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The Mommy Track Divides: The Impact of Childbearing on Wages of Women of Differing Skill Levels

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Abstract

This paper explores how the wage and career consequences of motherhood differ by skill and timing. Past work has often found smaller or even negligible effects for high skill women. This paper finds the opposite. Wage trajectories diverge sharply for high scoring women after (but not before) they have children, while there is little change for low skill women. There is some evidence that the costs of childbearing for high skill women are reduced by delaying children. Factors such as remaining in the same job and keeping interruptions short reduce the costs to women, but costs remain high for high scoring women. Men show far less impacts. As a result it appears that the lifetime costs of childbearing, especially early childbearing are particularly high for skilled women. These differential costs of childbearing may account for the far greater tendency of high skill women to delay childbearing or avoid it altogether.

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High skill women bear children far later and less often than do low skill women. The former typically postpone childbearing until their late 20s and often well into their 30s. A significant minority seem to never have children at all. Low skill women typically have children comparatively young, and nearly all have at least one child in their life.[1] Table 1 illustrates just how dramatic this pattern is. Some 64% of high school graduates and nearly 80% of dropouts among women born in the early 1960s, had a child by the time they reached 25. Only 20% of college graduates were in the same position. Even by age 30, 80% of high school grads had given birth while only half of college grads had. By age 40, a period that nearly marks the end of childbearing opportunities, most college grads have had children, but more than a quarter have none. Aggregate fertility for this college educated group is now well below the 2+ required for stable reproduction.

Interestingly, the differential pattern by education, though it has long existed,[2] has become far more dramatic in recent decades. Among the cohort of women born 20 years earlier, the timing of childbearing for high school dropouts was not very different from what it is today, though total fertility was higher. But college graduates behaved quite differently. Nearly 50% of college grads had children by age 25 and only 18% had no

[1] See for example Rindfuss et al. (1996) and Ellwood and Jencks (forthcoming).
[2] See Goldin (2004) for a wonderful historical discussion of birth and work patterns of college educated women over the twentieth century.

children by age 40, even though college graduates were a far smaller and more elite group in that earlier cohort.

The obvious question is: what accounts for the dramatic differences in childbearing patterns by skill level? This paper explores whether the career costs of childbearing are higher for high skill women.

There is abundant theoretical and empirical literature exploring the economics and sociology of fertility and family formation. This literature uniformly assumes that the labor market behavior of at least one parent will be affected by the presence of having a child and that expectations regarding labor market outcomes in turn influence family decisions. Yet the true consequences of childbearing on the labor market outcomes of women have received only modest attention, mostly involving studies of the static effect of children on pay of women. Limited attention has been paid to how the children might influence longer wage trajectories, and importantly, whether or not the long term labor market consequences of childbearing might vary by the level of human capital or other characteristics of the parent.

Using data from the National Longitudinal Survey of Youth 1979 (NLSY79), this paper examines the consequences of childbearing on the wage trajectories of women (and to some degree) men. It explores differentials by skill level of the parent and the timing of first births. Contrary some recent literature on the costs of children by education and in support of a few recent studies of the consequences of teen childbearing, the findings strongly indicate that the costs of childbearing are vastly higher for high skill women, that they do not evaporate over time, and that having children later may reduce their costs, but primarily for higher skill women.

Past Literature on the Costs of Childbearing

A number of authors have systematically examined the average impact of children on the wages on women (and men). Waldfogel (1997), Waldfogel (1998) finds that one child reduces women's wages by roughly 6% and two by 15% in a fixed effects model, even after controlling for actual work experience. When she controls for part-time work status, the effects drop by a couple of percentage points. Similarly Budig and England (2001) find a 7% wage penalty per child without controlling for actual experience and a 5% penalty after controlling for actual experience in fixed effects models. Earlier work such as Korenman and Neumark (1992) and Jacobson and Levin (1995) found smaller penalties, but this work had fewer controls for unmeasured fixed effects. In general these authors do not systematically examine whether the effects grow or decline as time since the birth passes, though Waldfogel (1997) finds that first difference models show larger effects as the time between the differences grows. She attributes this not to a growing penalty as parenting progresses but instead worries that "using short first-differences might underestimate the penalty".[3]

Recently a few authors have begun investigating whether these impacts differ by level of skill or schooling. Amuedo-Dorantes and Kimmel (2003), Taniguchi (1999), and Todd (2001) all report that the wage penalty declines with schooling. Indeed Amuedo-Dorantes and Kimmel (2003) report that the college educated get a wage *boost* from childbearing using a fixed effects model with additional sample selection corrections. Budig and England (2001) find "No clear evidence that more skilled or committed

[3] Waldfogel (1997, p. 213)

women experience higher penalties."[4] Recently Anderson et al. (2002), Anderson et al. (2003) report finding a hump-shaped penalty with respect to education: only middle education women experience a penalty—high and low education women show little effect.

These findings are somewhat surprising for both theoretical and empirical reasons. First, one of the most plausible explanations for a motherhood penalty, even after controlling for experience, is that mothers who are facing increased demands at home reduce the intensity of work effort or choose somewhat less pressured positions. While there is no necessary theoretical reason increased conflict of commitment should disproportionately affect high skill women, one might expect that the most lucrative careers, those with the steepest wage profiles, would require a special degree of commitment. Second, there are a host of more popular books all produced by thoughtful and careful authors, including Crittenden (2002), Hewlett (2002), Maushart (2000), Williams (2001) that all argue that professional women face sizable career costs and difficult tradeoffs in deciding to become a mother.

Still, the frequent finding of limited costs to motherhood for high skill women could be accurate. Perhaps college educated women can afford to pay for child care and other supports that help them reduce their career costs. And the need to be able to pay for such support could help explain the delays and avoidance of childbearing. Recall these results are net of any losses due to reduced experience, so the claim in the literature is not that educated women do not lose earnings, only that reduced work and experience accounts for those losses. But in fact, we find a very different result than this earlier literature, and so the question of why these results differ will need to be addressed.

[4] Budig and England (2001, p. 219

Finally there is a literature exploring whether the timing of childbearing (i.e. the age of first birth) affects the penalties of childbearing. The most prominent portion of this work focuses exclusively on whether teenage childbearing harms the prospects of women. Until recently, most observers would have said that adolescent childbearing was clearly costly in terms of the mother's future earnings. But some recent literature, nicely summarized in Cherlin (2001) has suggested that disadvantaged women who postpone childbearing until they are in their twenties often fare no better than those who have children in their late teens. Geronimus and Korman (1992) find that when sisters are compared, the differences between teen parents and older parents drop by as much as two-thirds. Hotz et al. (1997) compare women who miscarried with women who did not and find virtually no impact of teen childbearing (although their estimates are not very precise). Hoffman (1998) raises legitimate questions about this literature.

Literature on the effect of timing more broadly is far more limited. Amuedo-Dorantes and Kimmel (2003) report that delayed childbearing college educated women earn 43% *more* than childless women, and 21% more than earlier childbearers. Taniguchi (1999) reports that delay reduces the cost of childbearing. Very recently, Millar (2003) has used an instrumental variables approach in an intriguing new paper to conclude that delayed childbearing significantly reduced the costs of childbearing and that delay was particularly beneficial for more educated women.

Taken together this literature seems to suggest there are costs to childbearing above and beyond the effects of reduced work hours, but that it is hard to determine whether such effects differ by education or whether timing matters much. And the literature is puzzling in its variety of findings since most studies use data from the NLSY79 or the NLSY68.

Theoretical Models—Impacts of Childbearing on Wage Profiles and Impact of Childrearing Costs on the Timing and Incidence of Childbearing

The well established finding that on average mothers seem to have lower wages than non-mothers even after controlling for fixed effects might be explained in several ways, ranging from discrimination to unmeasured differences not captured by fixed effects. Becker (1985), Becker (1991) offers a logical starting point for thinking about the issue theoretically. He separates time and effort expended in market work activities and home activities. He assumes utility depends on "home goods" produced inside of the home using time, effort and market goods. For purposes of this exposition, it is just as easy to enter these inputs directly in an indirect utility function:

Thus

$U = U(C, t_H, e_H, Y)$

where

$C =$ number of children
$t_H =$ time spent at home
$e_H =$ effort expended at home
$Y =$ income (used to purchased goods used in home production or consumed directly)

Any time or energy not spent at home is assumed to be expended at market work. Income comes from earnings and outside income. Wages are a function of effort and human capital/skills. Thus utility is maximized subject to the following constraint:

$Y = W(e_M) \cdot t_M + V$

where

$W() =$ wage/salary

$V =$ outside income

Total time $T = t_M + t_H$, Total effort $E = e_M + e_H$

It is easily shown that for any given number of children, maximizing utility implies that

(1) $\frac{\partial U}{\partial t_H} = \frac{\partial U}{\partial Y} \cdot W$

(2) $\frac{\partial U}{\partial e_H} = \frac{\partial U}{\partial Y} \cdot \frac{\partial W}{\partial e_M} \cdot [t_M]$

Conditions (1) and (2) yield the very sensible conditions that the marginal utility of time and effort in market work and home production will be equalized.

