The Motherhood Wage Penalty: Which Mothers Pay It and Why?

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Studies of the motherhood wage penalty typically focus on the "pure" effect of children, holding all else equal. But as all parents know, the arrival of a child means that nothing stays the same. One change especially salient to labor economists is that many mothers stop out of the work force. Absences from the labor market are likely to reduce wages because general and firm-specific skills depreciate and workers lose rents associated with good job matches. Low-skilled workers may be less vulnerable to such earnings erosion since they have less human capital and their wages reflect less rent. If so, these workers may escape a motherhood wage penalty. Conversely, we would expect highly skilled women to experience the largest penalties for stopping out of the labor force to care for their children.

I. The Penalty for Having Children

As discussed in more detail below, we estimate a total motherhood wage gap of about 15 percent per child in a cross-section of working women. Previous studies report that the cross-sectional gap is at least partly explained by human capital variables such as education, work experience and time out of the labor force.[1] In fact, many studies measure the penalty as the estimated coefficient on the presence or number of children in a log wage equation that controls for these human capital variables. This measures the "pure" child effect, distinct from indirect effects caused by the reduction of work hours and gaps in labor force attachment. Although it is relevant to determine how children affect their mothers' wages directly, the total wage effect, including both direct and indirect effects, is perhaps even more important for understanding

women's labor market outcomes and assessing child-rearing costs.

Moreover, it is likely that the depreciation of human capital that occurs during labor market absences is more problematic for highly-skilled women, for reasons mentioned above.[2] If so, then estimating one "pure" child wage effect may obscure potentially large differences in the motherhood wage penalty across education groups.

As with measures of the "pure" child effect, estimates of the total child effect from cross-sectional data are biased if mothers and non-mothers differ in unobserved productivity traits. At the same time, differences estimated from cross-sectional analyses may have real effects on both women's employment and firms' hiring decisions — exactly because they are more readily observable. We therefore study the motherhood wage penalty using the 1968-1988 National Longitudinal Survey of Labor Market Experience of Young Women (NLSYW) – data which allow us to investigate both cross-sectional samples (with OLS models) and panel samples (with fixed effects models to control for heterogeneity).

II. Data and Empirical Approach

In 1968, the NLSYW surveyed a nationally representative sample of 5159 women between the ages 14 to 24; by the 1988 survey, 3508 women (currently ages 34 to 44) were still being interviewed. Due to space constraints, we present findings only for non-Hispanic white women; results for non-Hispanic black women are available upon request. We further restrict the sample to woman-year observations in which the woman is employed, earns an hourly wage between $1 and $150 in 1997 dollars, and is not enrolled in school. Finally, we exclude women who change education groups over the course of the survey, ensuring that each woman belongs to one of three mutually exclusive education groups: those with less than a high school degree;

high school graduates and those with up to three years of college; and college graduates. After deleting observations with missing information, the final sample includes an unbalanced panel of 2769 white women observed up to 15 times between 1968 and 1988 (17,515 woman-year observations). For more information on creation of the data set, see Deborah J. Anderson, Melissa Binder and Kate Krause (forthcoming).

We estimate models of the form

(1) $$Log\ Wage_{it} = \beta_0 + \beta_1 [ONE\ CHILD]_{it} + \beta_2[TWO\ OR\ MORE\ CHILDREN]_{it} + \beta_3[DEMOGRAPHIC\ CONTROLS]_{it} + \beta_4[HUMAN\ CAPITAL\ CONTROLS]_{it} + \upsilon_{it}$$

where i indexes individual women ($i = 1 \ldots 2769$), t indexes time ($t = 1968 \ldots 1988$), and υ_{it} is an error term. To estimate fixed effects models we use a model similar to equation (1), except that all variables pertain to mean-differenced values across years for each woman, and the error term is composed of a fixed component (α_i) and time-varying component (μ_{it}). Demographic controls include age and an indicator variable equal to one if the woman is married with spouse present (and zero otherwise); human capital controls include actual market work experience, education, time out of the labor market (calculated as age - education - experience - 6),[3] an indicator variable for part-time work, and occupation. β_1 and β_2 are parameters that measure the wage penalty for one and two or more children, respectively.

