Increasing Inequality: Trends in the Motherhood Wage Penalty, 1980-2010

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Abstract

Many studies have shown that women pay a wage penalty for motherhood. Despite this large body of work, we know very little about temporal trends in the motherhood wage penalty. The current study analyzes data from the 1980 to 2010 CPS and shows that the motherhood wage penalty increased for unmarried mothers and decreased for married mothers. The increases were largest for unmarried mothers with a high school degree or less who incurred a wage penalty that was over six times larger in 2010 than it was in 1980. In contrast, married mothers with high educational attainment began to earn a wage premium by the late 1990s. These highly educated mothers tend to work in jobs where they can reduce their work hours without compromising their annual earnings. The findings reported in the current study point to increasing inequality among mothers by social class and marital status.

Over twenty years ago, Hochschild (1989) argued that the gender revolution in the workplace was met by a stalled revolution in the home. Since then, we have amassed a large literature on trends in work-family inequality. Research has shown that the gender gaps in employment and wages narrowed in the 1970s and 1980s and slowly leveled off in the 1990s and 2000s (Blau and Kahn 2000, 2006; Cotter, Hermsen, and Vanneman 2004). Americans have become more supportive of gender equality (Brooks and Bolzendahl 2004). The gender gaps in housework and childcare have narrowed (Bianchi et al. 2000; Sayer 2005). Others have debated the contours of change (Blau, Brinton, and Grusky 2006; Jackson 2006) and characterized the gender revolution as "uneven and stalled" (England 2010). Despite such a large and varied body of work, we know very little about trends in the motherhood wage penalty. Has the penalty diminished over the past thirty years, and differently so for various groups of women? The current study presents answers to these questions.

Many studies have shown that mothers earn less than equally qualified childless women (Budig and England 2001; Budig and Hodges 2010; Glauber 2007). The pay penalty persists in statistical models that control for education, experience, and many other job-related characteristics. Given these findings, the residual motherhood wage penalty is often attributed to reduced productivity, labor market discrimination, or some combination of the two (see, for example, Benard and Correll 2010; Budig and England 2001; Correll, Benard, and Paik 2007; Kmec 2011).

Only a couple of studies have explored differences in the motherhood wage penalty over time. Petersen, Penner, and Høgsnes (2010) found that the wage penalty for Norwegian mothers declined substantially from 1979 to 1996. Avellar and Smock (2003) analyzed two cohorts of young women from the National Longitudinal Surveys (NLS) and did not find any differences

between the cohorts. Their analysis is limited in certain respects, as they pooled longitudinal data and compared the average motherhood wage penalty from 1975 to 1986 to the average motherhood wage penalty from 1986 to 1998. These averages could have masked variation within each time period and have led to an underestimation of change. Further, the study did not explore change since the late 1990s or variation among women.

Over the past thirty years, as inequality between men and women decreased, inequality among women increased (Autor, Katz, and Kearney 2008; Blau 1998; Card and DiNardo 2002; Western and Rosenfeld 2011). The proportion of women raising children as unmarried mothers increased, and, relative to their married peers, unmarried mothers lost economic resources (McLanahan 2004). Today, college-educated, married women in dual-earner families have more, whereas unmarried mothers tend to have less. Many work in worse jobs (Kalleberg 2010), have more debt, and have fewer resources to protect themselves from work-family conflict (Williams and Boushey 2010). The current study explores trends in the motherhood wage penalty for married mothers, unmarried mothers, those with less educational attainment, and those with more. I find evidence of growing inequality among women—a steep decline in the wage penalty for some mothers and a rise in the wage penalty for other mothers.

The Motherhood Wage Penalty

A large body of research shows that women pay a wage penalty for motherhood. Budig and England (2001) found that mothers pay a 3% wage penalty for one child, a 9% penalty for two children, and a 12% penalty for three or more children. Glauber (2007) found that white women pay a 6%, 10%, and 7% wage penalty for one, two, and three or more children, whereas African American women and Hispanic women tend to pay a smaller wage penalty. Budig and Hodges (2010) found that the motherhood wage penalty varies across the wage distribution.