Potential parents consider maximized utility with and without children in deciding whether or not to have them. In terms of time and effort devoted to market work, increasing the number of children from 0 to 1 would seemingly imply that the marginal utility from time and from energy spent at home would rise. Absent a change in the marginal utility of income, work and effort outside the home would surely decline. But the marginal utility of income would likely also rise due to the need for increased food, housing diapers, child care, and the like (a point not emphasized by Becker). As a result, whether time or energy outside of home declines depends on the relative changes in marginal utility of income and the changes in the marginal productivity of time and energy spent in the home.

What this might imply for women with different skill levels is uncertain. For women with little or no outside income (such as single parents who do not want to go onto welfare), the increased need for food and housing might dominate the pressures to spend time and energy on nurturing, so market work time/effort might actually increase. Higher skill women, and those with other sources of income might see less of change in the utility of income and might be more inclined to cut back on time and energy devoted to market work. On the other hand, higher skill women might also be in jobs where the impact of effort on wages is greater, so they might seek to reduce effort somewhat less.

If parents, particularly mothers do reduce market effort, the Becker model implies that their wages per hour worked will fall. Thus the apparent effect of children on pay could be traced to a form of omitted variable bias caused by the fact that effort cannot be measured in the wage equation.

This sort of model focuses our attention on the question of whether parents adjust their market activities in unmeasured ways that affect their wages. But is it plausible that changes in effort associated with childbearing would immediately and instantaneously lead to declines in wages? Becker argues rightly that in some cases women will be inclined to change jobs to ones that are less effort intensive and thus see immediate wage falls. But many women also return to their same employer following childbirth. It is far less reasonable to assume that employers would cut the pay of new parents—indeed it may be illegal to do so.

An alternative story, and one quite consistent with the popular literature on this topic, is that wage growth is heavily dependent on perceived effort expended. Promotions may go to people who are devoted to the job, who rearrange schedules to deal with immediate crises at work, who seem focused almost entirely on work. Parents, and probably disproportionately mothers could face conflicting commitments and thus see far slower wage growth. Thus it may be even more plausible that wage *growth* is dependent on effort as opposed to current pay. And if actual effort is hard to monitor, employers may rightly or wrongly perceive mothers are less committed to their jobs and move the off "the fast track".

Still the puzzle in fertility patterns that most interests us is why more educated women postpone childbearing more than less educated ones. Becker's static model offers little help with that question. Placing this Becker models in a life cycle context creates a complex dynamic programming model, especially if one allows related but separate choices over the timing of marriage and fertility, along with human capital decisions and choices over effort. To even begin to make the problem tractable, rather stringent assumptions are necessary. Mullin and Wang (2002) offer among the most complete and complex models (and this one ignores marriage). Children create an automatic temporary reduction in productivity in both the labor market and in investments for human capital. Within their model, age of first birth rises with "productivity loss from children" and with ability of the mother. The model has not been implemented empirically, but it points to the need to investigate the extent of labor market losses associated with children that might vary with skill or ability. Hotz and Miller (1988) offer the most widely cited version of an empirical model with life-cycle fertility, but they do not allow for career costs of childbearing (even due to reduced accumulation of experience) or distinctions by level of skill.

Still even without a dynamic programming model, we can gain insights into the potential costs of childbearing on careers. Only a modest extension of the basic model leads to the straightforward notion that both wages and wage growth might be dependent on effort as well as labor market experience. Then the effect of children on career is likely to differ for high and low skill parents both because they may be in jobs that differ in their sensitivity to effort and because they might make different choices regarding their work effort upon childbearing. Consider a 3 period model for women. Each period is long enough to bear and raise a child. Women may choose to have their child in the first or the second period but not both, and they are not able to bear children in the third period when they are no longer fertile. To keep things simple, we focus on only one child, and we assume women work full time in periods when they are not rearing a child. In the periods when women do rear children, they work reduced hours, experience some permanent wage decline, and have reduced returns to experience. Note one could model the wage penalty as a one time only cost, but if a woman works for an extended period at a lower paying job, it seems unlikely that she could simply return to her previous occupation.

Assume

$W_1 =$ full time pay rate for woman in year 1
$g =$ growth rate for a full time woman who not does rear a child in period (returns to experience)
$\alpha =$ the share of full time hours worked by a woman who rears a child in period
$p =$ wage penalty for a woman who rears a child in that period
$k =$ full-time equivalent growth rate of pay for a woman who rears a child in period (returns to experience for women with children)

Let us compare the earnings of a woman who have a child in period 1, have a child in period 2 or not have a child at all.

Earnings for Women By Period for Women By Timing of Childbirth

	No Child at All	Rear Child In Period 1	Rear Child in Period 2
Period 1	W_1	$W_1(1-p)\alpha$	W_1
Period 2	$W_1(1+g)$	$W_1(1-p)(1+\alpha k)$	$W_1(1+g)(1-p)\alpha$
Period 3	$W_1(1+g)(1+g)$	$W_1(1-p)(1+\alpha k)(1+g)$	$W_1(1+g)(1-p)(1+\alpha k)$

The woman who has no child at all earns full-time pay of W_1 in period 1. If she remains childless in period 2, her pay rises by g and she continues to work full time, so she earns $W_1(1+g)$ and this pattern of growth repeats into period 3. By contrast a woman who has a child in the first period faces a wage reduction of p and works only α share of full time work and thus earns $W_1(1-p)\alpha$. In the next period this woman returns to working full time, but her wage grows by only αk because she worked less than full time in the previous period and because the growth rate in pay for a women who rear a child is in the previous period is k. For the final period her pay rises by g again as she had reared her child in period 1.

The Earnings Costs of Early Childbearing

Consider the difference in lifetime earnings between the woman if she rears her children in period 2 versus period 1. Note that third period earnings are the same for both women. In effect, the early childbearers catch up to the later ones. But there are differences in the first two periods. Discounting the second year and subtracting yields the gain from waiting until the second period:

$$\frac{rW_1[1-\alpha+\alpha p]}{1+r} + \frac{pW}{1+r} + \frac{W(1-p)\alpha(g-k)}{1+r}$$

All three elements have a straightforward interpretation. The first term is simply the gain achieved through discounting by postponing the pay lost due to from child rearing one period into the future. The childbearing cost in the period of childbearing is the same proportion of income regardless of when it occurs. Postponing it by a year lowers its present value. The second term is the result of the fact that we assume the reduction of pay which occurs in the first year persists permanently. Thus having children earlier creates one extra period of reduced pay. If this loss was offset in future years, the term might go away. The final term captures the effect of differential growth for women with and without children.

Several features are worthy of note. First the gains to postponing are increased as the base wage rises, the penalty from childbearing rises, and as the *difference* between the without-child and with-child growth rate increases. Note, that the absolute growth rate in pay itself is irrelevant. This somewhat counterintuitive result can be understood as follows. A woman with a high growth rate who postpones childbearing will have a higher second period wage, but that gain will be offset by the fact that she will then suffer a higher second period loss when she has children. But if her wages grow more slowly as the result of children, postponing that loss in growth results in the higher present value of earnings. Note also that the impact of a higher α (a higher level of work with children) is ambiguous, lowering the earnings cost of childbearing since less time is taken off from work, and thus lowering the discounting benefits of postponing it, but also heightening any impact of a slower return to growth rate from working. As women spend more and more time in work, the impact of any differential growth rate will become a larger and larger share of the costs of early childbearing.

To determine whether or not early childbearing makes sense, women will need to compare the added lifetime earnings costs to the other benefits (and costs) of earlier childbearing. Early childrearers have more years to spend with their children and will be younger when they become grandparents. But they will have less leisure time early in life, and so forth.

The Earnings Costs of Childbearing Versus Avoiding Children Altogether

Simple inspection of the first and last columns of the table above reveal that the cost of childbearing versus avoidance is likely to be much larger than the cost of early versus late childbearing. Even those women who have children late still lose the earnings while out of the labor force, still face a long term wage penalty, and still experience a year of slower growth in this model. And in this case, g, the growth rate of earnings does enter directly. In this model then, the level of wages and the returns to experience influence the costs of having children, but the level of wages and the differential returns to experience between mothers and non-mothers to experience influence their timing.

Empirical Strategies

In determining what the impact of childbearing is on pay, our biggest challenge is endogeneity. An important part of the motivation for this work is the finding that more skilled women delay childbearing more and theory suggests this may be related to the costs of childbearing. By definition then, childbearing and its timing are likely to be related to labor market performance.

Unobserved heterogeneity is a conceptually distinct challenge. Characteristics of men and women that might make them less appealing to potential partners such as unpleasant personalities and thus reduce their likelihood of becoming parents, might also make them less successful in the labor market. These hampering characteristics might influence both their level of wages at any given time and also their growth over time.

There are two sorts of strategies that might offer a convincing way of discerning the effect of childbearing on work and careers. The first involves finding appropriate instruments for childbearing that are not directly correlated with work and wages. The second is to exploit the patterns and trends in the longitudinal data itself, looking for clear changes in trajectories that follow but do not precede the birth or conception of a child.

