCE EXPLAIN THE LOWER WAGES OF MOTHERS?

In analysis of cross-sectional data, "potential employment experience" (i.e., number of years since leaving school) is customarily used as a proxy for actual labor market experience. However, this specification biases the estimated effects of family status on women's pay, since it is the women with children who are likely to have fewer years of actual experience than potential experience. For this reason, I use the employment history data in the NLS-YW to calculate actual labor market experience.[2]

[1] Hypotheses not considered here include: employer discrimination (for which there is no objective measure in the data set) and the long-term effects of work interruptions (Jacobsen and Levin 1995; Waldfogel 1994). Another intriguing hypothesis attributes the lower pay of mothers to the reduced effort or energy available for labor market work because of ongoing parental responsibilities. Becker (1985), for example, argues that women with family responsibilities bring less effort to the job because of the effort they must devote to their household activities, but few empirical studies have tested this explanation (see Bielby and Bielby 1988; Hersch and Stratton forthcoming; and Waldfogel 1994).

[2] In the NLS-YW, number of weeks employed during the year is recorded for all but two of the years from 1968 to 1988 as well as for the year preceding the survey (1967). For the two missing survey years (1973 and 1975), I estimate the amount of labor market experience based on sum-

Table 1. Overview of Women's Labor Market Characteristics and Family Status: NLS-YW, 1988

Variable	All Women	Family Status: Women without Children	Married with Children	Previously Married with Children	Never-Married with Children
Number of cases	3,160	1,050	1,664	444	92
Potential work experience (mean years)	19.65	20.56	19.10	19.66	19.49
Actual work experience (mean years)	13.60	15.79	12.60	12.57	11.60
Mean $\left(\frac{\text{Actual work experience}}{\text{Potential work experience}}\right)$	.69	.77	.66	.64	.59
Percent currently employed	76.56	71.14	60.64	69.37	60.87
Percent employed part-time	18.96	12.18	26.46	12.01	12.50
Mean hourly wage (1988 dollars)	7.64	7.99	7.62	7.11	6.57

For this sample of women, actual experience is about two-thirds of potential work experience, but this ratio varies a great deal by family status. Table 1 shows that nonmothers have been employed 77 percent of the time since leaving school, married mothers 66 percent, previously-married mothers 64 percent, and never-married mothers 59 percent. The wage differences, also shown in Table 1, parallel these differences in employment experience.

To estimate the effects of family status on women's pay while controlling for actual experience, I estimate the following natural log wage regression, which includes the typical human capital variables plus controls for marital status and parental status:

$$\begin{aligned}\ln W_{it} = {} & Exp_{it} + Exp_{it}^2 + Age_{it} + Age_{it}^2 \\ & + Educ_{it} + Mar_{it} + Sep_{it} + Div_{it} \\ & + Wid_{it} + Onechild_{it} + Children_{it} \\ & + Black + Hispanic + \mu_{it}; \end{aligned} \quad (1)$$

where $i = (1, \ldots, N)$ indexes individuals; $t = (0, \ldots, 15)$ indexes time; $\ln W$ is natural log hourly wage in 1988 dollars; experience is years of actual employment experience; age and education are in years; married, separated, divorced, widowed, one child, two or more children, Black, and Hispanic are dummy variables; and μ_{it} is a disturbance term. Means for all variables are shown in Appendix A.

The results for the 1988 cross-sectional models are summarized in Table 2 and indicate that even after controlling for actual employment experience, having children (whether they are in the home or no longer in the home) matters. Interestingly, being married or divorced seems to be associated with increased wages relative to the wages of single women.[3]

I also created a pooled dataset which has the advantage of fully exploiting the NLS-YW data collected in 15 surveys over the 1968–1988 period. Because many women are not in the labor market every year, pooling the data greatly increases the likelihood of observing wages earned by any one woman. This step is important because, all else equal, women for whom the negative effect of children is the greatest are the least

mary data covering the period 1973 to 1978. I also impute experience for the period prior to 1967, using the standard potential experience formula (i.e., age minus years of education minus six).

[3] This marriage premium is similar to that ordinarily found for men. Although inconsistent with traditional human capital theory (Becker 1985), this marriage bonus is consistent with a household production model in which two can live more easily than one and in which both would therefore be more productive when married. It is also consistent with a selection model, in which doing well in the labor market is correlated with doing well in the marriage market. Also see Korenman and Neumark (1992), who report similar results for women.

