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"The Motherhood Wage Gap for Women in the United States: The Importance of College and Fertility Delay"

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Abstract. One of the stylized facts from the past 30 years has been the declining rate of first births before age 30 for all women and the increase rate of first births after age 30 among women with four-year college degrees (Steven P. Martin, *Demography*, 37(4), 523-533, 2000). What are some of the factors behind women's decision to postpone their childbearing? We hypothesize that the wage difference often observed between like-educated mothers and non-mothers (Jane Waldfogel, *Journal of Labor Economics*, 16, 505-545, 1998a; *Journal of Economic Perspectives* 12(1) 137-156, 1998b) may be affected by the postponement of childbearing until after careers are fully established. Hence, we focus on college-educated women because they are typically more career-oriented than their non-college educated counterparts and also the group most often observed postponing maternity. We use individual-level data on women from the 1979 National Longitudinal Survey of Youth (NLSY79) in order to control for individual-level unobserved heterogeneity as well as human capital characteristics, such as actual work experience, in our empirical analysis. We estimate wage equations, first producing base-line results to compare to the existing literature. Then, we expand the basic wage equation model to address fundamental econometric issues and the education/fertility issue at hand. Our empirical findings are two-fold. First, we find that college-educated mothers do not experience a motherhood wage penalty at all. In fact, they enjoy a wage boost when compared to college-educated childless women. Second, fertility delay enhances this wage boost even further. Our results provide an explanation for the observed postponement of maternity for educated women. We argue that the wage boost experienced by college-educated mothers may be the result of their search for family–friendly work environments, which, in turn, yields job matches with more female-friendly firms offering greater opportunities for advancement.

Keywords: family pay gap, mother's wages, fertility delay, motherhood wage gap, wage penalty, child-bearing postponement, college education

JEL Codes: J13 and J3

1. Introduction

Perhaps the second most significant demographic trend for women in the United States in the second half of the 20th century, after the dramatic increase in labor force participation, was the evolution of fertility patterns, including the slow but steady decline in overall fertility rates, and postponement of fertility. In 1960, the fertility rate per 1000 women of childbearing age was at a high of 120, and by the year 2000 this rate had fallen to 67. Described using total fertility rates (i.e., the number of births that a hypothetical woman is estimated to experience throughout her childbearing years if she follows current fertility patterns), this rate fell from 2.48 per mother in year 1960 to 2.13 in the year 2000.[1] Were it not for high fertility rates of new immigrants, the United States fertility rate would be considerably lower. Additionally, over the same time frame, the mother's age at first birth was rising: in 1970, 19 percent of first births were to women aged 25 or older; by 2000 this percentage had increased to over 50 percent. Of course, fertility delayed is often fertility foregone, meaning that as more women put off having children, the overall fertility rate may well continue to decline as a result. These fertility trends in the United States mirror those in many other countries in Western Europe as well as by most other developed and even some lesser-developed countries (Population Council, 1999; Trude Lappegard, 2000). In many of these countries, the fertility decline has continued and is now so low that it no longer achieves the threshold necessary for population replacement.[2]

Accompanying the fertility trends just noted has been an increase in the education level of mothers at the time of the child's birth. The median years of education for mothers has risen from 12.4 years in 1970 to 12.9 in the year 2000 (Joyce A. Martin, Brady Hamilton, Stephanie Ventura Fay Menacker, and Melissa Park, 2002). Across the same period, the percentage of mothers reporting 16 or more years of education has risen dramatically, from 17.8 percent to 25 percent (a 40 percent increase).

Why have these dramatic changes in fertility patterns occurred? Clearly, a number of factors have taken place simultaneously. Some of these factors include the previously mentioned increase in female employment, particularly for mothers; rising education levels of all women; an opening up of professional, career occupations once dominated by men; and changing social attitudes. Most relevantly, the trends with regard to age at first birth and mother's education are linked. In particular, previous studies have examined the link between education and fertility decline, and found that the trends vary across educational and racial groups, with much bigger declines experienced by white highly educated women. Examining the differences particularly by education is important because the mere existence of differences suggests that childbearing incentives might differ between educated and less-educated women. As posed by David Ellwood and Christopher Jencks (2001), the question is: "…does early as opposed to late childbearing actually do greater economic "harm" to the lifetime earnings prospect of women with more economic opportunities?" (p. 68).[3] We approach this question by examining the wage gap between mothers and non-mothers with an emphasis on the importance of (and interaction between) education and fertility timing.

Given that European trends in rising female education levels and fertility rates mirror those of the United States, why are overall European rates so much lower than fertility rates in the United States? While there is no clear answer to this question, two important factors contribute to these divergent trends. First, immigration is much more substantial (as a percentage of total country population) in the United States than in any European country, and the new United States immigrants exhibit much higher fertility rates than the native population (although this higher fertility rate falls towards native rates within one or two generations). The second reason that European fertility rates are much lower than rates in the United States involves disentangling the effects of rising education and changing per capita income. Specifically, while education and per capita income have moved in tandem in the United States, in European countries, rising female education rates have not produced similar increases in per capita income. Becker's theory of quantity versus quality of children implies that rising education rates will lead to a preference of quality over quantity (thereby reducing fertility), but rising per capita income will permit quality increases with little to no reduction in child quantity. According to Austin Nichols (2003), higher earnings per unit of human capital will lead to rising fertility rates. Thus, we would expect fertility rates in the United States to remain more stable than in European countries.

Fertility decline and changes in childbearing timing are of interest and concern to researchers and policy-makers alike for four reasons. First, fertility rates below replacement rates serve as a threat to the long-term survival for any society as the impact of an aging population and reduced economic growth reverberates throughout the economy. Second, with rapidly aging (on average) populations, the ability to provide costly support services to the non-working elderly becomes more uncertain. Third, as women delay fertility, they face declining fecundity in their 30s and 40s. Consequently, more families face increased medical expenditures as they confront this natural consequence of aging, a cost that is passed on to society in higher overall medical expenditures and rising health care costs. Furthermore, more women are remaining childless although their preferences are otherwise, merely as a result of delaying fecundity. Finally, because these fertility (as well as marriage) trends vary substantially by education, the resulting impact on family structure produces a rising unequal income distribution in the United States, with an increasingly marginalized population of "have-nots" characterized by poor education, low marital rates, and high rates of single parenthood (Ellwood and Jencks, 2001).

The popular media has also entered the discussion of these trends, most recently with the book titled *Creating a Life: Professional Women and the Quest for Children*, by labor economist Sylvia Ann Hewlett (2002). Hewlett describes the difficulties faced by educated women, including job market problems, mate-finding problems, and fecundity problems resulting from delayed childbearing. Most relevant for this research is her conclusions that the "costs" associated with motherhood are lower for younger first-time mothers than older first-time mothers.[4] Her argument is a convincing one were such choices made in a static framework, but not so convincing when one considers that fertility/employment decisions somewhat early in life affect wage levels and wage growth throughout a working lifetime. That is, if bearing children early in life scars a woman's career advancement and earnings potential for a lifetime, then the decision-making process must consider the full lifetime costs and benefits of early versus late motherhood. In other words, the potential effects on the motherhood wage gap (and overall career success) arising from the timing of first birth must also be considered. By delaying fertility, educated women leave time for a career to take off, allowing for a less-disruptive maternity period following this career build-up. How rational are these women? Are they making this decision to delay fertility in order to build-up formal and on-the-job human capital in their twenties? If so, the fertility timing decision becomes more complicated, given the conflicting goals of career success and motherhood.

In our research, we contribute to this debate by re-formulating the fertility timing decision in the framework of a career-oriented woman's effort to minimize the so-called motherhood wage gap. Because education plays a role both in fertility decisions and in family pay gap outcomes, it is likely that education provides the link between these two factors. We find that college-educated mothers actually experience a wage boost compared with college-educated non-mothers, and this wage boost is enhanced by their postponement of motherhood. This wage boost may possibly occur if, in the process of searching for family–friendly employers, college-educated mothers simultaneously are identifying those firms most likely to be friendly to women and to encourage their advancement within the firm.

In the next two sections of this paper, we describe in further detail trends in fertility and education, and their link to estimates of the motherhood wage gap. Next, in Section 4, we discuss the conceptual framework and empirical methodology of our study. Section 5 then follows with a description of our data. We present and explain our findings in Section 6, and our conclusions follow in Section 7.