The difficult search for instruments—The ideal instrument would exogenously influence childbearing without any direct impact on earnings. But good instruments are hard to come by. Having a child is the probably the most enduring and life altering event in the lives of most humans, and thus childbearing will be something that potential parents will work very hard to control. Moreover, the very people for whom the event would have the greatest impact are precisely the group who would have the strongest incentive to effectively control fertility.

Perhaps the most clever and compelling instrument is the incidence of miscarriage, prominently used by Hotz, McElroy and Sanders (1997) in their work on the impact of teen childbearing on wages, education, and other outcomes. If miscarriages are largely exogenous, women who have a miscarriage should on average, have children later than those who do not.

Still there are several important limitations with this instrument. First reported miscarriages are uncommon. In the NLSY79, just over 10% of women report having a miscarriage with their first pregnancy. And a miscarriage usually results only in modest delay, not avoidance altogether. At least 80% of women reporting a first miscarriage are later observed to have a child, and the average delay between miscarriage and childbirth is 2 years. Thus this instrument could at best be used to explore the impact of a two year delay on wages and given its low incidence, its power will be weak. More worrisome is the fact that health and other behavioral characteristics of mothers who miscarry may be worse than those who do not, and these health limitations may in turn lead such women to have lower pay. Finally, there is evidence that reported miscarriages are not exogenous. In our analyses of the NLSY79, we found that the reported rate of miscarriage was 17% among women who had reported in the previous survey that they did not expect to become pregnant within the next couple of years and who actively tried to prevent pregnancy through contraception. The rate was just 11% among women who reported they expected to become pregnant and who were not using contraception at the time they became pregnant. It may be that unwanted pregnancies are more stressful, leading to more miscarriages, or women may knowingly misreport such events (for example calling an abortion a miscarriage, or being more willing to reported a miscarriage of an unwanted child). Regardless, there may be good reasons to believe that this instrument will be correlated with the perceived costs of childbearing.

An alternative methodology is to use "undesired" or "unexpected" pregnancies. For example, Millar (2003) proposes using as an instrument whether the woman reports that she was using contraception at the time of conception. Unfortunately this instrument has more serious problems. Only 15% of women who became pregnant reported they were using contraception at the time of conception (presumably proving that contraception mostly works). Contraceptive use (and thus the odds of failure) will vary with the woman's information, her own sense of control, the ages of the partners, the perceived cost of pregnancy and childbearing, the availability and willingness to have an abortion, and most importantly with the perceived cost of pregnancy. If contraceptive use varies in ways correlated with market outcomes, pregnancies that are the result of contraceptive failure will still be correlated with market outcomes. And contraceptive failure rates themselves are likely to depend on the competence and knowledge of the woman.

Another problem with this instrument is the obvious question as to whether such self reported retrospective answers can be trusted. Women might overreport contraceptive use because they are embarrassed by their pregnancies, or underreport it so as not to admit the child was unwanted. The NLSY also includes prospective questions about when people expect to become pregnant. These have the advantage that they are asked prior to pregnancy. Revealingly, of those who reported they became pregnant while using contraception, nearly half had previously reported they had expected to be pregnant in the subsequent two years. One might count as truly "undesired" pregnancies only those where the woman did not expect to become pregnant in the next two years and who were contracepting at the time of pregnancy. Only about 8% of first pregnancies fit this criterion, so the power is again low.

Perhaps even more seriously, many unwanted pregnancies end in abortion, not childbearing, further weakening the instrument. Of the 8% of reported pregnancies which were unexpected and where contraception was reported used, 37% of were reported to be aborted and another 17% are reported to end in miscarriage,[5] leaving just 3-4% of all first pregnancies as "unwanted and unexpected" and resulting in a birth.[67]

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[5] By contrast only 26% of pregnancies ended in abortion or miscarriage among women who claimed they were using contraception but who had reported they did expect to have a child within the next couple of

In this work, we tried a variety of other possible instruments as well, including mothers age of first birth, types of contraception, expected age of pregnancy when the woman was 18, and the like. Overall, the estimates they produced were generally in the "right" direction, and sometimes significant, but they were unstable and thus unsatisfactory, especially when we sought to decompose effects by subgroups.

Tracking trajectories—In the absence of credible instruments, we instead exploit the inherent advantages of longitudinal data. The NLSY79 tracked women who were aged 14-21 in 1979 and has followed them more or less continuously since. The vast majority of respondents were childless at the start of the survey, and most were parents by the end. The obvious starting point for this work, examining the changes in wage trajectories as respondents become parents, offers a surprisingly powerful methodology for examining the impact of childbearing on pay.

Previous studies have already allowed for fixed effects. Fixed effects are essentially before-after strategies that control for any unchanging and unmeasured differences across individuals. But women will also differ in their wage trajectories—the patterns of growth not just their average pay, and unanticipated success or failure in the labor market influences childbearing, fixed effects will not fully solve the endogeneity problem. Fortunately with longitudinal data, trajectories can themselves be observed and

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years, virtually identical to the 25% termination pattern among those who reported they had not be using contraception.

[6] And nearly half of all abortions reported in establishment data are not reported in individual survey data such as the NLSY.

[7] Millar (2003) uses yet another instrument for age of first birth model : "the lag in years from the first attempt to conceive to first birth" But the NLSY has no direct question about when people sought to become pregnant. Instead Millar treats the time between the first unprotected intercourse and the first birth. Aside from the fact that few people are actually attempting to get pregnant with their first unprotected intercourse, there are severe econometric issues of subtracting age of first unprotected intercourse form age of first birth to then instrument age of first birth. Since nearly everyone has at least one unprotected intercourse early, this seems hardly an instrument at all. Not surprisingly the t-statistic of this variable in the first stage regression is nearly 20.

one can look for anomalous breaks in patterns that differ with the timing of childbirth. Exploiting the basic insight of Sims (1972) one look for evidence of causality by noting whether wage changes preceded or followed the childbearing.

Wage Trajectories By Timing of Childbearing and Skill Levels

Figures 1-4 show the age-wage trajectories of women by the timing of their first birth. Figure 1 shows the pattern for all women. Inspection suggests that women who bear children later seem to be on different trajectories. But close inspection appears to reveal a discernable change in the income trends for each group when they reach the age when they give birth. Intriguingly, women who never have a child are often on a lower trajectory than women who later do. This becomes far clearer when we break women into skill categories.

All women are broken into thirds based on their performance on the Armed Forces Qualification Test (AFQT) that was administered to NLSY respondents. We split the sample by AFQT rather than education to reduce endogeneity that would be present since early childbearing clearly can and does influence education.[8] There are several striking features of the figures.

First, the trajectories of the lower skill women are considerably flatter than those of higher skill women. Higher skill women seem to have much steeper gradients. And the trajectories of low scoring women do not change very noticeably after they have children. Women who remain childless or who have children late may do somewhat better, but the differences appear quite modest.

[8] The AFQT also has an element of endogeneity and measurement error since it can be somewhat influenced by education and because it is administered when the women entered the survey and their ages varied at the time from 14-21. The scores used here were normalized by age.

In contrast, for women in the top third, wage trajectories seem to shift rather dramatically after they have children. Wages of women rise sharply and largely in unison in the period prior to their having children, but at almost precisely the moment they bear children, their wage profiles flatten out. Moreover higher skill women who remain childless are not at the upper edge of earnings even in the period prior to the time when their peers have children. In their 20s, they often earn considerably less women who will later become mothers.

These graphs provide strong visual evidence that childbearing may indeed have a powerful effect on wage trajectories and that there are sharp differences in these impacts by skill group. The graph for high skill women also helps explain a puzzling finding in the literature, namely that high skill women apparently are not harmed much by having children, especially if they have children late. The graph suggests the finding is artifact of heterogeneity. Figure 4 makes clear that higher skill women who bear children comparatively late do indeed have higher pay than women who remain childless—but that advantage begins well before the women have children and it diminishes sharply after they become mothers.

We now turn to our statistical work. In this work we have chosen to focus exclusively on women who do eventually have children since the figures clearly illustrate that childless women often have different wage profiles than those who become mothers. In addition, since we would like some wage observations before childbearing, and because we want to limit endogeneity between schooling, test scores and childbearing, we look only at women who had children after age 21, after the period when the AFQT was administered and after most schooling is completed. This limitation seems reasonable for middle and upper scoring women who rarely have children prior to age 21, but it could be problematic for women in the bottom group who often have children as teens. We explore this issue below, but generally find that limiting this sample to women who had children after 21 had no significant effects on the results for any of the groups.

In all of our estimation, we controlled for fixed effects. In this work we will focus primarily on the impacts of first children, though we include variables for additional children. And we are interested in whether any impacts of childbearing grow or diminish as time since the birth passes. Thus we include dummy variables indicating the women had her first child within the past 0 to 4 years, 5-9 years ago, or greater than 10 years previously.