Table 2. Coefficients from Cross-Sectional Models Regressing Ln Hourly Wage on Selected Family Status Variables: Women from the NLS-YW, 1968–1988

Family Status	Model 1 (1988)	Model 2 (1968–1988)
Married	.063*	.056*
Divorced	.065*	.088*
One child	–.041	–.058*
Two or more children	–.096*	–.133*
Children not in the home	–.022*	–.034*
Number of observations	2,133	30,992

Note: Coefficients are from cross-sectional models in which the dependent variable is natural log hourly wage. In addition to variables shown above, models also include controls for actual experience, experience squared, age, age squared, education, separated, widowed, Black, and Hispanic (see equation 1).

*$p < .05$ (two-tailed tests)

likely to be employed and are also the least likely to be part of any given cross-sectional sample of labor-market participants.[4]

In the pooled model (column 2 of Table 2), the penalty associated with having one child is over 5 percent, and the penalty for two or more children is over 13 percent. These coefficients are larger than those in the single year cross-section, suggesting that selection may have biased the child coefficients toward zero. Taken together, these cross-sectional estimates suggest that even after controlling for actual experience (and other observable characteristics such as education), a direct effect of children on wages remains to be explained.

ALTERNATIVE HYPOTHESES FOR THE DIRECT EFFECT OF CHILDREN ON WOMEN'S WAGES

Unobserved Heterogeneity

It is possible that unobserved differences (e.g., in motivation or commitment to the job) may bias the parameter estimates, in particular the wage penalties associated with having children. If women with lower motivation to succeed in the labor market are more likely to have children and less likely to have high earnings, then this unobserved heterogeneity might explain the observed negative relationship of wages and having children. The concern here is not with reverse causality; rather, it is that some unobserved factor is affecting *both* family status and wages.

To control for unobserved heterogeneity, one option is to use a difference specification:

$$\begin{aligned}\Delta \ln W_i = {} & \Delta Exp_i + \Delta Exp_i^2 + \Delta Age_i + \Delta Age_i^2 \\ & + \Delta Educ_i + \Delta Mar_i + \Delta Sep_i + \Delta Div_i \\ & + \Delta Wid_i + \Delta Onechild_i \\ & + \Delta Children_i + \Delta\alpha_i + \Delta\mu_i , \qquad (2)\end{aligned}$$

where $\Delta \ln W_i$ equals $(\ln W_{it+1} - \ln W_{it})$, Δexp equals $(\exp_{it+1} - \exp_{it})$, and so on, and where α_i is an individual fixed effect and μ_i is a disturbance term.[5] If the unobserved characteristic does not vary over time, this specification controls for it, because the fixed effect α_i drops out. This assumption is plausible, if the unobserved variable is thought of as a relatively stable individual attribute, such as motivation or ability.

I use both a standard short first-difference model (in which one to two years elapse between observations) and a range of longer difference models (in which two to nine years elapse). A one- or two-year interval may not be sufficient to capture the effects

[4] There are two methodological caveats. First, the pooled data set is clustered, since each woman can contribute more than one woman-year observation. This means that standard OLS regression will yield incorrect standard errors (Moulton 1986). For this reason, in the pooled models the standard errors are corrected for clustering (using the group function in STATA). Second, the panel is unbalanced (i.e., each woman in the pooled data set contributes from 1 to 15 wage observations). If not corrected, this would be a concern because the women who contribute more observations will carry more weight in the pooled sample, and labor market participation may be correlated with other variables. This problem is corrected by using a sampling weight equal to the inverse of the probability that the woman is included in the sample for all years.

[5] Since the difference model is designed to control for an individual fixed effect, one can think of it as a special type of fixed-effect model.

Table 3. Coefficients from Difference Models Regressing Differences in Ln Hourly Wage Over Time on Differences in Selected Family Status Variables: Women from the NLS-YW, 1968–1988

	Model and Number of Years between Observations			
Family Status	Model 1 (1–2 Years)	Model 2 (2–4 Years)	Model 3 (3–5 Years)	Model 4 (5–9 Years)
Married	.003	.020*	.027*	.043*
Divorced	.028*	.032*	.033*	.061*
One child	–.018	–.053*	–.061*	–.064*
Two or more children	–.023	–.056*	–.076*	–.111*
Children not in the home	–.004	–.009*	–.010*	–.016*
Number of observations	21,460	18,026	15,535	11,559

Note: Coefficients are from difference models in which the dependent variable is the difference between the natural log hourly wage for an individual in one year and the natural log hourly wage for that individual in the comparison year. The independent variables are expressed as differences as well and include actual experience, experience squared, age, age squared, education, separated, and widowed. Observations are woman-years.