White women at the lower end of the wage distribution pay a 14% wage penalty per child, whereas white women at the upper end of the wage distribution pay a 2.5% penalty per child. Budig and England (2001) and Glauber (2007) found that married women pay a larger wage penalty than unmarried women, although Budig and Hodges (2010) reported something more complex: at the bottom of the wage distribution, married mothers pay a larger wage penalty than unmarried mothers. At the top of the wage distribution, married mothers do not pay a wage penalty and, in fact, earn a wage premium. This is an interesting finding because it runs counter to our theory of gender and work-family conflict. I expand on it in the current study.

Scholars have proposed four types of explanations for the motherhood wage penalty. The first explanation focuses on human capital, or the skills, experience, and education that an individual possesses that have an economic value in the labor market. The human capital explanation rests on the notion that motherhood leads to a loss of labor market experience and job-related skills. Budig and England (2001) found that human capital explains about one-third of the total motherhood wage penalty.

The second theory proposes that employers discriminate against mothers in hiring, promotion, and compensation decisions. Studies show that mothers are viewed as less competent, capable, and committed than women without children (Bernard and Correll 2010; Corell 2004; Correll, Benard, and Paik 2007). The third explanation proposes that mothers have less energy for and are less productive at work than childless women. Motherhood tends to lead to a more traditional division of household labor. The productivity effect of household labor, however, is difficult to measure. Kalist (2008) used golf scores from the Ladies Professional Golf Association as a measure of productivity and found that motherhood reduces professional women's golf scores. In contrast, Kmec (2011) found no difference between mothers' and

childless women's work effort, work intensity, motivation to work because of family, and other pro-work behaviors. In general, Kmec found similar pro-work behaviors among mothers, fathers, childless women, and childless men.

The fourth explanation proposes that motherhood does not cause a decrease in women's wages. Instead, the observed association between motherhood and wages reflects selection biases and pre-existing differences between mothers and childless women (unobserved heterogeneity). For example, a positive life orientation could be associated with women's wages and with the likelihood of becoming a mother. Many studies have used longitudinal data and individual fixed effects models to control for unobserved factors that do not change over time. The cumulative evidence suggests that unobserved heterogeneity accounts for about 15-30% of the motherhood wage penalty. Budig and England (2001) report a 6.8% motherhood penalty from a fixed effects model and an 8.1% motherhood penalty from an Ordinary Least Squares (OLS) model. Anderson, Binder, and Krause (2003) report a 3.0% penalty from a fixed effects model and a 5.2% penalty from an OLS model and. Avellar and Smock (2003), however, report OLS estimates that are slightly smaller than fixed effects estimates, although their general conclusions remain the same. These comparisons are important to the current study because I rely on cross-sectional CPS data to explore trends over time. As such, I cannot estimate individual fixed effects models. The findings reported in previous research suggest that cross-sectional estimates are only slightly biased by unobserved heterogeneity.

A few other studies have controlled for sample selection bias. Motherhood tends to increase women's reservation wages (Heckman 1974), and mothers may make decisions to stay in or leave their jobs based on their wage offers. Korenman and Neumark (1992) and Glauber

(2007) compared Heckman correction models to OLS models, and their conclusions did not differ substantially.

Motherhood Trends: 1980-2010

There are reasons to expect that the motherhood wage penalty has diminished over time. Two of the mechanisms of the motherhood wage penalty, discrimination and the traditional gender division of labor, may have diminished over the past thirty years. Since the middle of the 1970s, Americans have become more supportive of gender equality (Bolzendahl and Myers 2004; Brooks and Bolzendhal 2004). Studies have typically assessed trends in gender role attitudes by drawing on nationally representative social surveys that ask respondents to evaluate a series of statements on the breadwinner-homemaker model. The General Social Survey, for example, asks respondents to agree or disagree with a number of statements including the following: it is much better for everyone involved if the man is the achiever outside the home and the woman takes care of the home and family. In 1977, about 30% of Americans disagreed with this statement, whereas by the early 1990s, about 64% disagreed with this statement (Cotter, Hermsen, and Vanneman 2011). This measure of gender egalitarianism, as with other measures, peaked in the middle of the 1990s and then leveled off (Cotter et al. 2011).