Table 2 reveals that even after controlling for fixed effects, the sharp differences in the apparent effects of childbearing remain. Initially, we control only for "potential experience" (age-schooling -5), to capture the full apparent change in wages as women age. This model is comparable to the formulation of the graphs, except that we allow for fixed effects. For all three score groups, wage growth of women slows considerably after having children, and pay penalty grows as time since the birth passes. Moreover, the impacts on more skilled women are significantly greater. This latter group has a much sharper upward wage trajectory independent of children, but they seemingly suffer the largest relative declines in wages as a result of childbearing. After 10 years, low scoring mothers have wages that are 15% lower than their counterparts who have not yet had children; high scoring mothers have pay that is 30% lower.

Some decline in pay among mothers, or more precisely the slowing of pay growth, would be expected even if motherhood had no impact on wages per se. Mothers usually spend less time in the labor market than non-mothers and thus accumulate less work experience.

The models in Table 3 control for actual labor market experience and thus remove the effect of any reductions in hours worked on pay. Including actual experience sharply reduces the coefficient on motherhood for all skill levels. For low AFQT women, the remaining impact of childbearing moves to “just” 6-7% and the coefficient is insignificant after 5 years. And importantly for this group, the negative impact net of lost work experience does not appear to grow with time. Thus it appears that low scoring women face a one time, permanent fall in pay of perhaps 6% above and beyond any reductions in pay traceable to lost work experience.

In contrast, high scoring women show a net 8% reduction in pay during the first 5 years after giving birth, and that penalty grows to 21% in the decade after birth. One might have expected some catch up in later years, but we see the opposite here. Still it is important to recognize that women in our sample are 35 to 42 in the final sample year, so any pay recovery that occurs at later ages would be missed.

These results control for fixed effects. The possibility remains that women choose to have children at a time when they see their wages flattening. Table 4 tests for this possibility by examining whether wages fell in the period prior to the birth of the child. This is actually a simplified type of causality test—exploring which came first: lower pay or childbearing. Strikingly, wages in the years just prior to birth were insignificantly different from the baseline for all three groups. Indeed for two of the three groups the point estimates are positive. We see no evidence here of a wage dip before childbearing, only after it.

Finally, even within AFQT groupings, it is plausible that women with steeper trajectories have children later. Since we are conditioning on women having children at some stage, it is not clear how such a correlation would influence the results. We cannot realistically allow for each individual to have their own trajectory since both a slope and square term would be needed.[9] But we did one test that allowed for an interaction between age of first birth and experience and experience squared. These interaction terms were individually and jointly insignificant in the lower two AFQT groups and had no influence on those results. These did show some evidence that among high AFQT women, those who had later ages of first birth had steeper trajectories. However, the estimated impact of childbearing was largely unchanged and statistically indistinguishable from the previous estimates, though the estimated negative impact after 10 years leveled off at 15% rather than rising to 21%.

The estimated 15-20% reduction in pay for high scoring mothers after 10 years is dramatically higher than the results found elsewhere in the literature and discussed above. For example Waldfogel (1997) and Budig and England (2001) report reductions net of actual experience in fixed effects models of closer to 7-8% and the latter find little variation by education or skill level. As noted above, some authors even find positive effects of childbearing for more skilled women.

The differences might be traced primarily to three differences in methodology that are easily tested: first, previous authors have not sought to examine whether the impact

[9] We did experiment with allowing individual experience coefficients along with the fixed effects while omitting experience squared or fixing or estimating it at some common level, even though it is next to impossible to construct a theoretical model to justify allowing individually different returns to experience but imposing a uniform impact of experience squared. In our estimates, these individual experience effects varied widely (including many negative values) and, not surprisingly the measured costs of childbearing proved very sensitive to the treatment of the atheoretical common experience squared term.

of children grew as time since the birth increased. While one might think that this omission would simply give an average impact of childbearing, a serious truncation bias can arise in most existing longitudinal data series. If one were using the NLSY through say 1995 as earlier studies have, the final ages of sampled women would be 30-37. Since the median age of first birth among women scoring in the top third is 27, many of the mothers would be captured only in the first year or two after birth, so the "average" impact found in earlier models would be only the initial impact for higher skill women. If the impact of childbearing on pay grows as time since the birth increases, then the eventual impact of childbearing will be considerably greater than average estimated for this late childbearing group.[10] This issue would be far less serious in the low scoring women where median age of first birth is closer to 20.

Second, we noted that including women who never give birth appears to bias the results in some cases, since the figures show that such women often are on lower wage trajectories even in the period before other women become mothers. Again in Figures 2-4, this seems to be a serious problem especially for high scoring women. Finally, we chose to limit the sample to women who have their first child after age 21 so that issues of educational endogeneity can be reduced and to ensure that we can usually get some wage observations in the period prior to childbearing. As noted previously, for low scoring women our method could introduce bias since over half have their first child prior to age 21.

Tables 5 and 6 illustrate the impact of these modeling features on the results for high and low skill women. In these tables the first column is the traditional estimate

[10] Note this issue remains in our use of a simple measure of number of additional children. Since many of these are born later in a mother's life our estimates of the impact of additional children probably suffers from some sample truncation bias.

using the methodology common in the literature, and the last column is our preferred form. For low skill women, the impact of the various modeling differences is quite small. Allowing for changing impacts as the child ages and limiting the sample to women who eventually become mothers does little to change the estimates. Limiting the sample to women who have children after age 21 does push up the estimates slightly, but the differences are not statistically different.

But for high skill women, allowing effects to grow as the child ages pushes the apparent 5% effect found in previous literature up to nearly 12% by the 10^{th} year. Limiting the sample to women who eventually have children pushes the impact up to 20%. Again, it is evident that women who never give birth have lower trajectories than women who eventually do. Finally using only the sample to women who have children after age 21, by contrast, has very little impact. Our conclusion is that modeling limitations in previous work probably hid the most of the sizable impacts of childbearing for high skill women while having little impact for lower skill women.

The Influence of Timing on the Career Costs of Childbearing

The timing of childbearing might influence the career consequences of children. The earnings of women seem to plateau in the period after they have children. This would seem particularly costly early in a career when age-earnings profiles are steep. Later, as profiles flatten out as a matter of course, a flatter profile might be less costly. And since the profiles of high scoring women are steeper on average, it would seem plausible that the gains to waiting would be greater for this group.

Table 7 explores the issue of timing. The model includes an interaction term from which one can infer the impact of each additional year of waiting beyond age 21.[11] Once again, we find sizable differences by skill level. The apparent impact of waiting is mildly positive for women in the bottom third of AFQT scores, but the effect is completely insignificant. For higher skill women, the apparent benefits of delay are quite large and highly significant. The estimates imply that waiting 10 years reduces the cost of childbearing by nearly 2/3s. Taken at face value, Table 7 implies that high skill women face much higher costs of childbearing (as a fraction of pay) and have a much greater benefit from postponing childbearing.

But the data on the timing issue are less clear cut than they appear in Table 7. In Table 8 we examine the impact of delay for high skill women using two slightly different specifications. In the first column, we impose a common experience profile regardless of the timing of first birth and allow the effects of childbearing to differ depending on whether the child was born before or after the woman turned 28 (the median age of first childbirth for this group is 27). The first column again shows a smaller cost of childbearing for women who bear them later. In the next two columns, we estimate the model separately for women who had children prior to age 28 and those who had children at age 28 or later. When we split the sample in this way, there is no clear evidence that women who have children later face lower costs. The reason the results differ is that the estimated wage profile for this late childbearing group is estimated to rise slower initially with experience but flatten out less quickly (the squared term is lower) than does the profile for the earlier childbearers.

[11] The variable is equal to zero in the years before the woman has a child and equal to age of first birth-21 for the years period after a woman has given birth. It thus represents a scalar adjustment to the apparent effect of childbearing.

In selecting the specification to pick, it should be remembered that the post age 28 childbearing equation suffers from a relatively short post childbirth period because the samples age ranges from 35 to 42 in the last year 2000, the last year we have data. In trying to estimate the impacts on pay as time since the birth passes, the sample gets smaller and smaller and implicitly one is selecting people who had births closer and closer to age 28, so the longitudinal character of the data in not being used very effectively in this later model. We are asking the model to distinguish experience curvature from flattening due to childbearing in a relatively small group of women who are having children at almost precisely the time when the profile tends to flatten and when the data are reaching their end point. Given the difficulty of trying to tease so much out of the profiles of these women, we prefer the estimate that imposes a common functional form on the base profile for early and late childbearers, but we cannot fully reject the hypothesis that the costs do not differ depending on the timing.

What Explains the Fall in Earnings Among High Scoring Mothers?

Several hypotheses have been suggested to explain the impact of childbearing on earnings. Labor force withdrawal and a move to part-time work may impose penalties on female workers diminishing both immediate pay and long term wage growth. One might anticipate that patterns of withdrawal or moves to part-time status would be more common among low skill than high skill women, and indeed low skill mothers are more likely to be outside the labor force than are higher skill mothers. But in fact the *changes* in work behavior after the birth of child are actually somewhat greater for high skill women, especially with respect to part-time work. Higher scoring women work full-time all year much more than lower skill women do prior to their first birth, 70-75% versus 55-60%. But after birth roughly 35% of each group is working fully in the labor market in any of the 5 years after birth. Where the groups differ is on part time work, with high skill women being far more likely to be working part-time and low skill women more likely to withdraw from the labor force altogether.