*$p < .05$ (two-tailed tests)

that having children has on wages because new mothers may not be employed at all and/or because the effects may be cumulative over time.

In the four difference models summarized in Table 3, a pattern clearly emerges: the longer the difference, the greater the estimated penalties associated with having children. This pattern implies that children have a negative effect on women's wages, even after controlling for unobserved heterogeneity, and that using short first-differences might underestimate this penalty.

A second way of testing for unobserved heterogeneity is a fixed-effects specification in which all the variables are expressed as deviations from their mean values:

$$\begin{aligned}(\ln W_{it} - \overline{\ln W}_i) &= (\exp_{it} - \overline{\exp}_i) \\ &+ (\exp_{it}^2 - \overline{\exp}_i^2) + (Age_{it} - \overline{Age}_i) \\ &+ (Age_{it}^2 - \overline{Age}_i^2) + (Educ_{it} - \overline{Educ}_i) \\ &+ (Mar_{it} - \overline{Mar}_i) + (Sep_{it} - \overline{Sep}_i) \\ &+ (Div_{it} - \overline{Div}_i) + (Wid_{it} - \overline{Wid}_i) \\ &+ (Onechild_{it} - \overline{Onechild}_i) \\ &+ (Children_{it} - \overline{Children}_i) \\ &+ (\alpha_{it} - \bar{\alpha}_i) + (\mu_{it} - \bar{\mu}_i), \end{aligned} \quad (3)$$

where $\ln W_{it}$ equals natural log hourly wage for individual i at time t; $\overline{\ln W}_i$ equals mean natural log hourly wage for individual i; and so on. As in a difference model, the individual effect is assumed to be time-invariant and potentially correlated with one or more dependent variables.[6]

The fixed-effects results are shown in columns 4 through 6 of Table 4 (comparable pooled OLS models are shown in columns 1 through 3). In the first model (columns 1 and 4), the fixed-effects coefficients for one child and two or more children are virtually the same as in the pooled OLS model. The effects of marital status on wages, however, tend to fall in the fixed effects model, indicating that some of the estimated bonus attributed to being married or previously married is in fact due to unobserved heterogeneity.

It is striking that the estimated child penalties from the pooled and fixed-effects models are virtually identical and that they are larger—that is, more negative—than in a single year OLS model. This result suggests

[6] An alternative would be a random-effects model, but a random-effects model would treat the individual effect as not correlated with the other variables (Hsaio 1986). Also note that the pooled estimates are, in essence, random-effects estimates since they include a control for random group effects (i.e., the individual woman effects).

Table 4. Coefficients from Pooled OLS Models and Fixed-Effects Models Regressing Ln Hourly Wage on Selected Family Status Variables: Women from the NLS-YW, 1968–1988

	Pooled OLS Models			Fixed-Effects Models		
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Actual work experience	.025* (.003)	.025* (.002)	—	.027* (.002)	.025* (.002)	—
Actual work experience squared	–.000 (.000)	–.000 (.000)	—	–.000 (.000)	–.000* (.000)	—
Part-time work experience	—	—	–.002 (.004)	—	—	.024* (.003)
Part-time work experience squared	—	—	.002* (.000)	—	—	–.000* (.000)
Full-time work experience	—	—	.029* (.003)	—	—	.025* (.002)
Full-time work experience squared	—	—	–.000 (.000)	—	—	–.000 (.000)
Age	.110* (.007)	.093* (.007)	.095* (.006)	.112* (.003)	.104* (.003)	.104* (.003)
Age squared	–.002* (.000)	–.002* (.000)	–.002* (.000)	–.002* (.000)	–.002* (.000)	–.002* (.000)
Education	.070* (.002)	.069* (.002)	.069* (.002)	.059* (.002)	.051* (.002)	.051* (.002)
Married	.056* (.011)	.047* (.010)	.045* (.010)	.042* (.007)	.034* (.006)	.034* (.006)
Divorced	.088* (.015)	.065* (.015)	.064* (.014)	.062* (.009)	.048* (.009)	.047* (.009)
One child	–.055* (.012)	–.043* (.011)	–.041* (.011)	–.056* (.006)	–.039* (.006)	–.038* (.006)
Two or more children	–.133* (.013)	–.107* (.013)	–.096* (.013)	–.147* (.008)	–.117* (.008)	–.116* (.008)
Children not in the home	–.034* (.005)	–.033* (.005)	–.027* (.005)	–.033* (.003)	–.030* (.003)	–.029* (.003)
Part-time work currently	—	–.145* (.010)	–.123* (.010)	—	–.111* (.005)	–.112* (.005)
Black	–.029* (.010)	–.042* (.010)	–.045* (.010)	—	—	—
Hispanic	.040 (.023)	.040 (.022)	.040 (.022)	—	—	—
Adjusted R^2	.339	.357	.338	.316	.328	.329
Number of observations	30,992	30,992	30,992	30,992	30,992	30,992