2. Further trends in fertility and education

Aggregate and detailed fertility trends in the United States have changed dramatically in the past century. These changes are related intricately to simultaneous, interrelated changes in women's work, education and marriage patterns. Considering age at first birth, one sees substantial variation by educational attainment. Less-educated women are much more likely to experience their first birth in their twenties, while more educated women are more likely to experience that first birth in the thirties. Additionally, the wage gap between mothers and non-mothers varies substantively by education, with more educated women experiencing a smaller penalty associated with motherhood. Descriptive evidence to support this conclusion can be found in Lucie Schmidt's (2002) study of unmarried mothers. She finds that less-educated unmarried mothers earn only 75 percent, on average, of their non-mother counterparts while the comparable percentage for more-educated unmarried mothers is 95 percent (p. 5).

Steven Martin (2000) examines the growing trend of delaying fertility beyond the age of 30, and finds that the women underlying this aggregate trend are more educated women. He argues that fertility delay is a consequence of career-building demands and the high costs of quality child care, with both factors becoming less insurmountable as the woman's career progresses and earnings grow. As a consequence, "... especially for college-educated women, the competition between work and family roles in the early adult years causes births to be consigned to the later adult years'' (p. 523).[5] In addition, while college-educated women are more likely to delay fertility, they are also more likely to experience a late birth, thereby compensating at least in part for that earlier delay in fertility.[6] Renbao Chen and S. Philip Morgan (1991) add to this descriptive evidence by noting a large racial gap persists in the timing of first birth. Using a sophisticated theoretical model of fertility timing, Siv Gustafsson (2001) identifies women's career planning as the primary explanation for postponement of maternity. This implies that the delay of fertility will be most beneficial for career-oriented women, who are also likely to be relatively better educated (see also Murat F. Iyigun 2000; Amalia R. Miller 2003).

Linking fertility timing and education is insufficient, however, as surely wages also play a role, and as discussed earlier, education and wages do not always trend upward at the same rates. McKinley L. Blackburn, David E. Bloom, and David Neumark (1990) directly address the linkage between fertility timing and wages in a lifecycle context and conclude that mothers who have delayed fertility until their thirties tend to earn higher wages. They find that the increased wages for ''late'' mothers are driven by greater formal human capital investments (p. 24).

In summary, this literature suggests a strong connection between fertility delay and education, although the explanations are not clear. We address this issue in a more rigorous way in the following section.

3. The motherhood wage gap and its potential link to changing fertility patterns

On average, women with children earn less than women without children, even when various relevant productivity characteristics are controlled. This so-called motherhood wage gap has been discussed in the labor economics literature for many years, originally as a by-product of comparisons between married and single working women, and the more broad comparison of wages across sex. Early literature examining the sex wage gap proffered the explanation that marriage and childbearing altered the earnings capacity differentially by sex. For example, Gary S. Becker (1985) suggests that some portion of the wage gap observed between single and married mothers arises from the choice by married mothers to work in less intensive and more convenient jobs (p. S54). Of course, married men are not typically observed making such trade-offs.

Typically, estimates of the motherhood wage gap are obtained from estimates of linear log wage equations estimated with a sample of working women, with a variety of right-hand side regressors, including demographic and productivity characteristics, job characteristics, and variants of motherhood status measures (including a 0–1 dummy variable for being a mother, the total number of children of the mother, and two 0–1 dummy variables for having one child and having 2 or more children). Martha Hill (1979) was one of the first examine this issue, finding no substantive motherhood wage gap once differential work history is controlled. She concludes that "the number of children is a good proxy variable for differential work history and labor force attachment for white women" (p. 591).

Future work focused further on disentangling the effects of marital status and motherhood status on women's wages with improved estimation techniques. Sanders Korenman and David Neumark (1992) provide a nice review of this marriage, fertility, and wage literature as well as a comprehensive discussion of the numerous econometric complexities, and find little evidence of a direct motherhood wage penalty, although their results vary tremendously by specification and estimating technique. Most often, they find no significant effect on wages of having a first child, but rather large effects from the second child (in the neighborhood of a 10–20 percent penalty). Interestingly, implementing panel data methods eliminates this effect, but their methods rely on just two time periods of data, possibly resulting in unreliable estimates.

The literature that follows Korenman and Neumark (Waldfogel, 1997, 1998a, b; Michelle J. Budig and Paula England, 2001; Deborah J. Anderson, Melissa Binder, and Kate Krause 2002a) utilizes a range of technical approaches, although the bulk continues to implement panel data techniques. Each one of these empirical studies produces statistically significant estimates of the motherhood wage gap, in the range of 3–10 percent per child.[7] Anderson, Binder and Krause (2002b) examine specifically the existence of educational differentials in the wage gap, with an additional focus on differences based on timing of return to work following childbirth. While their results vary substantially by specification, in some cases, white college educated mothers actually enjoy a wage boost.[8]

How do estimates of the motherhood wage gap compare to such gaps in other developed countries? Erin L. Todd (2001) examines the link between educational attainment and the family pay gap for five industrialized countries, and finds that the nature of the gap differs across countries.[9] She shows that for the United States and Canada, better-educated mothers experience a very small (nearly non-existent) wage penalty, leading her to determine that "high educational attainment acts as a 'shock absorber'." Susan Harkness and Jane Waldfogel (2003) also present an international comparative study, with a focus on seven industrialized nations.[10] They find notable differences across countries in the family pay gap, with the largest gap in the United Kingdom and the smallest in the Nordic countries. They also find a link between the magnitude of the family pay gap in a specific country and that country's gender wage gap. They suggest that some portion of these differences might be due to differences in family–friendly policies in the workplace.

What does the existing wage gap literature say about the role of fertility timing? Three papers from the wage gap literature address this issue and serve as useful lead-ins to our research. T.D. Chandler, Y. Kamo, and J.D. Werbel (1994) test the link between marriage and fertility delay and earnings and find that there is an association between delay and enhanced earnings. Marie Drolet (2002) uses a similar approach using Canadian data to examine the link between fertility timing and the motherhood wage gap. She finds that, compared to those mothers with early first births, delayed mothers earn 6 percent higher wages, without a statistically significant difference in the wages earned by late mothers relative to non-mothers. Finally, Hiromi Taniguchi (1999) looks separately at two issues: the impact on the motherhood wage gap of fertility delay, and the importance of education on this wage gap. Looking at fertility delay, she estimates the wage gap separately by age at first birth and shows that late mothers experience a very small (and not statistically significant) wage gap. Additionally, Taniguchi estimates the wage gap by education and, consistent with Todd (2001) and Anderson, Binder, Krause (2002b), finds that the wage gap declines as education rises. In fact, she finds that college-educated mothers experience a small wage boost. However, by addressing the two issues (fertility timing and education) separately, it is not possible to interpret the source of the reduced wage gap because; as described earlier, fertility delay goes hand in hand with increased education.[11]

The most explicit test of the relationship between labor market potential, fertility timing, and the motherhood wage gap is provided by Elizabeth M. Caucutt, Nezih Guner, and John Knowles (2002), who develop an equilibrium search model of marriage, divorce, and child investment that permits differences in the timing of fertility. Their model is distinctive because they theoretically coordinate marital and fertility decisions, and distinguish between the male and female view of these choices.[12] They find that labor markets produce incentives for fertility delay and that these incentives can explain the motherhood wage gap as well as fertility trends in the past 40 years.

Our research contributes to the existing literature in three ways. First and most importantly, by isolating the role that fertility timing plays in the determination of wages, separately from the role of education, we are able to address the specific question posed by Ellwood and Jencks concerning the reasons for fertility delay by higher-educated women. Recall that fertility delay is primarily a phenomenon of the higher educated. Thus, we provide estimates of the wage effects for college-educated childless women, college-educated mothers, and college-educated mothers who delay fertility. Second, by building our econometric model step by step, accounting for more potentially important estimation concerns, we are able to isolate the importance of each model extension. Finally, we produce estimates of the effect of motherhood on wages for college-educated women who delay fertility, while accounting for the potential endogeneity of both motherhood status and fertility delay.

4. Conceptual framework and empirical methodology

Following the neoclassical model of labor-leisure choice, we assume that women are utility maximizing individuals who allocate their time so as to ensure that the last dollar spent on leisure provides the same utility as the last dollar spent on the consumption of goods and services. Women will enter the labor market only if the offered market wage exceeds their reservation wage. Once working, they will choose to work the number of hours for which the offered market wage matches their marginal rate of substitution (that is, the rate at which they are willing to give up leisure hours in exchange for additional consumption).