We separate demographic from human capital variables since measures of a woman's labor market productivity are likely to change in response to her mother status. For example, market work experience and time out of the labor market are directly associated with labor supply decisions that occur after the birth of a child. Mothering may also affect education (since women who plan to have many children, and those who bear children when they are very young,

are likely to complete fewer years of schooling) and occupation (if, as Gary Becker (1985) argues, mothers choose occupations that are relatively more compatible with raising children[4]). The total motherhood wage penalty is estimated from a regression with only the demographic controls; estimates of models that also include human capital controls help to identify the human capital characteristics that contribute to the total wage effect.

III. Who Bears the Motherhood Wage Penalty?

A. OLS Results

Panel A of Table 1 shows results of cross-sectional models for white women. The total motherhood wage gap (controlling only for age and marital status) for all women is quite high: about 16 percent for one child and 29 percent for two or more children. This gap varies markedly, though, across education groups. The least educated mothers bear no penalty at all; in contrast, high school and college graduate mothers earn about ten percent less than non-mothers for each child. The highest total penalty is borne by college-educated mothers of two or more children.

[Table 1 Approximately Here]

For high school graduates, a comparison of the total penalty (row 1) with the residual penalty after controlling for all human capital differences (row 6) shows that up to 60 percent of the motherhood wage penalty results from human capital differences between mothers and non-mothers. The largest incremental change is between rows 3 and 4: adding time out of the workforce to a model which controls for education and experience explains an additional 35 percent of the total penalty for one child and an additional 41 percent for two or more children, compared with the previous specification.

For college graduates, only 25 percent of the one child penalty and 32 percent of the two or more children penalty can be explained by human capital. Comparing rows 2 and 3 shows that experience, the most important factor, explains an additional 20 percent of the penalty compared to a model that controls only education. The relatively small role of human capital variables in explaining the penalty for college graduates suggests that large wage differences between mothers and non-mothers may be due to substantial unobserved heterogeneity.

The pattern of results is very similar for the cross-section of black women; however, high school graduates suffer somewhat smaller penalties, and college graduates experience slightly larger penalties, relative to white women.

B. Fixed Effects

Results of fixed-effects models for white women are presented in Panel B of Table 1. Controlling for time-invariant unobserved heterogeneity, the total child penalty for all women falls dramatically to about four percent per child. As in the cross-sectional analysis, the least educated mothers face no penalty at all; in fact, black mothers without a high school diploma earn more than non-mothers in some specifications. The fixed effects estimates for high school and college graduates, however, are quite different from the OLS results. For white high school graduates, the total penalty falls by about one-half (comparing Panel A, row 1 and Panel B, row 1) and is nearly identical to the "pure" child effect estimated in the cross-section (comparing Panel B, row 1 and Panel A, row 6). When we control for experience in row 3, we see that the child penalty rises. This means that, because women have more work experience as workers with children than they had as workers without children, the total wage penalty is somewhat attenuated. The subsequent inclusion of other human capital variables – especially years out of

the workforce and working part-time – accounts for about 30 percent of the row 3 penalty. This leaves a large share of the motherhood wage penalty that cannot be explained by human capital. Although black high school graduates bear no significant penalty for one child, the penalty for two or more children is very similar to their white counterparts.

A different pattern emerges for college-educated mothers. The fixed effects estimates of the total child effect show that white women actually earn more as mothers than non-mothers; this premium is nearly 10 percent for one child and about seven percent for two or more children. With controls for education and experience, however, mothers of two or more children face a substantial penalty of close to 15 percent. This penalty can be entirely explained by the number of years out of the work force: with this variable added (see Panel B, Row 4), the penalty falls to less than three percent and is not statistically significant. Interestingly, the penalty for only one child is much less than half of the penalty for two or more children: with controls for education and experience one child imposes only a four percent penalty for college-educated women. College-educated black women also bear no penalty for one child and an experience-adjusted penalty for two or more children very similar to whites. This penalty, however, persists even with controls for stopping out, part-time work and occupation.

IV. Conclusion

The motherhood wage penalty for white mothers varies considerably by education level. In a cross-section, mothers who did not complete high school do not earn less than their childless counterparts, while high school and college graduates earn about 10 percent less per child. Human capital variables account for up to 60 percent of the cross-sectional wage gap for high school graduates, with years out of the workforce alone explaining 40 percent of the gap. In

comparison, human capital variables explain only 30 percent of the wage gap for college graduates, with experience accounting for 20 percent of the gap.