Notes: The dependent variable in all pooled regressions is the natural log hourly wage. In the fixed-effects models, the dependent variable is the deviation of the natural log hourly wage from the mean natural log hourly wage for the individual.

*$p < .05$ (two-tailed tests)

that unobserved heterogeneity is not biasing the estimated effects of children on women's wages (or, if anything, is biasing the effects toward zero). Intuitively, this finding that mothers are not systematically different from non-mothers in their unobservable characteristics makes sense. Mothers are, after all, not a select group. Over the 1968–1988 period, over 90 percent of the women in the NLS-YW had children. Of those who did not have children, some number may not have been able to (due to lack of a suitable partner, fertility problems, etc). It is certainly plausible that mothers as a group do not systematically differ from non-mothers in ways that are not observed and that would affect their wages.

Current and Past Part-Time Employment

Some of the wage penalties to having children might be due to the indirect effects of part-time employment, since wages for part-time jobs are generally lower and mothers are more likely than non-mothers to be employed part-time.[7] To control for this possibility, the second set of pooled and fixed-effects models shown in Table 4 (columns 2 and 5 respectively) includes current part-time employment status. The third set (columns 3 and 6) also controls for part-time employment in the past by separating past experience into part-time and full-time components.

The estimates in Table 4 indicate that there is, in fact, a wage penalty for part-time employment for the women in this sample, and that controlling for part-time employment reduces the estimated direct wage penalties associated with having children from the levels in the first models (columns 1 and 4). In both the pooled cross-sectional and fixed-effects models, the negative effects of children in the home fall after controls are added for current part-time employment status. Controlling for part-time employment in the past has a slight additional effect on the estimated effects of children, but it is the current part-time status that dominates. It is also worth noting that the estimated effect of part-time status is substantial: In the fixed-effects estimates, the penalty in hourly wages for being employed part-time is over 10 percent.[8]

Clearly, part of the overall wage penalty associated with having children estimated here is due to the indirect effects of current part-time status and of being employed part-time in the past, but it is also important to note that significant negative direct effects of children on women's wages remain. Even after controlling for human capital, unobserved heterogeneity, and part-time job status (see column 6), there is still a 4 percent penalty for having one child and a nearly 12 percent penalty for having two or more children.

Table 5. Coefficients from Pooled Models Regressing Hourly Wage on Selected Family Status Variables by Race: NLS-YW, 1968–1988

Family Status	All Women	Whites Only	Blacks Only
Married	.056*	.065*	.029
Separated	.046*	.062*	.028
Divorced	.088*	.084*	.091*
One child	−.055*	−.080*	−.019
Two or more children	−.133*	−.182*	−.053*
Children not in the home	−.034*	−.047*	−.004
Number of observations	30,992	21,959	8,338

Note: Coefficients are from OLS models that also included controls for actual work experience, experience squared, age, age squared, and years of education. Observations are woman-years.

*$p < .05$ (two-tailed tests)

[7] It is important to note that it is married mothers who are most likely to work part-time, as is shown in Table 1. The effect of part-time job status, then, is likely to be less important in explaining lower wages among unmarried mothers. Rather, it is time out of the labor market that seems to be particularly important (Waldfogel 1994).