If there exists a motherhood wage penalty, the lower market wage encountered by mothers relative to the one earned by women who remain childless, would generate both an income and a substitution effect among the former. While the income effect would increase their hours of work, the substitution effect would decrease their hours of work. Regardless of which of the two effects dominates, the market wage reduction would move working moms to a lower indifference curve with a lower associated reservation wage.[13] As a result, whether they increase or reduce their hours of work, working moms would have to settle for a labor market equilibrium characterized by a lower utility level and a lower market wage than the ones attained by working women who remain childless. The market wage and utility level available to working mothers relative to their childless counterparts can be further reduced if, in addition to the motherhood wage penalty, there is an additional "early" motherhood penalty for women who give birth by age 30. In that event, working moms who do not delay childbearing would have to settle for a labor market equilibrium characterized by a lower utility level and a lower market wage than the ones attained by working mothers who delayed childbearing and, given the existing motherhood wage penalty, lower than the one attained by women who remain childless. That is, postponing fertility may mitigate the wage gap often observed between like-educated mothers and non-mothers. In this paper, we attempt to assess whether this is the case for higher educated women. In particular, we examine the wage difference between college-educated early versus late mothers to assess the variability of the motherhood wage effect for college-educated mothers according to the timing of their first birth. Evidence of the latter may provide an explanation for the observed postponement of maternity among highly educated women.

4.1 Baseline estimation of the motherhood wage gap associated with fertility delay

We follow human capital theories and assume that the offered market wage received by working mothers can be expressed as a function of personal, family, and job related characteristics as follows:

$$\ln w_{ijt} = f(P_{it}, F_{it}, J_{ijt}, R_t) + \varepsilon_{ijt}, \quad (1)$$

where w_{ijt} stands for the market wage received by the *i*th respondent in the *j*th job at time *t*; *P* stands for a vector containing information on personal characteristics affecting earnings, such as educational attainment; *F* is a vector of family related characteristics potentially affecting the working mothers' earnings, such as whether or not they have kids and whether they gave birth before or after age 30; and *J* represents a vector of job related characteristics, such as tenure and occupation. Finally, the vector *R* includes a set of regional and yearly dummies to broadly account for any remaining macroeconomic factors that may affect individual earnings.[14]

Note, however, that since the analysis is focused on employed women, our wage regressions need to correct for the sample selection bias incurred when focusing on working respondents. Otherwise, the observed wage differential may overstate or understate the difference in average wage offers. In particular, if women do not participate in the labor market when their earnings fall below a threshold or reservation wage, women in the lower end of the wage distribution are less likely to work. Their scant work participation will offset their lower average wage offers, narrowing the observed wage gap, and obscuring the role of the timing of motherhood on wages. Additionally, given the role of education in our empirical investigation, we need to avoid the possibility that the importance of selection differs systematically between high versus low educated workers (Derek Neal, 2004). Hence, we address the selection incurred when focusing on working women with the inclusion of the inverse Mill's ratio (λ)—constructed using the predictions from a probit model of the likelihood of being working—among the regressors in Equation (1). In addition to the respondent's personal, family, and regional characteristics included in the wage regression, the selection model for being working includes information on the highest grade completed by the respondent's mother and father, as well as a dummy variable indicative of whether the respondent lived with her parents by age 18. Based on human capital theory and previous research using sibling pairs to identify wage equation parameters (Zvi Griliches, 1979), we exclude these three regressors from the wage regression as determinants of the respondent's current hourly wage other than through her ability and educational attainment, for which we already control.[15] In addition, we include years of schooling in the selection model for being working, whereas the educational attainment information included in the wage regression is captured through a set of dummy variables reflecting the highest grade completed by the respondent. The results from estimating two selection models for being working, one using a dummy variable for motherhood and the other one distinguishing between mothers with one child versus mothers with two or more children, are contained in Table A in Appendix A.[16]

Finally, since differences in the earned wages by non-mothers, mothers who do not delay childbearing, and mothers who do delay might occur due to unobserved personal characteristics, we estimate Equation (1) using fixed-effects to account for sample heterogeneity.[17]

4.2. Model extensions: endogeneity of motherhood and delayed motherhood

Nonetheless, even after correcting for the likelihood that women might work in a given year, we still need to account for endogeneity issues endangering the reliability of our coefficients estimates. In particular, there are two variables of key interest in Equation (1) suspected of being endogenous to wages: the motherhood dummy and a dichotomous variable indicative of late motherhood. Women's motherhood and timing of motherhood are likely to depend on the existence and size of the motherhood or early motherhood wage penalty. To assess empirically whether this is the case, we first test for the endogeneity of motherhood and delayed motherhood following Hausman (1978) and conclude that the motherhood decision and the timing of motherhood are both, not surprisingly, endogenous.[18]

However, correcting for the endogeneity of motherhood and the timing of motherhood is more complex. One possibility for addressing these endogeneity problems is to estimate a bivariate probit model outlining women's motherhood and late motherhood decisions as follows:[19]

$$Y_i^{Motherhood} = 1 \quad \text{if}(\theta_1' W_i + u_{1i}) > 0 \quad \text{otherwise}: \; Y_i^{Motherhood} = 0, \text{and} \tag{2}$$

$$Y_i^{Delayed\ Motherhood} = 1 \quad \text{if}(\theta_2' W_i + u_{2i}) > 0 \quad \text{otherwise}: \; Y_i^{Delayed\ Motherhood} = 0, \tag{3}$$

where $(u_{1i}, u_{2i}) \sim \text{BVN}(0, 0, 1, 1, \rho), \rho = \text{Cov}(u_{1i}, u_{2i}|W_i)$. The binary variables: $Y_i^{Motherhood}$ and $Y_i^{Delayed\ Motherhood}$ equal 1 if the respondent is a mom and if she delayed motherhood, respectively, whereas the vector W_i contains various characteristics influencing both motherhood decisions.[20] We then compute the predicted probabilities of motherhood $(Pdpb_i^{Motherhood})$ and delayed motherhood $(Pdpb_i^{Delayed\ Motherhood})$ to instrument for women's motherhood decisions and to correct for their endogeneity with earned wages. Our final wage equation is given by

$$\begin{aligned} \ln w_{ijt} = \alpha_i + \beta_1' Pdpb_i^{Motherhood} + \beta_2' Pdpb_i^{Delayed\ Motherhood} \\ + \beta_3' P_{it} + \beta_4' F_{it} + \beta_5' J_{ijt} + \beta_6' R_t + \beta_7' \lambda_{ijt} + \varepsilon_{ijt}, \end{aligned} \tag{4}$$

where F now includes all family and job related characteristics, with the exception of motherhood and delayed motherhood.

We rely on family background characteristics—such as the mother's highest grade completed, the father's highest grade completed, and a dummy variable indicative of whether the respondent lived with her parents by age 18—to identify the motherhood and delayed motherhood effects in the wage regression. As in the case of the selection model for being working, these variables are excluded from the wage regression as determinants of the respondent's current hourly wage other than through her ability and educational attainment, which we already control for. Similarly, we include years of schooling in the bivariate probit model for motherhood and delayed motherhood, whereas the educational attainment information included in the wage regression is captured through a set of dummy variables reflecting the highest grade completed by the respondent. Finally, we make sure that these family background characteristics are indeed correlated with motherhood and delayed motherhood. Additionally, we also check that the chosen instruments are not be correlated with the error term from the wage regression using an over-identification test.[21]

As discussed in the previous sections, the earlier literature examining the wage penalty associated with early motherhood often failed to address the aforementioned econometric problems, endangering the unbiasedness and consistency of the estimated parameters.[22] In order to appropriately asses the value of correcting for the aforementioned econometric problems, and with the purpose of providing the reader with a benchmark comparison of our results to those obtained by the earlier literature, we gradually build-up the model, present the results, and discuss the findings under the different estimation techniques.