Given such widespread cultural change, employment discrimination against mothers may have dissipated over the past thirty years. Employers may think more favorably of working mothers' competencies and commitments today than they did in the early 1980s. Although we have amassed a large literature on trends in gender attitudes, we do not know much about trends in discrimination against mothers. There was a 400% increase in caregiver suits filed between 1999 and 2008 as compared to the previous decade (Calvert 2010), but this increase could reflect an increase in employer discrimination, cultural change, public awareness, or outreach to

workers. These changes have also occurred alongside the rise in the ideology of intensive motherhood, which portrays mothers as selfless and devoted to their children's various emotional, psychological, and physiological needs (Hays 1996).

Tithe gender gaps in housework, paid work, and leisure have narrowed over the past couple of decades. Mothers may have more energy for paid work today than they did in the past. Women performed six times as much housework as men in 1965. They performed 3.3 times as much as men in 1975, two times as much in 1985, and 1.8 times as much in 1995 (Bianchi et al. 2000). Sayer (2005) found that in 1975, mothers spent 40% as much time as men in paid work, whereas by 1998, they spent 60% as much time as men in paid work. Likewise, in 1975, mothers performed four times as much housework as fathers. By 1998, they performed only 1.6 times as much housework. Sayer also found that between 1975 and 1998 mothers and fathers increased their time spent with children, from 74 to 104 minutes for mothers and from 22 to 57 minutes for fathers. Thus, the ratio of mother's to father's time spent in childcare decreased from 3.4 to 1.8, but the absolute time spent with children increased for both mothers and fathers. Others report similar results (Hook 2006).

Unmarried and Married Mothers: Increasing Inequality

One trend is quite clear: the economic gap between unmarried and married mothers has widened. The proportion of children raised by unmarried mothers increased over the past thirty years, although most of the change occurred prior to the end of the 1990s (Ellwood and Jencks 2004). Unmarried mothers have become a more disadvantaged group. The percentage of children with unmarried *college educated* mothers rose from just 6% in 1965 to 10% in 1980 and then leveled off. The percentage of children with unmarried mothers who *did not finish high school*, however, rose from 13% in 1965 to 40% in the middle of the 1990s (Ellwood and Jencks 2004).

Unmarried mothers, particularly those with low educational attainment, may have less job security, flexibility, and fewer resources to protect themselves from work-family conflict. In contrast, dual-income, professional families are working longer hours (Jacobs and Gerson 2004), but they have more resources at their command. Married women may use these resources to purchase high quality childcare or household help. They may work in more flexible jobs and receive more support from their co-workers and employers. In short, married women—especially those with higher educational attainment—may use their resources to "purchase" reduced work family conflict and a reduced motherhood wage penalty. The current study explores this contention and tests the following hypothesis:

> *The motherhood wage penalty will have increased for unmarried mothers and decreased for married mothers. The increase will be largest for unmarried mothers with low educational attainment.*

Method

Data

Data for this study come from the 1980 to 2010 March CPS. The CPS is a monthly survey of about 57,000 households that provides information on the labor force characteristics of the non-institutionalized U.S. population. Both the March CPS and the CPS Merged Outgoing Rotation Group (CPS-MORG) can be used to analyze trends in hourly wages. The March CPS includes a question about last year's earnings that can be used in conjunction with questions about total weeks worked and usual hours worked per week to compute an hourly wage. In contrast, the CPS-MORG includes a question about current hourly wage for individuals paid by the hour. It also includes a question about current weekly earnings for all individuals. There is some evidence that the CPS-MORG provides a more precise measure of hourly wage for those

paid by the hour (Lemieux 2003). The CPS-MORG, however, does not contain information on the presence of children for the years 1980-1983 and 1994-1998 (Feenberg and Rothl 2007). For this reason, I draw on data from the March CPS, which was obtained from the Minnesota Population Center's Integrated Public Use Microdata Series (King et al. 2010).