Mothers may leave their previous employer when they give birth (either by choice or because they cannot get back their previous job).[12] Women who make such a change give up any benefits they were gaining from firm specific human capital and presumably lose their returns to tenure. A related hypothesis is that some women interrupt their careers for as much as several years, and that this interruption knocks them onto a slower track. Finally it is possible that mothers are perceived (rightly or wrongly) as less willing or able to spend the "extra hour" that superiors may use as a signal of commitment to the enterprise and thus less likely to gain promotion.

Table 9 examines these hypotheses for higher scoring women. The first column gives the results previously reported. Column (2) shows the effect of controlling for part-time status and tenure on the job. Interestingly, even though both are highly significant, they do not explain a great deal of the reduced pay associated with children. In our own examination of this issue, we found that women with longer tenures at their employer when they gave birth were less likely to move to part-time status or change employers. Thus the group for whom the loss of tenure might make the greatest difference, often do not change employers.

[12] The Family and Medical Leave Act of 1993 now allows new mothers to take up to 12 weeks unpaid leave and still be rehired into comparable jobs if the woman worked for an employer with 50 or more and had worked 1,250 hours in the 12 months prior who the leave.

Column (3) also controls for whether or not the person stayed with the same employer two years after birth and whether they did not work at all in the second full year after the birth of the child. It is this latter variable that proves most powerful. It appears that extended work interruptions may be the most costly with respect to impacts on pay. Recall that this is net of any direct cost of lost experience. Women who leave the workforce for significant periods may indeed fall out of the "fast lane". Column (4) adds in two digit occupation dummies to test whether women may be moving to lower paying occupations after childbearing, perhaps to find greater flexibility or reduced stress. Adding the occupation effects has no real impact.

Yet, surprisingly perhaps, even after controlling for all these variables, over half of the impact remains. Column (5) focuses on a select sub group: women who work full-time all year in the second full year after they give birth for the same employer that they were with prior to giving birth. One would certainly expect this group to be among the least affected by childbearing. Though the smaller sample sizes push some of the coefficients to insignificance, the point estimates are close to those column (4). In other words even if women work full time at their same employer, on average their wage growth slows and over time their pay appears to be 9% lower. The data do not allow any judgment as to whether this pay penalty reflects the conflict of commitment reported by some women, or subtle discrimination against mothers reported by others.

We explored two other questions. One might suppose that the negative impacts of childbearing would differ depending on the marital status of the mother. Married mothers might be able to share the burden with a partner, or conversely they may feel less pressure to continue competing at work. We found very little evidence that marital status influenced the results. In part this reflects differences across skill groups. Low scoring women are the group vastly more likely to be unmarried at the time of birth, but they are also the group where childbearing seems to impose far lower career costs. High skill women on the other hand are virtually always married at the time of their first birth, and unmarried high skill mothers are undoubted a rather select group.

We also examined whether the results differed for black women. Once again, we found little evidence that black women fare differently. We first allowed for an interaction between the cost of childbearing and being black. This term was completely insignificant in all AFQT categories. In addition, we estimated separate effects for blacks in the bottom third of AFQT (the only group where we have a sizable sample of blacks) and the results were virtually identical to those reported earlier.

Impacts for Men

Figure 5 shows the age earnings graphs for men in the top third of AFQT distribution broken out by the age that the men report they first became fathers.[13] This graph looks rather different from Figure 4, the one for high skill women. While men who have children later end with higher pay than those who have them earlier, one sees far less evidence that trajectories shift with the arrival of parenthood. Rather men who have children later seem to start and end with higher pay. Most notable here is the position of childless men. Men who never have children, far from being the best performers in the labor market, appear to be among the worst. This may either be a case where poor labor market performance makes men unappealing partners, or where some unmeasured characteristics hurt men in both settings. In either case, it is obvious that any estimates

[13] Unmarried fathers report fewer children than do unmarried mothers. But one would expect that any children with whom the father is deeply involved and who thus might influence earnings would be reported.

that show men gain from childbearing by comparing those who have children and those who do not will suffer from severe selection bias.

Table 10 gives the estimated impact of childbearing for men using the same specifications as we used for women. Unlike previous literature we do see some evidence of negative consequences of parenthood for men. The 10 year estimate for high skill men is roughly half that for women. But in nearly all cases the impacts are not statistically significant. Only the 10 year impact for high skill men reaches conventional levels of significance. And unlike the estimates for women, these are very sensitive to functional form and they fail our specification tests. For example if we include a variable capturing the 3 years prior to birth, the results all seem to evaporate. Similarly, test for connections between the steepness of trajectory and the timing of first birth also show that the apparent impacts of childbearing can be traced to differences that precede the onset of parenthood. We find little evidence here of strong effects of parenthood on male pay. There is a hint that high skill men may be now feeling some negative consequences, but even this evidence is weak. At the same time we see no evidence that men a gaining as a result of childbearing.

The Perceived Costs of Childbearing

It appears that the career and earnings costs of childbearing for women differ dramatically by skill level. All women's earnings are hurt by the time they take out of the labor market, but high skill women also face a very high penalty in the form of lower pay above and beyond the effects of lost experience. Moreover, early childbearers face additional penalties, and these are far larger for high than low skill women. Table 11 illustrates the estimated lifetime earnings impact of childbearing and timing for women of different skill levels using the models from Table 7 which show a sharp differential timing effect by skill level. While our analysis left some uncertainty about the magnitude (if any) of the timing effect, it is quite likely that women considering when to have children would notice that late childbearers seem to do better in their careers and unlikely that they could fully adjust for the differing potential curvature of women bearing children early and late. They, like we, have trouble determining the true counterfactual. Thus we would argue that the perceived and perhaps the real cost of childbearing is shown on Table 11.

In generating Table 11 we made several assumptions. Our goal is not to determine an accurate cost of childbearing, but rather to give a sense of the different magnitudes involved.[14] All women within each skill group are assumed to have the same pre-child experience profile and returns to education regardless of the timing of their first birth or if they decide not to have a child at all. Thus the predicted wages for a women who never has a child is based on the equation estimated for women who did have them.[15]

Two features of Table 11 are notable. First the impact of delay for low scoring women is vastly smaller than for high skill women. A low scoring women stands to gain less than 30,000 or less than 10% of lifetime earnings by waiting. By contrast women in the top group gain nearly $125,000 or more than 20% of lifetime earnings. Perhaps even

[14] We assumed the woman had only one child. We assumed that low (middle; high) scoring women worked 80% (90%, 100%) of full time in the years prior to having children, 50% (50%; 60%) in the first five years after birth, 70% (80%; 80%) in the next 5 years, and back to 80% (90%; 100%) in subsequent years. These roughly correspond to the actual patterns for mothers of different scores in our data. We assumed that once wages eventually leveled off, but they did actually fall. And finally women work until age 65 and then retire. Present values of earnings were determined at age 18 using a 3% real discount rate.

[15] We have already established that the wage profiles of women who actually remain childless are often lower than those who have children among the most skilled women. The right comparison is what the women who become mothers would have earned had they remained childless.

more starkly, the costs to having children regardless of the timing are vastly higher for high skill women. If a low scoring women chooses to have children, she will give up 10-17% of her potential lifetime earnings. But high scoring women give up nearly 17-32% of earnings. Even if such women wait until age 30 to have a child, the cost is nearly $160,000.

These figures offer a powerful reason why the birthing patterns of women might differ so much by level of skill. High skill women apparently face very high costs of early childbearing and give up a great deal by having children at all. And consistent with these costs, high skill women typically have children late, and many avoid childbirth altogether. Low skill women face much lower costs of childbearing and less benefit from delay and, consistent with these results, tend to have children earlier.

Discussion

We have not sought to develop a full model of birth timing decisions here or prove that career costs are the driving force behind differential fertility patterns. A fuller model would take account of male partners, potential impact of childbearing on marriage, and a series of other issues. But these data alone point to powerful effects of social and economic changes which likely then influence patterns of fertility. We suspect that dramatic changes in the 1960s: the women's movement, the pill, the expansion in work opportunities for women, altered attitudes about maternal work and premarital sexual activity, gave women a new ability to control fertility and a potential reason to do so. In effect these social and economic changes allowed economic forces to play a much stronger role in decisions about fertility. But as we see, even today, the economic reasons to postpone or avoid childbearing appear vastly stronger for high skill women than for low skilled ones. And thus, it is the behavior of high skill women that has changed radically.

The implications of these increasingly large differences in fertility patterns may be profound. Children born to low skill women come early, when the mother is often earning very little money and few of the mothers are married at the time of birth. Children born to high skill women almost always enter the home of a married couple in their peak earning years. The potential differences in childhood outcomes are great. Policymakers may want to consider whether the best strategy for influencing the timing of childbearing, particularly teen childbearing, may involve shifting economic opportunities and the increasing the benefits to delay. And for women at all levels, one must confront a profound social question: should the nation be concerned about the costs of childbearing that seem to fall so heavily on women and the consequences for the pattern of American fertility.