5. The data and some descriptive evidence

We use data from the National Longitudinal Survey of Youth (NLSY79). Since 1979, a vast amount of information on the educational attainment, employment, and fertility patterns of a representative sample of individuals between the ages of 14 and 21 as of December 31, 1978 has been collected.[23] Due to modifications in the survey design implemented over the years, the 2000 wave of the NLSY79 contained information on 8,033 individuals, of whom 4,113 were women.[24]

We work with an unbalanced panel dataset on women from the 19 rounds of the NLSY79.[25] We restrict our sample to person–year observations for which information is available regarding education, employment, fertility, and other regression variables, such as an hourly rate of pay. We deflate hourly wages using the CPI index and restrict our sample to individuals reporting hourly earnings between \$2 and \$100.[26]

Table 1 contains a detailed description of the variables used in the analysis for the year 2000, along with their means and standard deviations. Because these data have been used extensively by researchers, and most relevantly, used by several previous wage gap researchers, we provide here only a cursory description of our sample. The women in our sample are 39 years of age on average, and 58 percent are married. Thirty percent of the sample is African American and 19 percent Hispanic, reflecting the over-sampling present early in the NLSY's survey design. Regarding education, the average years of education is 13.3 years, with approximately 21 percent having completed four years of college. Eighty-three percent of the women are mothers by this final period of data, and about 10 percent delayed fertility until their thirties.[27] Looking now at employment characteristics, these working women received an hourly wage of \$8.32 in 1982–1984 dollars, and more than one quarter held part-time jobs. Finally, luckily reflecting a strong commitment to the labor force and career, 36 percent of the women held jobs in professional and managerial occupations.

Before estimating our model, it is of interest to examine whether the wage data seem to support, at least from a descriptive point of view, our hypothesis. We start by examining if our data corroborate the findings from the previous literature motivating our analysis. This is shown in Table 2 and 3. In particular, Table 2 supports the existence of a statistically significant motherhood wage penalty, while Table 3 confirms the link between higher education and delay of fertility by showing that college educated women delay childbearing by an average of approximately 6 years.

Why are women delaying childbearing? In the previous section, we hypothesize that one reason is the higher pay earned by these women relative to their counterparts who do not delay childbearing. This hypothesis is validated by the figures in Table 4, which show that women who delay childbearing until after 30 earn almost twice as much as their female counterparts who do not (i.e. \$11/h versus \$6/h in 1982–1984 dollars). In fact, Table 5 shows further that this is still the case among college-educated women, for whom the difference in earnings between early and late mothers is also statistically significantly different from zero and economically meaningful (reaching approximately \$4/h).

Finally, Table 6 checks for descriptive evidence of the importance of sample heterogeneity in the explanation for the observed wage differences between working mothers who delay childbearing and other working-women, thus, the need to account for it econometrically. A simple way to assess whether this is the case is to look at a sample of women who were childless at age 25, and compare the wages, at that point in time, of women in the group who delay childbearing to those of women who remain childless. Table 6 shows that, indeed, future mothers earned approximately 20 cents less (a statistically significant difference) than their childless counterparts even before the future mothers ever had children. This suggests the importance of modeling heterogeneity as distinct from the endogeneity of fertility. In what follows, we pursue our regression approaches to examine in a rigorous way whether the motherhood wage gap among college-educated women may be affected by postponing childbearing once we account for other respondent's personal, family, and work related characteristics.

6. Results

6.1. *Baseline estimates and corrections for selection bias and heterogeneity*

Before discussing how the wage effects of motherhood vary for college-educated mothers who delay childbearing versus college-educated women who do not, we replicate the results provided by the earlier literature examining the motherhood wage gap to place our research in the existing literature. We present these preliminary findings in Table B in Appendix A. We estimate two different specifications, one using a motherhood dummy and the second one using two dichotomous variables indicating the presence of only one child and of two or more children. As in much of the earlier literature, we estimate these two regressions using pooled OLS and without any correction for either sample selection or endogeneity. As previous studies, we find that mothers earn approximately 5 percent less than their childless counterparts, with the motherhood penalty for mothers with more than one child more than doubling that of mothers with only one child.

Do college-educated early versus late mothers experience different motherhood wage effects? Table 7 expands the earlier literature estimations, allowing us to address this question.[28] Note that, as in Table B in Appendix A, Table 7 has 6 columns containing results for two measures of motherhood (a 0–1 motherhood dummy variables and then measures of one child and two or more children), corresponding to models (1) and (2). Also, the table contains increasingly

Table 1. Variables, means, and standard deviations in the year 2000.

Variable name	Variable description	Means	S.D.
Age	Age of respondent	39.0737	2.2479
Hispanic	Race dummy	0.1866	0.3896
Black	Race dummy	0.3013	0.4589
Other race	Race dummy	0.5121	0.4999
Adults in HH	Number of adults in the household	1.7783	0.7905
Married	Marital status dummy	0.5789	0.4938
Years of education	Completed years of schooling	13.2832	2.3819
Less than high school	Educational attainment dummy	0.0825	0.2751
High school	Educational attainment dummy	0.4418	0.4967
Some college	Educational attainment dummy	0.2643	0.4411
College	Educational attainment dummy	0.2114	0.4083
Motherhood	Dummy equal to 1 if woman is a mother	0.8257	0.3795
One kid	Dummy equal to 1 if woman only has one child	0.2433	0.4291
Two kids or more	Dummy equal to 1 if woman only has more than one child	0.5699	0.4952
Delayed motherhood	Dummy equal to 1 if woman delayed motherhood after age 30	0.0966	0.2954
Family resources	(Previous year family income–respondent's labor income)	15775.24	22434.64
Working	Dummy variable equal to 1 if woman works	1.0000	0.0000
Part-time job	Dummy variable equal to 1 if woman works part-time	0.2736	0.4459
Tenure	Tenure in weeks	299.4642	292.8323
Work experience	Work experience in weeks	34.3503	31.1226
Real hourly wage	Real hourly wage in 1984–1986 dollars	8.3216	6.2477
Professional and managers	Occupation dummy	0.3602	0.4802
Sales	Occupation dummy	0.0873	0.2824
Clerical	Occupation dummy	0.2395	0.4269
Craftsmen	Occupation dummy	0.0218	0.1462
Operatives	Occupation dummy	0.0746	0.2628
Laborers	Occupation dummy	0.0279	0.1647

Table 1. Continued.

Variable name	Variable description	Means	S.D.
Farm	Occupation dummy	0.0085	0.0918
Services	Occupation dummy	0.1795	0.3839
Mother's highest grade	Mother's highest grade completed	10.8163	3.1226
Father's highest grade	Father's highest grade completed	10.8154	3.8558
Live with parents by age 18	Dummy equal to 1 if respondent lived with parents at age 18	0.6093	0.4880
Urban	Dummy equal to 1 if respondent lives in an urban area	0.7560	0.4737
High unemployment rate	Dummy equal to 1 if respondent lives in an area with high unemployment	0.0542	0.2265
North east	Regional dummy	0.1479	0.3551
North central	Regional dummy	0.2380	0.4259
South	Regional dummy	0.4237	0.4942
West	Regional dummy	0.1904	0.3927
Predicted probability of motherhood	Predicted probability of motherhood	0.8312	0.1551
Predicted probability of delayed motherhood	Predicted probability of delayed motherhood	0.1037	0.0600

Table 2. Motherhood Wage Penalty.

Motherhood status	Mean hourly wages	S.E.	Difference in means	*t*-statistic
Childless woman	6.6226	0.0271	0.3860	10.6950***
Mother	6.2366	0.0239	–	–

Notes: *Signifies statistically different from zero at the 10 percent level or better.
**Signifies statistically different from zero at the 5 percent level or better.
***Signifies statistically different from zero at the 1 percent level or better.

Table 3. Average age at first birth among college-educated women.

By educational attainment	Mean age at first birth	S.E.	Difference in means	*t*-statistic
No college degree	20.4382	0.0180	−5.8958	−94.0363***
College degree	26.3340	0.0601	–	–

Notes: *Signifies statistically different from zero at the 10 percent level or better.
**Signifies statistically different from zero at the 5 percent level or better.
***Signifies statistically different from zero at the 1 percent level or better.

Table 4. Wage premium associated to late motherhood.

By delayed motherhood	Mean hourly wages	S.E.	Difference in means	*t*-statistic
Not delayed motherhood	6.0568	0.0227	−4.6965	−21.5899***
Delayed motherhood	10.7533	0.2163	–	–

Notes: *Signifies statistically different from zero at the 10 percent level or better.
**Signifies statistically different from zero at the 5 percent level or better.
***Signifies statistically different from zero at the 1 percent level or better.

appropriate econometric techniques. We present each model's results separately so that the reader can discern the effects of modifying the empirical approach one step at a time.

The first and second model specifications in Table 7, models (1) and (2), constitute our benchmark specifications.[29] However, given the robustness of our results to alternative specifications of the number of children, we focus our discussion on the model specification using the motherhood dummy variable. Note that Table 9 provides a summary of the summed coefficients used to discuss wage effects in text. Using model (1) as our benchmark specification, which controls fertility timing, we find that mothers earn approximately 6.5 percent less than their childless counterparts, whereas college-educated mothers earn about 2 percent less than their childless

Table 5. Wage premium associated with late motherhood among college-educated women.