The motherhood wage gap for college graduates appears to be a phenomenon of unobserved heterogeneity between mothers and non-mothers, since in fixed effects analyses, the total wage effect for having children is positive. When we control for education and experience, however, we find that college graduates pay about a 15 percent wage penalty for having more than one child. The one child penalty, at four percent, is much smaller. Both penalties are entirely explained by years out of the workforce for white mothers. In contrast, stopping out explains only about 20 percent of the motherhood wage penalty for white high school graduates and only 12 percent for black college graduates once we control for unobserved heterogeneity.

How does the pattern of results relate to our predictions regarding educational differences in the penalty for stopping out? First, it is clear that the least skilled do not suffer lower wages for becoming mothers; this is consistent with our hypothesis that stopping out should not impose high costs on low-skilled workers. The 15 percent penalty for college-educated mothers of two or more children, which can be entirely explained by years out of the workforce for whites, is also consistent with our hypothesis that high-skilled workers should face high costs for stopping out. Finally, high school women and black college graduates appear to occupy a middle position: years out of the workforce contribute only modestly to explaining the motherhood wage penalty experienced by individual women. The puzzle for these mothers is the large share of the total penalty that cannot be explained by human capital variables.

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Table 1. Estimated wage penalties for white women with one and two or more children, OLS and fixed effects models [a]

	All women		Without high school diploma		High school graduate and some college		College graduate (16 years of schooling or more)	
Controls	**One child**	**Two or more children**	**One child**	**Two or more children**	**One child**	**Two or more children**	**One child**	**Two or more children**
A. ORDINARY LEAST SQUARES								
1. Age, MSP[b] (TOTAL PENALTY)	-.165**	-.288**	.048	.059	-.121**	-.217**	-.095**	-.238**
2. Age, MSP, Education	-.085**	-.154**	.024	.048	-.102**	-.195**	-.091**	-.224**
3. MSP, Education, EXP, EXP^2	-.093**	-.149**	.029	.053	-.115**	-.194**	-.075**	-.181**
4. Above + Years Out[c]	-.066**	-.093**	.028	.046	-.072**	-.104**	-.071*	-.163**
5. Above + Part-time	-.056**	-.078**	.029	.048	-.061**	-.086**	-.061	-.150**
6. Above + Occupation	-.049**	-.069**	.027	.058	-.056**	-.085**	-.071**	-.163**
B. FIXED EFFECTS								
1. Age, MSP (TOTAL PENALTY)	-.041**	-.081**	.023	.038	-.057**	-.098**	.100**	.070**
2. Age, MSP, Education	-.041**	-.080**	.021	.035	-.056**	-.096**	-.025	-.143**
3. MSP, Education, EXP, EXP^2	-.056**	-.093**	.035	.065**	-.074**	-.114**	-.040*	-.150**
4. Above + Years Out[c]	-.046**	-.070**	.017	.021	-.063**	-.088**	.006	-.027
5. Above + Part-time	-.037**	-.056**	.021	.030	-.053**	-.073**	.006	-.031
6. Above + Occupation	-.034**	-.056**	.007	.019	-.050**	-.079**	.004	-.022
Number of observations (number of women)	17515 (2769)		2078 (399)		12267 (1843)		3170 (527)	

Asterisks indicate estimate is significant at the 5% level (**) or 10% level (*).

[a] Dependent variable is log wage in constant 1997 dollars; control variables are listed in first column. Estimates are coefficients on mutually exclusive indicator variables for one child or two or more children; the omitted category is no children. The OLS analysis uses a pooled cross section of all woman-year observations in the sample; we weight each observation by the inverse of the probability that the woman is in the sample for all 15 years and estimate robust clustered standard errors.

[b] MSP = married with spouse present.

[c] Years Out = number of years not in workforce after schooling is complete.

NOTES

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[1] See, for example, Sanders Korenman and David Neumark (1992), Jane Waldfogel (1997), Shelly Lundberg and Elaina Rose (2000), and Michelle J. Budig and Paula England (2001).

[2] On depreciation of human capital see Jacob Mincer and Solomon Polachek (1974) and Leslie S. Stratton (1995).

[3] Whenever experience and education are included in the regression, age is dropped from the analysis.

[4] Evidence provided by Budig and England (2001) appears to refute this proposition.