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Table 1
Birth Patterns of Women By Level of Education
Women Born in 1960-1964

Level of Education	Percent With First Birth By Age 25	Percent With First Birth By Age 30	Percent With First Birth By Age 40*	Average Number of Children Born By Age 40*
Dropouts	78	83	86	2.6
HS grads	64	79	84	2.0
Some college	49	70	81	1.9
College graduate	20	50	73	1.6

Source: Ellwood and Jencks (forthcoming) based on June CPS data.
* estimated based on partial data since entire cohort had not reached 40 by the most recent survey (2000)

Figure 1
Average Wages of Women by Age
and Age of First Birth

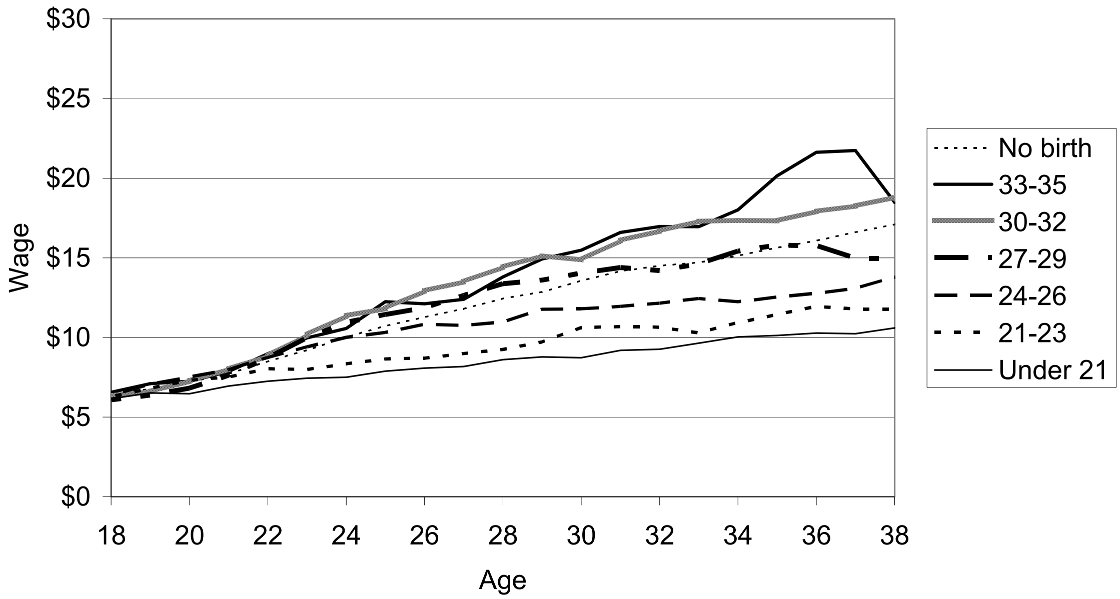
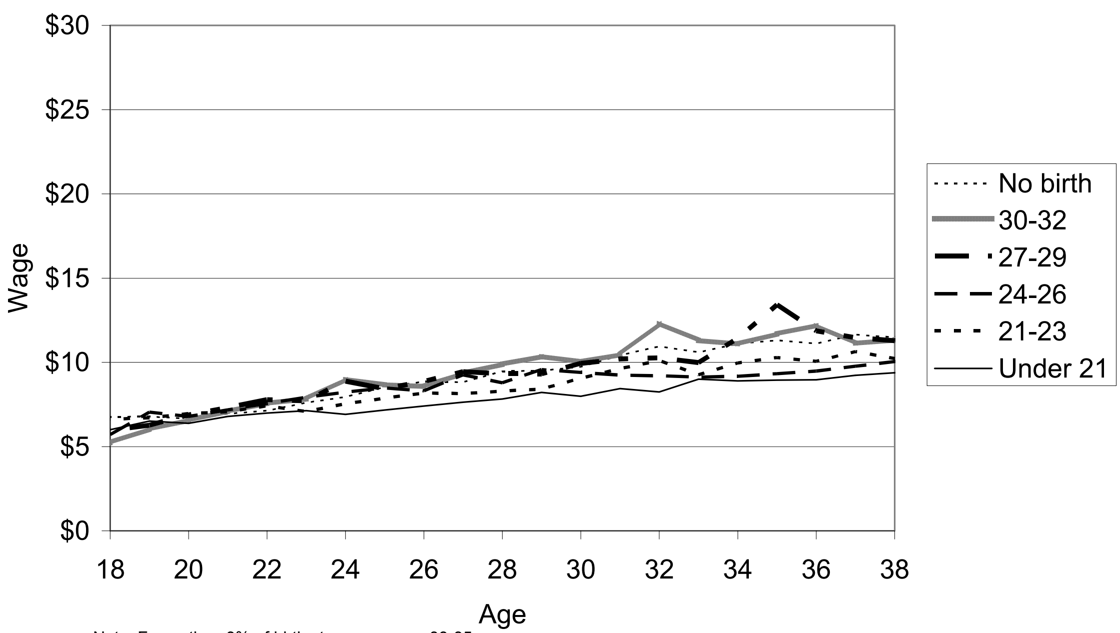


Figure 2
Average Wages of Women in the Bottom AFQT Third by Age
and Age of First Birth



Note: Fewer than 3% of births to women age 33-35

Figure 3
Average Wages of Women in the Middle AFQT Third by Age and Age of First Birth

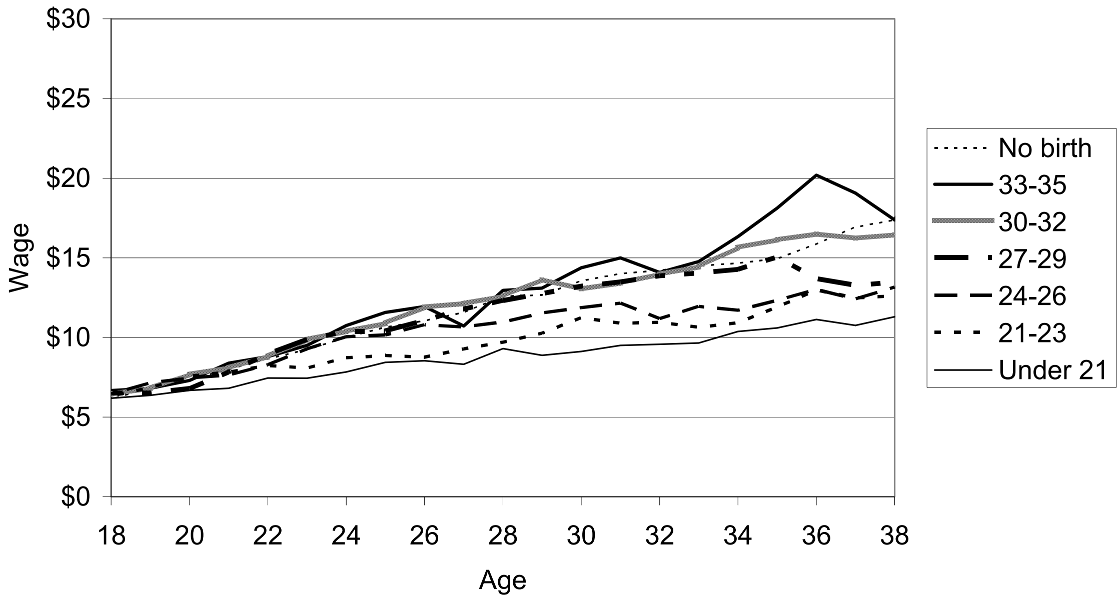


Figure 4
Average Wages of Women in the Top AFQT Third by Age and Age of First Birth

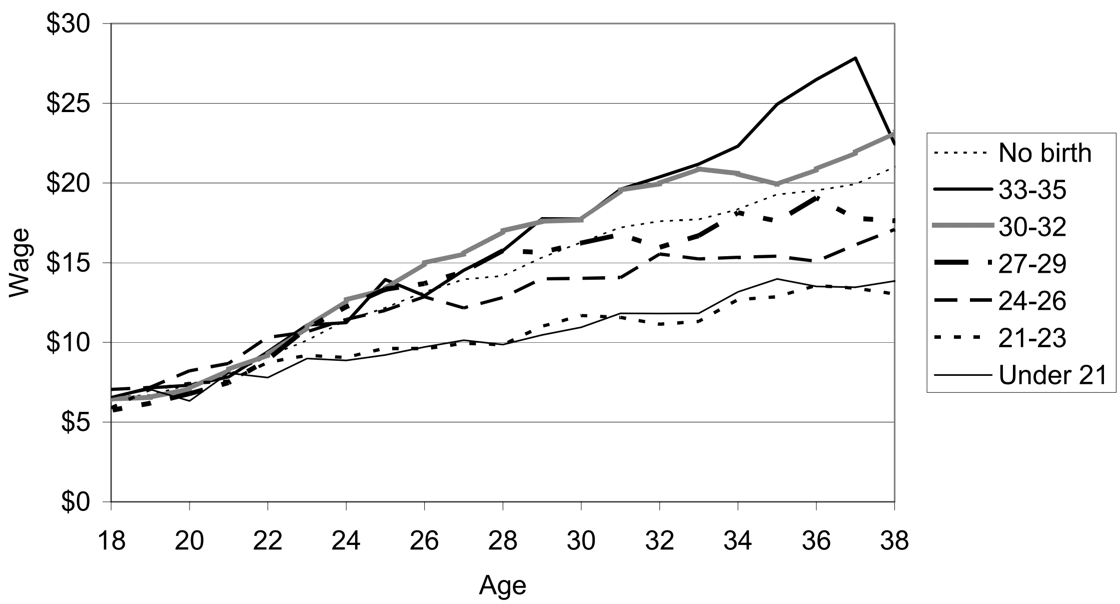


Table 2
Fix Effects Log Wage Regressions for Women Using Potential Experience
Women Aged 20 and Over Who Had a Child After Age 21