By delayed motherhood	Mean hourly wages	S.E.	Difference in means	*t*-statistic
Not delayed motherhood	9.9320	0.1251	−4.1167	−10.0260***
Delayed motherhood	14.0488	0.3911	–	–

Notes: *Signifies statistically different from zero at the 10 percent level or better.
**Signifies statistically different from zero at the 5 percent level or better.
***Signifies statistically different from zero at the 1 percent level or better.

Table 6. Wage differences between childless women and late mothers before birth.

Motherhood status	Mean hourly wages	S.E.	Difference in means	*t*-statistic
Childless	7.8452	0.3448	0.1905	0.4023**
Late mother	7.6547	0.3245	–	–

Notes: *Signifies statistically different from zero at the 10 percent level or better.
**Signifies statistically different from zero at the 5 percent level or better.
***Signifies statistically different from zero at the 1 percent level or better.

counterparts.[30] Turning to fertility timing, the 6.5 percent motherhood wage gap dissipates for women who delay childbearing beyond age 30, who earn, on average, 6 percent higher hourly wages than their childless counterparts and 13 percent more than mothers who do not delay childbearing.[31] Is this still the case among college-educated women? As summarized for this model specification in Table 9, college-educated women who delay childbearing earn approximately 19 percent more than their childless counterparts, and approximately 21 percent more than college-educated women who do not delay childbearing.[32] Hence, our findings suggest that delayed fertility for college-educated women serves to boost wages even beyond the wage enhancement associated with motherhood. As we discuss in more detail in the final section of the paper, one explanation for this wage boost involves unobserved job quality.[33]

The discussed motherhood wage differentials are quite substantial and might be over-stated due to the selection biases and individual heterogeneity. Hence, model (3) and (4) include a correction for the sample selection incurred when focusing on working women, while model (5) and (6) further re-estimate the models accounting for individual heterogeneity through the use of a fixed-effects panel data technique. According to the estimated coefficient for the inverse Mill's ratio in model (3) and (4), we incur a significant sample selection bias in the estimation of the motherhood wage penalty when restricting the analysis to employed women. Accounting for the aforementioned sample selection bias cuts the average motherhood wage penalty estimate from the earlier specifications by approximately half. In particular, focusing on the estimates from model (3), the motherhood wage gap drops from 6.5 percent to 3.5 percent. College-educated mothers now experience a wage boost of approximately 4 percent.[34] Additionally, the payoff to delaying childbearing rises, with late mothers earning approximately 10 percent (versus 6 percent in the previous specification) more than similar childless women, and 13 percent (as in model (1)) more than women who do not delay childbearing.[35] Does the timing of motherhood continue to affect the motherhood wage effect experienced by college-educated women? As summarized in Table 9, college-educated women who delay motherhood now earn about 23 percent more than college-educated childless women (versus 19 percent in model (1)), and approximately 19 percent more than college-educated women who do not delay childbearing (versus 21 percent in model (1)).[36] Hence, delaying motherhood continues to pay off among college-educated women after we correct for any potential sample selection resulting from focusing on working women.

Finally, in models (5) and (6), we account further for individual level heterogeneity by re-estimating models (3) and (4) using a fixed-effects regression technique. Accounting for individual level heterogeneity erases the statistical significance of a high school education and reduces the payoff to a college degree to approximately 14 percent. Similarly, the magnitude of our estimate for the sample selection correct term λ drops substantially once unobserved heterogeneity is controlled, suggesting that controlling unobserved individual heterogeneity captures much of the individual unobservable characteristics correlated with being employed. In contrast, accounting for individual fixed-effects increases the motherhood wage penalty back to approximately 6 percent, whereas it reduces the premium to delaying childbearing to approximately 7 percent.[37] As a result, the wage premium enjoyed by women who delayed motherhood relative to childless women practically disappears (less than 1 percent). Is this also the case among college-educated women? As in the previous cases, Table 9 summarizes the results from model (5) for college-educated women. In this model, the wage boost to college-educated mothers (versus childless college-educated women) is approximately 3.5 percent.[38] Additionally, while the use of fixed-effects reduces the estimated payoff to delaying motherhood, we still find that college-educated women who delay motherhood earn 16 percent more than college-educated childless women, and approximately 13 percent more than college-educated women who do not delay childbearing.[39]

In sum, once we correct for the sample selection biases incurred when focusing on working women as well as for their individual level heterogeneity, late mothers earn approximately the same as their childless counterparts and 7 percent more than mothers who do not delay childbearing. And, college-educated mothers earn approximately 3.5 percent more than their childless counterparts. The benefits to delaying childbearing are further reinforced among college-educated women. College-educated mothers who postpone childbearing actually earn about 16 percent more than like-educated women who remain childless, and approximately 12.5 more than college-educated mothers who do not postpone childbearing beyond age 30.

Table 7. Coefficients and standard errors of real hourly wage regressions.

Independent variables	Coefficient (S.E.) Model (1): Pooled OLS	Model (2): Pooled OLS	Model (3): Pooled OLS & selection correction	Model (4): Pooled OLS & selection correction	Model (5): FE & selection correction	Model (6): FE & selection correction
High school	0.0938***	0.0960***	0.0658***	0.0654***	0.0143	0.0142
	(0.0063)	(0.0065)	(0.0085)	(0.0088)	(0.0179)	(0.0184)
Some college	0.1960***	0.1944***	0.1484***	0.1462***	0.0438**	0.0421**
	(0.0071)	(0.0073)	(0.0099)	(0.0102)	(0.0217)	(0.0223)
College	0.3675***	0.3656***	0.2901***	0.2880***	0.1434***	0.1314***
	(0.0090)	(0.0092)	(0.0133)	(0.0134)	(0.0281)	(0.0285)
Motherhood	−0.0650***	–	−0.0354***	–	−0.0618***	–
	(0.0046)		(0.0086)		(0.0098)	
One kid	–	−0.0450***	–	−0.0132*	–	−0.0489***
		(0.0054)		(0.0093)		(0.0101)
Two kids or more	–	−0.0885***	–	−0.0625***	–	−0.1036***
		(0.0055)		(0.0096)		(0.0114)
Delayed motherhood	1293***	0.1140***	0.1346***	0.1155***	0.0674***	0.0565***
	(0.0170)	(0.0173)	(0.0198)	(0.0201)	(0.0191)	(0.0192)
College versus motherhood	0.0470***	–	0.0709***	–	0.0965***	–
	(0.0100)		(0.0115)		(0.0139)	
College versus one kid	–	0.0236**	–	0.0393***	–	0.0752***
		(0.0130)		(0.0149)		(0.0159)
College versus two kids or more	–	0.0678***	–	0.0969***	–	0.1236***
		(0.0122)		(0.0141)		(0.0164)
College versus delayed motherhood	0.0766***	0.0868***	0.0563**	0.0696**	0.0581**	0.0656***
	(0.0269)	(0.0274)	(0.0310)	(0.0314)	(0.0306)	(0.0307)

Table 7. Continued.

Independent variables	Coefficient (S.E.) Model (1): Pooled OLS	Model (2): Pooled OLS	Model (3): Pooled OLS & selection correction	Model (4): Pooled OLS & selection correction	Model (5): FE & selection correction	Model (6): FE & selection correction
Lambda	–	–	0.0819*** (0.0107)	0.0786*** (0.0109)	0.0219** (0.0097)	0.0208*** (0.0098)
Number of observations	44303	43053	30801	30068	30801	30068
F statistic	899.50	824.08	607.87	558.09	266.72	247.48
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Notes: *Indicates significance at the 10 percent level.
**Indicates significance at the 5 percent level.
***Indicates significance at the 1 percent level.
All regressions include all female workers; consequently, the data are an unbalanced panel. Finally each regression includes a constant term, age, age squared, race, marital status, dummy indicative of any adults in the household, work experience, work experience squared, tenure, tenure squared, occupation dummies, urban residence, high unemployment rate area, and regional dummies.

Table 8. Coefficients and standard errors of real hourly wage regressions with endogeneity corrections.