[8] An alternative way to control for the effects of part-time work (and one that might be preferred if working part-time is endogenous) is to exclude part-time workers. Accordingly, a pooled model (not shown here) was run for a sample of full-time workers only, and there were no significant differences between the results for the full-time workers and all women. This indicates that including the part-time employees in the analysis is not driving the results obtained here.

VARIATION AMONG WOMEN

There is no reason to assume a priori that the wage penalties associated with having children would be constant across women. Rather, these effects might vary by factors such as race or educational level.

In models run separately for White women and African American women (summarized in Table 5), the family status effects (with the exception of the divorce premium) are uniformly smaller for Black women than for White women. This result is consistent with Hill (1979) and Korenman and Neumark (1992), who also found smaller wage penalties for Black women with children. There is no ready explanation for these differences, and this area merits further research. In other models not shown here, I allowed the effects of family status to vary by educational status. I found that the wage penalties associated with having children tended to rise with education level. Further research would be useful here.

SUMMARY AND CONCLUSIONS

The key findings of this paper can be summarized as follows. First, even after controlling for actual labor market experience, a direct effect of children on women's wages remains. Second, difference models and fixed-effects models provide no evidence that the estimated effects of having children are due to unobserved heterogeneity; they do indicate, however, that some of the positive effects of being married or divorced as opposed to single may be due to unobserved individual differences. Third, there is a wage penalty for current part-time employment and a slight wage penalty for part-time versus full-time experience; controlling for part-time status reduces, but does not eliminate, the negative effects of children on wages. Fourth, there is a suggestion in the data that these family status effects may vary among women by race and educational level.

The principal conclusion of this paper is that women do suffer a wage penalty when they have children, and this "family penalty" does not disappear when controls are added for actual employment experience (in addition to controls for observable differences in personal characteristics). Taking time out of the labor market is certainly an important part of the explanation for mothers' lower earnings, but it is not the whole story. Alternative hypotheses are clearly needed, and this paper has considered two of them.

Differences between mothers and nonmothers on characteristics unobserved in the data were not an important explanatory factor here, as the estimated effect of children on wages did not fall significantly in the difference models and fixed-effects models. Part-time employment, on the other hand, proved to be quite an important component of the "family gap" in wages. Models estimated here show a penalty of approximately 10 percent for being employed part-time instead of full-time. Interestingly, past part-time experience was by no means worthless; in fact, it was worth almost as much as past full-time work experience.[9]

Even after controlling for human capital, unobserved heterogeneity, and part-time job status, an unexplained "family gap" in wages between mothers and other women persisted, with a 4 percent penalty for one child and a 12 percent penalty for two or more children. Further explanations must be sought. One suitable hypothesis is that "work and family conflict," whether in the form of employer perceptions (i.e., discrimination) or employee adjustments (e.g., occupational downgrading, changing jobs after childbirth, etc.), may have a negative effect on the wages of mothers.

Jane Waldfogel *is Assistant Professor of Social Work at Columbia University School of Social Work. She is author of several articles on women's employment and earnings, maternity leave, and the Family and Medical Leave Act. Recent publications include "The Family Gap for Young Women in the United States and Britain" (Journal of Labor Economics, forthcoming) and a chapter in* Gender and Family Issues in the Workplace, *edited by Francine Blau and Ronald Ehrenberg (Russell Sage 1997). Her current research interests include the labor market prospects and outcomes for disadvantaged youth, a new paradigm for child protective services, and the relationship between maternity leave, child care, and child well-being.*

[9] Also see Ferber and Waldfogel (1996), who find positive returns to past part-time employment experience, particularly for women who worked part-time voluntarily.

Appendix A. Variable Means for the Samples of Working Women from the NLS-YW, 1968–1988

Variable	1988 Sample	1968–1988 Pooled Sample
Age	38.61	28.17
Actual work experience	15.20	7.31
Years of education	13.23	12.79
Percent married	63.68	53.36
Percent separated	5.19	5.49
Percent divorced	18.87	10.15
Percent widowed	1.56	5.90
Percent never-married	10.70	25.10
Children in the home	1.15	.96
Total children born	3.08	1.74
Percent Black	26.37	27.02
Percent Hispanic	2.26	2.24
Percent employed part-time	18.96	23.54
Hourly wage (1988 dollars)	7.64	6.79
Number of observations	2,120	30,992

Note: Observations are in woman-years.

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