	(1) all women	(2) low AFQT	(3) mid AFQT	(4) high AFQT
Education	0.140 (0.009)	0.121 (0.021)	0.123 (0.017)	0.142 (0.011)
Potential Experience (age-schooling-5)	0.069 (0.004)	0.036 (0.010)	0.064 (0.007)	0.085 (0.007)
Potential Experience Squared	-0.0013 (0.0002)	-0.0003 (0.0004)	-0.0013 (0.0003)	-0.0018 (0.0003)
First 4 years After First Birth	-0.09 (0.01)	-0.08 (0.03)	-0.06 (0.02)	-0.10 (0.02)
Years 5-9 After First Birth	-0.16 (0.02)	-0.10 (0.04)	-0.11 (0.03)	-0.21 (0.04)
Years 10 and higher After First Birth	-0.22 (0.03)	-0.15 (0.06)	-0.16 (0.05)	-0.30 (0.06)
Number of Additional Children	-0.05 (0.01)	-0.02 (0.02)	-0.05 (0.02)	-0.06 (0.02)
Fixed Effects?	Yes	Yes	Yes	Yes
# of Observations	2369	744	788	698

Robust standard errors in parentheses

Table 3
Fix Effects Log Wage Regressions for Women Using Actual Experience
Women Aged 20 and Over Who Had a Child After Age 21

	(1) all women	(2) low AFQT	(3) mid AFQT	(4) high AFQT
Education	0.101 (0.009)	0.083 (0.022)	0.085 (0.017)	0.098 (0.013)
Actual Experience in Years	0.072 (0.004)	0.057 (0.008)	0.068 (0.006)	0.083 (0.006)
Actual Experience Squared	-0.0015 (0.0002)	-0.0013 (0.0004)	-0.0014 (0.0003)	-0.0016 (0.0003)
First 4 years After First Birth	-0.07 (0.01)	-0.07 (0.02)	-0.05 (0.02)	-0.08 (0.02)
Years 5-9 After First Birth	-0.12 (0.02)	-0.06 (0.04)	-0.10 (0.03)	-0.17 (0.03)
Years 10 and higher After First Birth	-0.16 (0.03)	-0.07 (0.05)	-0.14 (0.04)	-0.21 (0.05)
Number of Additional Children	-0.03 (0.01)	-0.03 (0.02)	-0.03 (0.02)	-0.02 (0.02)
Fixed Effects?	Yes	Yes	Yes	Yes
# of Observations	2269	722	763	684

Experience in years calculated as hours of work experience divided by 2000 hours per year.

Robust standard errors in parentheses

Table 4
Fix Effects Log Wage Regressions for Women Using Actual Experience
Including Variable for 3 Years Prior to Birth
Women Aged 20 and Over Who Had a Child After Age 21

	(1)	(2)	(3)	(4)
	all women	low AFQT	mid AFQT	high AFQT
Education	0.100 (0.009)	0.082 (0.022)	0.086 (0.017)	0.097 (0.013)
Actual Experience in Years	0.071 (0.004)	0.057 (0.008)	0.068 (0.007)	0.081 (0.007)
Actual Experience Squared	-0.0015 (0.0002)	-0.0013 (0.0004)	-0.0014 (0.0003)	-0.0016 (0.0003)
3 Years Prior to First Birth	**0.01** **(0.01)**	**0.00** **(0.03)**	**-0.01** **(0.02)**	**0.02** **(0.02)**
First 4 years After First Birth	-0.06 (0.02)	-0.07 (0.04)	-0.06 (0.03)	-0.06 (0.03)
Years 5-9 After First Birth	-0.11 (0.03)	-0.06 (0.06)	-0.10 (0.04)	-0.14 (0.04)
Years 10 and higher After First Birth	-0.15 (0.03)	-0.06 (0.07)	-0.15 (0.05)	-0.18 (0.06)
Number of Additional Children	-0.02 (0.01)	-0.03 (0.02)	-0.03 (0.02)	-0.02 (0.02)
Fixed Effects?	Yes	Yes	Yes	Yes
# of Observations	2269	722	763	684

Experience in years calculated as hours of work experience divided by 2000 hours per year.

Robust standard errors in parentheses

Table 5
Specification and Sample Effects in Fixed Effects Log Wage Regressions
Low AFQT Women

	(1)	(2)	(3)	(4)
	All low AFQT women	All low AFQT Women	Low AFQT Who Have a Child	Low AFQT Women over Age 20 Who Have a Child After age 21 and
Education	0.056 (0.008)	0.056 (0.008)	0.050 (0.010)	0.083 (0.022)
Actual Experience in Years	0.053 (0.004)	0.053 (0.004)	0.056 (0.004)	0.057 (0.008)
Actual Experience Squared	-0.0012 (0.0002)	-0.0012 (0.0002)	-0.0013 (0.0002)	-0.0013 (0.0004)
Has First Child	-0.03 (0.02)	-	-	-
First 4 years After First Birth	-0.02 (0.01)	-0.02 (0.01)	-0.02 (0.01)	-0.03 (0.02)
Years 5-9 After First Birth	-	-0.04 (0.02)	-0.04 (0.02)	-0.07 (0.02)
Years 10 and higher After First Birth	-	-0.03 (0.02)	-0.03 (0.02)	-0.06 (0.04)
Number of Additional Children	-	-0.04 (0.03)	-0.04 (0.03)	-0.07 (0.05)
Fixed Effects?	Yes	Yes	Yes	Yes
# of Observations	2406	2406	2035	722

Experience in years calculated as hours of work experience divided by 2000 hours per year.

Robust standard errors in parentheses

Table 6
Specification and Sample Effects in Fixed Effects Log Wage Regressions
High AFQT Women

	(1)	(2)	(3)	(4)
	All high AFQT women	All high AFQT Women	High AFQT Who Have a Child	High AFQT Women over Age 20 Who Have a Child After age 21 and
Education	0.097 (0.005)	0.095 (0.005)	0.099 (0.006)	0.098 (0.013)
Actual Experience in Years	0.074 (0.004)	0.076 (0.004)	0.079 (0.005)	0.083 (0.006)
Actual Experience Squared	-0.0016 (0.0002)	-0.0016 (0.0002)	-0.0016 (0.0002)	-0.0016 (0.0003)
Has First Child	-0.05 (0.02)	-	-	-
First 4 years After First Birth	-0.04 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)
Years 5-9 After First Birth	-	-0.04 (0.02)	-0.07 (0.02)	-0.08 (0.02)
Years 10 and higher After First Birth	-	-0.10 (0.03)	-0.14 (0.03)	-0.17 (0.03)
Number of Additional Children	-	-0.11 (0.04)	-0.18 (0.04)	-0.21 (0.05)
Fixed Effects?	Yes	Yes	Yes	Yes
# of Observations	1254	1254	874	684

Experience in years calculated as hours of work experience divided by 2000 hours per year.

Robust standard errors in parentheses

Table 7
Fix Effects Log Wage Regressions for Women Using Actual Experience
Differential Impact By Age of First Birth
Women Aged 20 and Over Who Had a Child After Age 21

	(1) all women	(2) low AFQT	(3) mid AFQT	(4) high AFQT
Education	0.099 (0.009)	0.083 (0.022)	0.084 (0.017)	0.097 (0.013)
Actual Experience in Years	0.074 (0.004)	0.058 (0.007)	0.069 (0.007)	0.086 (0.006)
Actual Experience Squared	-0.0017 (0.0002)	-0.0014 (0.0004)	-0.0015 (0.0003)	-0.0019 (0.0003)
First 4 years After First Birth	-0.16 (0.02)	-0.11 (0.04)	-0.12 (0.04)	-0.22 (0.04)
Years 5-9 After First Birth	-0.20 (0.03)	-0.09 (0.04)	-0.15 (0.04)	-0.28 (0.05)
Years 10 and higher After First Birth	-0.22 (0.03)	-0.09 (0.05)	-0.18 (0.05)	-0.30 (0.06)
Number of Additional Children	-0.02 (0.01)	-0.02 (0.02)	-0.03 (0.02)	-0.02 (0.02)
Impact of Each Additional Year Past 21 for Age of First Birth	**0.014 (0.003)**	**0.007 (0.006)**	**0.010 (0.005)**	**0.019 (0.005)**
Fixed Effects?	Yes	Yes	Yes	Yes
# of Observations	2269	722	763	684

Experience in years calculated as hours of work experience divided by 2000 hours per year.