Independent variables	Coefficient (S.E.) Model (7): FE, selection & endogeneity corrections	Coefficient (S.E.) Model (8): FE, selection & endogeneity corrections
High school	0.0092	0.0149
	(0.0184)	(0.0184)
Some college	0.0354*	0.0466**
	(0.0229)	(0.0230)
College	0.0004	0.0223
	(0.0328)	(0.0330)
Delayed motherhood	0.0535***	–
	(0.0185)	
College versus delayed motherhood	0.0559**	–
	(0.0285)	
Predicted probability of motherhood	−0.0740*	−0.0628
	(0.0444)	(0.0446)
Predicted probability of delayed motherhood	–	0.0171
		(0.0807)
College versus (predicted probability of motherhood)	0.3257***	0.2712***
	(0.0250)	(0.0277)
College versus (predicted probability of delayed motherhood)	–	0.2308***
		(0.0780)
Lambda	0.0549***	0.0424***
	(0.0082)	(0.0080)
Number of observations	30801	30813
F statistic	271.29	270.89
Prob > F	0.0000	0.0000
Over-identification test	$9.43 < \chi^2_{3,1\ \text{percent}}$	$6.29 < \chi^2_{2,1\ \text{percent}}$

Notes: *Indicates significance at the 10 percent level.
**Indicates significance at the 5 percent level.
***Indicates significance at the 1 percent level.
All regressions include all female workers; consequently, the data are an unbalanced panel. Finally All regressions include a constant term, age, age squared, race, marital status, dummy indicative of any adults in the household, work experience, work experience squared, tenure, tenure squared, occupation dummies, urban residence, high unemployment rate area, and regional dummies.

That is, the motherhood wage penalty converts to a wage boost for college-educated women. The possibility of wage enhancement may provide an explanation for the observed postponement of childbearing among highly educated women.

Table 9. Comparison of wage effects.

Group category	Computation	Coefficient (F-test of joint significance)				
		Model (1): pooled OLS	Model (3): poled OLS & selection correction	Model (5): FE & selection correction	Model (7): FE, selection & endogeneity corrections	Model (8): FE, selection & endogeneity corrections
Mothers	Mom	−0.0650*** (199.86)	−0.0354*** (16.80)	−0.0618*** (40.13)	−0.0740* (2.78)	−0.0628 (1.99)
Late mothers	(Mom + delayed mom)	0.0643*** (122.42)	0.0992*** (30.38)	0.0056*** (22.01)	−0.0205** (5.77)	−0.0457 (1.03)
Childless women with college	College	0.3675*** (1669.00)	0.2901*** (479.09)	0.1434*** (26.09)	0.0004 (0.00)	0.0223 (0.46)
Mothers with college	(College + mom + college versus mom)	0.3495*** (984.48)	0.3256*** (256.78)	0.1781*** (35.35)	0.2521*** (69.69)	0.2307*** (42.20)
Late mothers with college	(College + mom + delayed mom + college versus mom + college versus delayed mom)	0.5554*** (644.64)	0.5165*** (193.36)	0.3036*** (35.13)	0.3615*** (55.79)	0.4786*** (57.36)

Notes: *Indicates significance at the 10 percent level.
**Indicates significance at the 5 percent level.
***Indicates significance at the 1 percent level.

6.2. Accounting for the endogeneity of motherhood and the timing of motherhood

While we recognize the difficulty of correcting for the likely endogeneity of the motherhood decision and the decision to postpone childbearing, we cautiously explore the consequences of attempting to address the endogeneity of motherhood and the timing of motherhood in Table 8. As it is often the case with instrumental variable analysis, we expect our model modifications to significantly alter our initial estimates, in part because of the descriptive result in Table 6 according to which college-educated mothers who delay fertility earn approximately 50 cents more than their childless counterparts. Clearly, these women differed in their labor market productivity even prior to having children.

As in Table 7, our discussion proceeds in a sequential manner, focusing on the simplified motherhood dummy specification given the robustness displayed by our previous results to alternative motherhood specifications. We assess the effect of correcting for the endogeneity of motherhood and, subsequently, for the endogeneity of motherhood delay using the predicted probabilities derived from the bivariate probit model in Table C in Appendix A. This is done in models (7) and (8) in Table 8. Focusing on the results from models (7), we find that exclusively correcting for the endogeneity of motherhood results in a motherhood wage gap of 7 percent. Most notable is the sizeable drop in the wage effect experienced by childless college-educated women (it turns negative and loses significance), resulting in a remarkable relative wage boost for college-educated mothers of approximately 25 percent.[40] Turning to fertility timing, now there is a 5 percent wage premium for delaying childbearing.[41] Hence, delaying motherhood reduces the motherhood wage gap but does not completely eliminate it. However, as indicated in Table 9 for model (7), college-educated women who delay childbearing earn approximately 36 percent more than their childless counterparts, and 11 percent more than college-educated women who do not postpone motherhood.[42]

When we correct further for the endogeneity of delayed motherhood in model (8), the statistical significance of the motherhood wage penalty and the delayed motherhood wage premium completely disappears, while the large wage boost for college-educated mothers versus childless college-educated women persists. Nonetheless, looking at the figures in Table 9, we find a significantly larger premium to delaying childbearing among college-educated women, who appear to earn approximately 45 percent than their childless counterparts and 25 percent more than college-educated women who do not delay motherhood.[43]

Despite the implausible magnitude of the IV estimates from models (7) and (8) in Table 9, the most important conclusion to draw from this new set of results is the fact that, even after substantially altering the model specification in an attempt to address the endogeneity of motherhood and delayed motherhood, we continue to find a statistically significant wage premium to delaying childbearing beyond age 30 among college-educated women. This wage premium to delayed motherhood, which disappears for non-college educated mothers (only a non-statistically different from zero 1-percent gap persists), potentially may lie at the root of the growing trend of delaying fertility beyond the age of 30 among college-educated women.

7. Conclusion and policy implications

A growing literature addresses the existence and magnitude of a motherhood wage gap, i.e., a difference between the wages of mothers versus non-mothers that cannot be explained by productivity characteristics. This so-called family pay gap has been estimated to be in the range of 5–10 percent. This gap estimate is an average across all education levels. We contribute to this literature by disentangling the origins of this gap based on the mother's education and her age at first birth.

Our findings are two-fold. First, we find that college-educated mothers do not experience a wage penalty; in fact, they enjoy a wage boost. We estimate this wage boost to be approximately 4 percent in our model (5)—full model with fixed-effects and work selectivity corrections. This finding goes well beyond the elimination of the wage penalty for higher-educated women presented by Taniguchi (1999) and Todd (2001), which Todd explained as evidence that higher education can serve as a "shock absorber" to mitigate or even eliminate the negative effects of motherhood. In our results, college-educated mothers actually earn more than their college-educated counterparts, even when fertility timing is controlled. This suggests that something is going on beyond what we can observe in our data, particularly relating to job quality, as noted by Waldfogel (1998) and Harkness and Waldfogel (2003). Waldfogel focuses on the Family and Medical Leave Act (FMLA),[44] asserting that the availability of maternity leave tends to reduce the magnitude of the motherhood wage gap. An extension of this notion is that if higher education and fertility delay serve as proxies for "good jobs," then it is conceivable that such workers might exhibit wage boosts rather than wage penalties. Our finding is consistent with that of Caucutt, Guner, and Knowles (2002) who find that labor markets produce incentives for fertility delay. They conclude that these incentives can explain the motherhood wage gap as well as fertility trends in the past 40 years.

What might be some of the factors behind our first result that college-educated mothers experience a wage boost (in comparison to college-educated non-mothers)? There must exist some relevant unobserved factors accounting for this result. Most importantly, we do not observe enough information regarding job characteristics to determine, for equal wage jobs, which jobs might be considered "good jobs" versus "bad jobs." Jobs that are "good" might provide family–friendly benefits (such as flexible work hours or occasional work from home) that diminish any negative wage effects of childbearing, while also providing other good benefits like job training and job flexibility. Training will enhance earnings growth, while flexibility is likely to serve as a perk that reduces turnover amongst better workers. It is possible that when mothers seek job matches that best accommodate work/family responsibilities, they are also inadvertently identifying jobs with other positive benefits. That is, the availability (and observability) of family–friendly policies might serve as a signal of job quality in a broader sense. Additionally, employers who provide the most generous family–friendly policies are also likely to be the most motivated to attract and retain female employees. As a consequence, these family–friendly policies might also signal a less discriminatory workplace. Blackburn, Bloom, and Neumark (1990) note the ''anomalous'' result that childless women receive lower returns to tenure than late childbearers (p. 17), thereby providing further evidence of the possibility of greater wage growth for mothers.[45]

Our second major finding relates to fertility timing. We find that college-educated mothers can enhance their motherhood wage boost further by delaying fertility. College-educated mothers, who delay first birth until age 30 or beyond experience higher wages, once observed productivity factors are controlled, than their counterparts who do not postpone motherhood. This further wage boost is estimated around 13 percent in our model (5)—full model with fixed-effects and work selectivity corrections. The result of this finding is the reformulation of our hypothesis regarding college-educated mothers' motivation for delaying fertility. Rather than an attempt to reduce the motherhood wage gap, it can be considered an effort to accrue the maximum benefit to their formal human capital investment, which is hampered if fertility is not delayed. For college-educated mothers, there is a penalty for interrupting early career human capital investment (see, for example, Martin 2000). Family–friendly policies also play a role here because it is the most senior employees who have the most access to such benefits, particularly in the form of job flexibility.