The sample includes 816,313 total women who are between the ages of 25 and 45. This age restriction is necessary because mothers tend to be older than childless women. Without the age restriction, the motherhood wage penalty could simply reflect age-related sample differences. Of these women, 616,288 worked at least one week last year and reported annual earnings of at least $1. I dropped 6,161 women who worked at least one week last year and did not report any annual earnings, although the results were not sensitive to this exclusion. I dropped another 9,363 women from the married sample because they lived away from their spouse and did not report on their spouse's work hours, education, and age.

Measures

The primary dependent variable is the log hourly wage adjusted for inflation to 2010 dollars using the Consumer Price Index Research Series (CPI-R-S). Hourly wage was constructed by dividing annual pre-tax earnings for the preceding calendar year by the product of number of weeks worked in the preceding year and the number of hours usually worked per week. To protect confidentiality, the CPS assigns a topcode to annual earnings. In 1980, the CPS topcoded annual earnings at $50,000. Thirteen women in the current study had earnings at or above $50,000 in 1980. Between 1981 and 1983, the CPS topcoded wages at $75,000 (affecting 10 women in this study). Between 1984 and 1994, the CPS topcoded wages at $99,999 (affecting 242 women in this study). Between 1995 and 2001, the CPS topcoded wages at $150,000 (affecting 41 women in this study), and between 2002 to 2010, the CPS topcoded wages at

$200,000 (affecting 100 women in this study). In general, topcoding affects men more than women. For example, in 1982, 0.16% of women and 1.76% of men in the entire CPS had topcoded annual earnings. In 2007, 0.86% of women and 2.59% of men had topcoded annual earnings (Burkhauser and Larrimore 2009). Following conventional practice (Lemieux 2003; Weeden et al.), I multiplied all topcoded earnings by 1.4.

Many studies exclude workers who make less than $1 per hour (in 1979 dollars) or more than $100 per hour (in 1979 dollars). There are only 402 women in this study who make more than $100 per hour, but there are 10,716 women who make less than $1 per hour. On average, these women earn $1,350 per year, work 34 hours per week, and 36 weeks per year. A full fifteen percent of these women are childcare workers, private household cleaners or servants, or waitresses. I include these women in the sample. I dropped 2,749 extreme outliers—women who made less than $1 per hour (in 2010 dollars). On average, they earned $431 per year, worked 34 hours per week, and 40 weeks per year. I also dropped 364 women who made more than $300 per hour (in 2010 dollars). On average, these women earned $128,904 per year, worked 16 hours per week, and 20 weeks per year.

The primary independent variable is mother, which indicates the presence of a biological, adopted, or step child residing in a woman's household. This dichotomous variable simplifies the presentation of findings, but I also report on analyses using the number of women's children.

Yearly trends are indicated by the variable year, which ranges from 0 in 1980 to 30 in 2010.

The selection models, which I discuss below, include a measure of the metropolitan status of the respondent's area. This variable ranges from 1 to 5 and takes the values of: not identifiable; not in metro area; central city; outside central city; central city status unknown.

The models include four individual-level explanatory variables. Part-time is a dichotomous variable indicating that a woman usually worked fewer than 35 hours per week last year. Year-round is a dichotomous variable indicating that a woman worked 52 weeks last year. Pension is a dichotomous variable indicating that a woman had an employer-sponsored pension or retirement plan. Health insurance is a dichotomous variable indicating that a woman's employer paid for some or all of the cost of premiums for a group health insurance plan.

The models include control variables for age, African American, region (northeast, midwest, south, west), and major occupation (managerial and professional; technical, sales, and administrative support; service; farming, forestry, fishing, precision production, craft, and repair; operators, fabricators, laborers; unknown by the CPS). Major occupation is the 1990 occupation that IPUMS offers consistently over the sample period.

The models for married women also include explanatory variables for spouse's pension, spouse's health insurance, spouse's full-time year round work status, spouse's education (high school or less; some college; college degree; graduate degree); spouse's age.

Analysis (this needs to be written)

Sample selection bias may be present if mothers who work for pay systematically differ from mothers who do not work for pay. Ordinary Least Squares (OLS) models may underestimate the motherhood wage penalty if women who would fare worse leave the labor market on the birth of a child.

Weights are used to account for the oversample of Hispanics and non-interviews.