Robust standard errors in parentheses

Table 8
Fix Effects Log Wage Regressions Separated by Age of First Birth
High AFQT Women Aged 20 and Over Who Had a Child After Age 21

	(1) All High AFQT Women	(2) High AFQT Women: Birth Before Age 28	(3) High AFQT Women: Birth Age 28 or Older
Education	0.098 (0.013)	0.085 (0.022)	0.108 (0.015)
Actual Experience in Years	0.083 (0.006)	0.090 (0.012)	0.075 (0.007)
Actual Experience Squared	-0.0017 (0.0003)	-0.0023 (0.0004)	-0.0012 (0.0003)
Birth Before Age 28: First 4 years After First Birth	-0.13 (0.03)	-0.12 (0.03)	-
Birth Before Age 28: Years 5-9 After First Birth	-0.20 (0.04)	-0.18 (0.05)	-
Birth Before Age 28: Years 10 + After First Birth	-0.23 (0.05)	-0.17 (0.08)	-
Birth Age 28 or Older: First 4 years After First Birth	-0.04 (0.03)	-	-0.07 (0.03)
Birth Age 28 or Older: Years 5-9 After First Birth	-0.12 (0.04)	-	-0.17 (0.04)
Birth Age 28 or Older: Years 10 + After First Birth	-0.14 (0.06)	-	-0.21 (0.07)
Number of Additional Children	-0.02 (0.02)	-0.02 (0.03)	-0.02 (0.03)
Fixed Effects?	Yes	Yes	Yes
# of Observations	684	338	346

Robust standard errors in parentheses

Table 9
Fix Effects Log Wage Regressions for High AFQT Women
Women Aged 20 and Over Who Had a Child After Age 21

	(1)	(2)	(3)	(4)	(5)
	high AFQT	high AFQT	high AFQT	high AFQT	high AFQT stayers/full-time*
Education	0.098 (0.013)	0.105 (0.013)	0.107 (0.013)	0.089 (0.012)	0.081 (0.021)
Experience in Years	0.083 (0.006)	0.072 (0.006)	0.072 (0.006)	0.070 (0.006)	0.093 (0.012)
Experience Squared	-0.0016 (0.0003)	-0.0015 (0.0003)	-0.0016 (0.0003)	-0.0015 (0.0003)	-0.0023 (0.0004)
First 4 years After Birth	-0.08 (0.02)	-0.08 (0.02)	-0.04 (0.02)	-0.04 (0.02)	-0.06 (0.04)
Years 5-9 After Birth	-0.17 (0.03)	-0.15 (0.04)	-0.10 (0.04)	-0.09 (0.04)	-0.08 (0.07)
Years 10 + After Birth	-0.21 (0.05)	-0.18 (0.06)	-0.12 (0.06)	-0.14 (0.06)	-0.09 (0.10)
# Additional Children	-0.02 (0.02)	-0.04 (0.03)	-0.04 (0.03)	-0.02 (0.02)	-0.04 (0.04)
Tenure With Employer		0.019 (0.003)	0.018 (0.004)	0.014 (0.003)	0.005 (0.006)
Part time or Part Year		-0.031 (0.018)	-0.032 (0.018)	-0.009 (0.016)	-0.089 (0.035)
New Employer in 2nd Full Year			-0.054 (0.042)	-0.022 (0.037)	
Did Not Work in 2nd Full Year			-0.172 (0.067)	-0.095 (0.066)	
2 Digit Occup Dummies	No	No	No	Yes	No
Fixed Effects?	Yes	Yes	Yes	Yes	Yes
Observations	684	684	684	684	132

Robust standard errors in parentheses
*Worked Full-Year, Full-Time at Pre Birth Employer in 2nd Full Year After Birth

Figure 5
Average Wages of Men in the Top AFQT Third by Age
and Age of First Birth

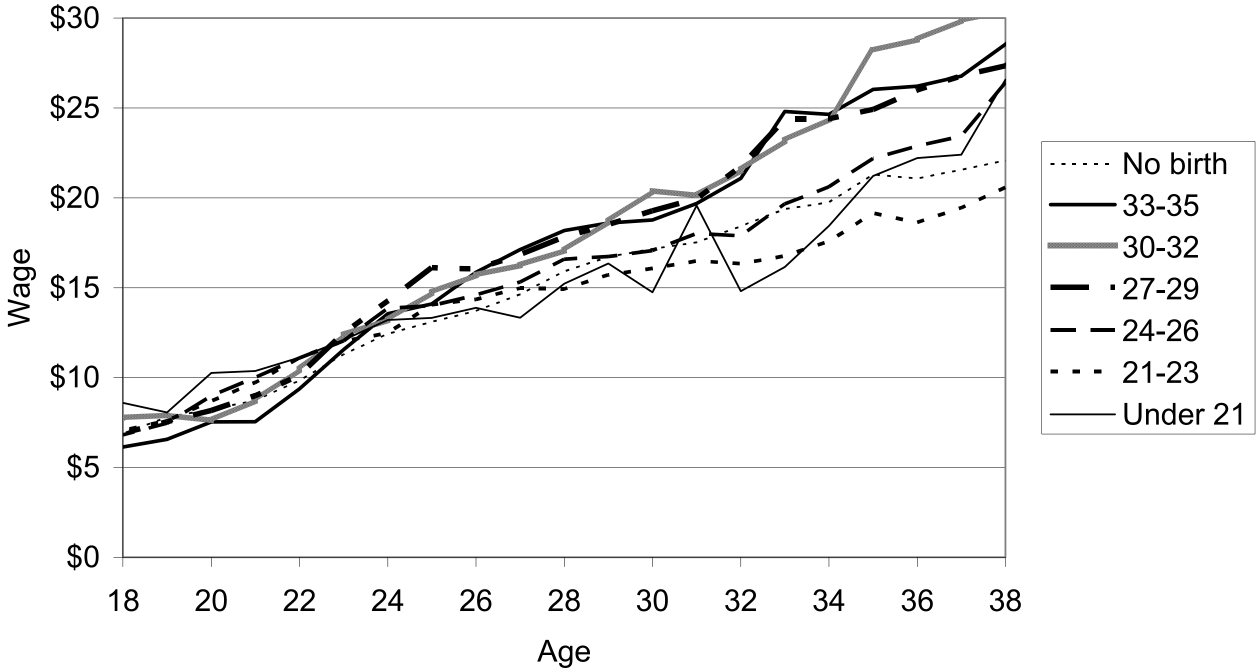


Table 10
Fix Effects Log Wage Regressions for **Men** Using Actual Experience
Men Aged 20 and Over Who Had a Child After Age 21

	(1)	(2)	(3)	(4)
	all women	low AFQT	mid AFQT	high AFQT
Education	0.118 (0.009)	0.033 (0.027)	0.106 (0.020)	0.109 (0.010)
Actual Experience in Years	0.060 (0.004)	0.036 (0.005)	0.062 (0.007)	0.072 (0.005)
Actual Experience Squared	-0.0009 (0.0001)	-0.0004 (0.0002)	-0.0010 (0.0003)	-0.0012 (0.0002)
First 4 years After First Birth	-0.01 (0.01)	0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)
Years 5-9 After First Birth	-0.07 (0.02)	-0.02 (0.03)	-0.06 (0.03)	-0.04 (0.03)
Years 10 and higher After First Birth	-0.14 (0.03)	-0.08 (0.05)	-0.09 (0.05)	-0.12 (0.05)
Number of Additional Children	-0.01 (0.01)	-0.01 (0.01)	-0.04 (0.01)	0.00 (0.01)
Fixed Effects?	Yes	Yes	Yes	Yes
# of Observations	2673	985	763	762

Experience in years calculated as hours of work experience divided by 2000 hours per year.

Robust standard errors in parentheses

Table 11
Simulated Present Value of Lifetime Earnings
Women with One or No Children
By AFQT Third and Timing of First Birth
Discounted to Age 18

	Age of First Birth			
	20	25	30	Never Gave Birth
Low AFQT	328,342	343,473	357,857	392,977
Middle AFQT	431,038	460,832	491,240	565,883
High AFQT	624,082	676,119	752,118	903,318

Based on models in Table 7. Assumes 3% real discount rate, and that wages level off (rather than fall) when at the negative effect of the experience squared term dominates the positive effect of experience. Assumes only one child. "Never Gave Birth" is an out-of-sample prediction from that model (which is based only on people who give birth) to project what their pay would have been had they postponed childbearing forever. Low AFQT women are assumed to get 12 years of schooling, and to work 80% of full time (80% of 2000 hours) in the years prior to having children, 50% in the first five years after birth, 70% the next 5 years, and back to 80% in subsequent years. Middle AFQT mothers are assumed to get 13 years of schooling and work 90%, 50%, 80%, 90% respectively; for high AFQT, schooling is assumed to be 16 years, and their work patterns would be 100%, 60%, 80%, 100%. Women retire at age 65 and have no further earnings.