A final contribution of our paper lies in its attempt to address some of the most important econometric concerns, including modeling the sample selection bias incurred when focusing on working women and the potential endogeneity of motherhood and delayed motherhood. As our results show, numerical estimates are affected by these model improvements, but their sign and significance remains robust substantial model permutations in support of the reliability of our findings.

Overall, these findings reinforce the concern voiced by Ellwood and Jencks (2001) and Rindfuss, Morgan and Offutt (1996), who worried that a differential wage gap by education (which now we see can be increased by delaying fertility) will contribute to growing inequality between families with less-educated adults and families with better-educated adults. Along with our earlier footnoted finding that fertility delay does *not* affect wages positively for less-educated workers, we are led to the policy suggestion that extension of family–friendly policies to less-educated workers is warranted. Employers often are motivated to implement family–friendly policies only for their most valuable employees, who are likely to be the better-educated mothers. In this regard, policy measures that expand coverage and eligibility for mandated family leave and provide at least partial compensation during such leaves may prove beneficial.[46] This is true not only for mothers, but also for childless women, who might consider seeking jobs that provide quality family–friendly benefits under the assumption that such employers will also provide other less readily observed benefits—like job training and potential for advancement, and a more female-friendly work environment.

The second policy concern relates to the link between fertility delay and fertility foregone. For college-educated mothers, delaying fertility has clear benefits. However, as described in the paper, there is social concern regarding the feasibility of maintaining current fertility rates while the percentage of mothers with college degrees is growing. How might policy be devised to make it beneficial for college-educated women to begin childbearing earlier? Worded differently, what is it precisely about late childbearing that is so beneficial for college-educated women? One answer might be job flexibility. Once workers reach a level of seniority in the office, productivity is not tied so closely with "face time." Therefore, the professional repercussions of maternity leaves may not be as large given that some portion of the job can be performed from home or with short visits to the office. A second suggestion is to improve family leave policies, making it more affordable and modifying the leave to permit the possibility of a gradual return to work. Given that current leave policy guarantees only unpaid leave, it might be the case that only more senior employees can afford a family leave and a gradual return to work following the leave. A final suggestion reiterates that made by Martin (2000), who noted that more-educated parents tend to desire higher quality childcare, which can be quite expensive. For these mothers, delaying fertility and therefore experiencing sufficient wage growth to afford higher quality care might be necessary. Any policy that assists in the purchase of high quality care (even for families with what most would consider comfortable incomes) might be warranted.

Implicit in the discussion of the previous paragraph is that fertility delay is somehow bad, although clearly this is not always the case. More mature parents tend to enjoy greater financial stability and as a result, are likely to be more involved in their children's lives. However, this delay comes with some costs. Older mothers are much more likely to experience preterm deliveries or multiple births, both of which increased dramatically in the past 10 years and contribute to rising medical costs.[47] For that reason alone, fertility delay warrants some concern. Additionally, the recent near-replacement fertility rates in the United States have been primarily supported by high immigration and relatively strong family income growth. However, neither immigration nor continuous family income growth can be guaranteed in the future. This is especially evident in the case of immigration, since fertility rates of the native born are considerably below replacement rates. Therefore, if immigration slows down, U.S. total fertility rates will follow. Lastly, as a society, we must be concerned with relying on the immigrant (particularly Latino) and less economically advantaged population to maintain near-replacement fertility rates given the strong correlation between family income and child outcomes. Therefore, we either implement policies to strengthen fertility rates of the less economically disadvantaged population, or we support measures that may improve child outcomes.

To conclude, much remains unanswered on this topic. For instance, due to small sample sizes, we are unable to establish with any reliability whether mothers do indeed enjoy enhanced family–friendly benefits. Empirical evidence on this ground would support our hypothesis that family–friendly benefits attract mothers (as well as non-mothers if they signal an overall environment friendly to female workers) to better paid jobs. Future research on this topic might exploit the case study approach, targeting specific employers to garner more information about family–friendly nonpecuniary benefits. Additionally, albeit somewhat off the primary topic of college-educated women, much more could be learned about fertility patterns of lesser-educated mothers. This would permit more concrete conclusions and policy recommendations regarding the role of family–friendly benefits in securing economic security for such families.

Appendix

Table A. Probit model for being working.

	Coefficient (S.E.)	
Independent variables	Model (A.1)	Model (A.2)
Years of education	0.1224***	0.1143***
	(0.0074)	(0.0076)
Motherhood	−0.7917***	–
	(0.0295)	
One kid	–	−0.6893***
		(0.0313)
Two kids or more	–	−0.9547***
		(0.0365)
Family Resources	−3.83e−06***	−3.71e−06***
	(3.04e−07)	(2.97e−07)
Mother's highest grade	0.0122***	0.0137***
	(0.0061)	(0.0062)
Father's highest grade	0.0022	0.0015
	(0.0046)	(0.0047)
Live with parents by age 18	0.0405***	0.0341***
	(0.0280)	(0.0284)
Number of observations	48682	47353
Wald Chi2(19)	2260.79	2194.44
Prob > chi2	0.0000	0.0000

Source: *Indicates significance at the 10 percent level.
**Indicates significance at the 5 percent level.
***Indicates significance at the 1 percent level.
The regressions include a constant term, as well as controls for age, age squared, race, marital status, dummy indicative of any adults in the household, urban residence, high unemployment rate area, and regional dummies.

Table B. Coefficients and standard errors of real hourly wage regressions exclusively focusing on the impact of motherhood.

	Coefficient (S.E.)	
Independent variables	Model (B.1): pooled OLS	Model (B.2): pooled OLS
High school	0.0955***	0.0976***
	(0.0063)	(0.0065)
Some college	0.2007***	0.1985***
	(0.0071)	(0.0073)
College	0.3964***	0.3935***
	(0.0080)	(0.0082)
Motherhood	−0.0510***	–
	(0.0043)	
One kid	–	−0.0303***
		(0.0049)
Two kids or more	–	−0.0771***
		(0.0052)
Number of observations	44318	43065
F statistic	987.68	932.09
Prob > F	0.0000	0.0000

Notes: *Indicates significance at the 10 percent level.
**Indicates significance at the 5 percent level.
***Indicates significance at the 1 percent level.
All regressions include a constant term, age, age squared, race, marital status, dummy indicative of any adults in the household, work experience, work experience squared, tenure, tenure squared, occupation dummies, urban residence, high unemployment rate area, and regional dummies.

Table C. Bivariate probit model for being a mother and for delaying motherhood.

Probability of motherhood	Coefficient (S.E.)
Years of education	−0.1919***
	(0.0119)
Family resources	1.15e−06***
	(2.80e−07)
Mother's highest grade	−0.0207**
	(0.0086)
Father's highest grade	−0.0127**
	(0.0063)
Live with parents by age 18	−0.2386***
	(0.0401)
Probability of delaying motherhood	
Years of education	0.0528**
	(0.0155)
Family resources	5.82e−08***
	(2.72e−07)
Mother's highest grade	0.0366**
	(0.0153)
Father's highest grade	0.0063***
	(0.0114)

Table C. Continued.

Probability of motherhood	Coefficient (S.E.)
Live with parents by age 18	0.0206***
	(0.0767)
Number of observations	48660
Wald Chi2(16)	3415.49
Prob > Chi2	0.0000

Notes: *Indicates significance at the 10 percent level.
**Indicates significance at the 5 percent level.
***Indicates significance at the 1 percent level.
The regressions include a constant term, as well as controls for age, age squared, race, marital status, dummy indicative of any adults in the household, urban residence, high unemployment rate area, and regional dummies.

Notes

1. Fertility rates actually increased in 1999 and 2000, with total fertility rates in the year 2000 rising above replacement rates (the rate necessary to keep total population stable) for the first time in 30 years (*National Vital Statistics Reports* 2002). Also, as explained by Ronald R. Rindfuss, Philip S. Morgan, and Kate Offutt (1996), the bulk of the fertility decline occurred in the early 1960s. Between 1963 and 1989, the overall fertility rate remained fairly stable at about 1.9.
2. For example, the fertility rate in Spain in 2001 was 1.1, while in Sweden, Germany and Greece the rate was 1.4 or less (United Nations data cited in Bruni 2002).
3. Joseph V. Hotz, Susan Williams McElroy, and Seth Sanders (Unpublished Manuscript) examine the opposite, often-stated hypothesis, that very early childbearing reduces economic stability compared with non-very early childbearing. The authors find no evidence of this teenaged fertility penalty.
4. Also see Ann Crittendon (2001) for further popular media discussions of the costs of motherhood.
5. Jere Behrman, Suzanne Duryea, and Miguel Szekely (1999) provide evidence that improvements in health over time might be more important than rising educational levels in explaining differences in fertility across world regions.
6. Additionally, fertility delay affects an ever-increasing proportion of the population due to the increasing percentage of women with a college degree. Rindfuss, Morgan, and Offutt (1996) describes the rising incidence of college completion for women, increasing from 12 percent in 1970 to 23 percent in 1990.
7. The estimates for the effect of having one child range from 3 percent to 5 percent, and having two or more children range from 6 percent to 20 percent. Parameter estimates associated with a single motherhood measure defined as the total number of children range from 3.7 percent to 7.3 percent.
8. This paper does not correct for employment sample selection, which could contribute to the differential but inconsistent findings by education.
9. The five countries she studies are Canada, the United States, Germany, the Netherlands, and Sweden.
10. The seven countries they study are Australia, Canada, the United Kingdom, the United States, Germany, Finland, and Sweden.
11. Two other potential drawbacks of her research are somewhat outdated data (Waldfogel, 1997 notes that the motherhood wage gap is rising), and a mis-specified wage equation. She uses observed hours of work on the right-hand side of the wage equation, thereby producing measurement error that is highly correlated with measurement error in the dependent variable. Extending her findings, Abbigail J. Chiodo and Michael T. Owyang (2003) present a nice theoretical explanation for the differences in the importance of marriage on wages by sex.

12. See also Schmidt (2002) for a model that links marriage and fertility timing, with a focus on older single mothers.
13. This discussion ignores, of course, the possibility of increased utility from having children.
14. Examples are local unemployment rates and region of the country in which they reside.
15. Other studies in the literature, such as Korenman and Neumark (1992), also use similar family background variables as factors influencing women's labor force participation and fertility decisions, but lacking an independent effect on wages other than through their ability and schooling.
16. Both models correct the standard errors for clustering at the individual level.
17. We specified the individual effects as fixed-effects after testing for their appropriateness in this case using the Breusch and Pagan Lagrangian multiplier and the Hausman specification test. Results are available from the authors upon request.
18. Results are available from the authors upon request.
19. We correct the standard errors for clustering at the individual level.
20. We follow Korenman and Neumark (1994), Gustafsson (2001), and Cecile Wijsen and Clara Mulder (2002) in our selection of variables when modeling fertility decisions. In particular, and in addition to the traditional respondent's personal and income related characteristics, we follow Gustafsson (2001)—who discusses the role of the size of child quality expenditures on fertility delay, and the Becker fertility model—which posits that desired child quality is positively related to parental educational attainment, and include information on parental education and other family background characteristics reflecting upbringing possibly affecting future fertility choices. As a result, the vector W_i includes information on the following controls: age, age squared, race, marital status, years of educational attainment, the number of other adults in the household, previous year's household income minus the respondent's labor income, a dummy variable indicating whether the respondent lives in an urban area, a dummy variable indicating whether the respondent lives in a high unemployment area, regional dummies, mother's highest grade completed, father's highest grade completed, and a dummy variable indicative of whether the respondent lived with her parents by age 18.
21. We use the over-identification test suggested in Jeffrey M. Wooldridge (2003, p. 508). As indicated at the bottom of Table 8, which contains the results from our estimation correcting for the endogeneity of motherhood and delayed motherhood, we accept the null hypothesis and conclude that our instruments are exogenous at the 1 percent level.
22. While the recent literature does incorporate panel data methods in various ways, the bulk does not address the employment selection issue (with the exception of Korenman and Neumark (1992) and Anderson, Binder, and Krause (2002)), and only Korenman and Neumark (1992) make any serious attempt at addressing the multitude of endogeneity problems inherent in this empirical exercise.
23. Respondents were interviewed yearly between 1979 and 1994. Beginning with the 1994 interview, interviews are only scheduled to take place biennially.
24. Earlier waves of the NLSY79 included a sample of 1280 military youths and a supplemental sample designed to over sample civilian Hispanic, black and economically disadvantaged non-black and non-Hispanic youth. However, these two samples were mostly dropped in 1985 and in 1991, respectively.
25. Hence, we calculate robust standard errors to account for the resulting heteroscedasticity that may affect our estimation.
26. The CPI for all urban consumers, not seasonally adjusted, with base period 1982–1984 was retrieved from http://www.bls.gov/cpi/home.htm
27. We chose the age of 30 as representative of delayed motherhood since the average age at first birth of college-educated women is 26 years, with a standard deviation of 4 years. Also, this is the age cut-off used by other researchers (see Martin 2000, for example).
28. At this point, it is worth noting that, in our quest to learn about the wage gains resulting from delaying childbearing, we have also explored whether women with less than a college education reduce their motherhood wage gap by delaying childbearing. Our findings indicated the lack of any statistically significant gain from delaying childbearing among women with less than a college education. This serves as an explanation for the observation noted earlier that fertility delay is largely a phenomenon for higher-educated women.

29. We also estimated our models including information on the total number of children and the results were very similar to those in the previous literature (see, for example, Budig and England, 2001).
30. That is: (0.3495−0.3675) = 0.018 or 2 percent.
31. This last figure is computed as: (0.0643−(−0.0650)) = 0.1295 or 13 percent.
32. Computed as: (0.5554−0.3675) = 0.1879 or 19 percent, and as: (0.5554−0.3495) = 0.2059 or 21 percent, respectively.
33. For instance, we examine some of the fringe benefits available to mothers and non-mothers in the NLSY79 and find that mothers are more likely to work for employers offering childbearing services, independently of whether or not they make use of such services, than non-mothers. This type of family–friendly policies might serve as a signal of job quality and of employers more willing to attract and retain female employees.
34. Computed as: (0.3256−0.2901) = 0.0355 or 4 percent.
35. This last figure is computed as: (0.0992−(−0.0354)) = 0.1346 or 13 percent.
36. Computed as: (0.5165−0.2901) = 0.2264 or 23 percent, and as: (0.5165−0.3256) = 0.1909 or 19 percent, respectively.
37. This last figures is computed as: (0.0056−(−0.0618)) = 0.0674 or 7 percent.
38. Computed as: (0.1781−0.1434) = 0.0347 or 3 percent.
39. Computed as: (0.3036−0.1434) = 0.1602 or 16 percent, and as: (0.3036−0.1781) = 0.1255 or 12.5 percent, respectively.
40. Computed as: (0.2521−0.0004) = 0.2517 or 25 percent.
41. Computed as: (−0.0205−(−0.0740)) = 0.0535 or 5 percent.
42. Computed as: (0.3615−0.0004) = 0.3611 or 36 percent and as (0.3615−0.2521) = 0.1094 or 11 percent, respectively.
43. Computed as: (0.4786−0.0223) = 0.4563 or 46 percent, and as (0.4786−0.2307) = 0.2479 or 25 percent, respectively.
44. The FMLA was passed in the United States in 1993, and allows (in addition to other sorts of leave) eligible new mothers to take up to 12 weeks of unpaid leave while retaining their same jobs.
45. The NLSY data are simply not rich enough to examine actual differences in "family–friendly" benefits by motherhood status or for mothers, differences in such benefits between early versus late-mothers. While the survey does ask a series of questions regarding benefits such as on-site childcare services, health insurance, and retirement, sample sizes are simply too small to draw conclusions.
46. Many states do mandate family leave that covers workers at smaller firms than the 50-worker limit delineated by FMLA. Additionally, although the current administration nixed efforts to provide partial remuneration via state unemployment insurance funds, this mechanism may yet prove viable.
47. National Vital Statistics Reports, 2003.

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