Findings

Figure 1 presents the unadjusted wage penalty for married and unmarried mothers. The penalty reflects the difference in median wages between mothers and childless women. The

figure indicates a clear divergence between married and unmarried mothers. In the early 1980s, married and unmarried mothers earned about 17% less per hour than their childless peers. By the late 2000s, married mothers earned 3% more per hour than married childless women, but unmarried mothers earned about 20% less per hour than unmarried childless women. Multivariate findings, which are described below, lead to similar conclusions.

The multivariate analysis begins by replicating results from previous studies. Table 1 presents regression estimates of the motherhood wage penalty for married women and for unmarried women. Model 1 presents estimates from a selection model that includes control variables and an interaction between year and motherhood. The year variable begins at zero, which allows for a meaningful interpretation of the coefficients. The motherhood coefficient reflects the wage penalty at the start of the time period, and the interaction coefficient reflects the yearly change in the penalty. The motherhood wage penalty at the end of the time period is equal to the starting penalty plus the number of years (in this case 30) times the yearly change in the penalty. These starting and ending wage penalties are included at the bottom of Table 1. The model assumes a linear yearly trend, but in subsequent models, I explore non-linear trends.

The first model in Table 1 indicates that married mothers paid a 4.1% wage penalty in 1980 and a 1.1% wage penalty in 2010. The decline in the penalty is larger in Models 2 and 3, which include women's work characteristics and their spousal characteristics. Model 3, which includes all of the explanatory and control variables, indicates that married women paid a 4.1% wage penalty in 1980 but earned a 1.9% wage premium by 2010. The final model presents OLS estimates. The OLS estimate of the 1980 motherhood wage penalty is slightly higher (5.2% compared to 4.1%), but the interaction between motherhood and year is similar across the two models.

Table 1 indicates that the baseline motherhood wage penalty increased by 480% over the past thirty years. Some of this increase is accounted for by women's work characteristics. Model 2, which includes these characteristics, presents estimates that are smaller—the motherhood wage penalty for unmarried women was 3.7% in 1980 and 9.7% in 2010. The estimates also appear to be somewhat downwardly biased due to sample selection. The next set of analyses explores trends in more detail for married women by their educational attainment.

Married Mothers

The first panel in Table 2 presents trends in the motherhood wage penalty for married women with a high school degree or less (hereafter referred to as women with low educational attainment). All of the models include control variables, but they are omitted from the tables for simplicity. As the first model indicates, the wage penalty for married women with low educational attainment has not changed over time. The interaction effect is not significantly different from zero. Married women with low educational attainment paid a 2.7% motherhood wage penalty in 1980 and in 2010.

The second model in Table 2 includes measures of women's labor supply and job benefits, and the third model includes measures of spousal characteristics. The final model presented in Table 2 shows estimates from an OLS regression that does not account for women's non-random labor market selection. The OLS estimate of the motherhood wage penalty is larger than the Heckman estimate (-0.056 in Model 4 compared to -0.029 in Model 3). The OLS yearly trend is positive and significant, whereas it is not significant in the Heckman selection model. These findings suggest that among married women with low educational attainment, those who would incur a smaller wage penalty leave the labor market when they become mothers. Those

who do worse—in terms of the motherhood wage penalty—stay. By the end of the time period, however, the bias is negligible.

In contrast to married women with low educational attainment, married women with more than a high school degree incur a smaller motherhood wage penalty today than they did thirty years ago. Married women with some college paid a 12.7% motherhood wage penalty in 1980 and a -0.7% penalty in 2010 (see the first model in Panel B of Table 2).

Labor supply, job benefits, and spousal characteristics do not substantially account for changes in the motherhood wage penalty among married women with some college. Spouse's full-time year-round work is associated with a 3% increase in the hourly wage of these women. The specialization theory proposes that married women's wages are negatively correlated with their spouse's work hours. The findings reported in this study, however, show that married women's wages are positively correlated with their spouse's work hours.

As the final model presented in Panel B of Table 2 indicates, labor market selection works in the opposite direction for married women with some college than for married women with low educational attainment. The OLS estimate presented in the final model of Table 2 is -0.053, whereas the Heckman estimate presented in Model 3 is -0.079. Thus, the motherhood wage penalty is slightly underestimated for these women due to labor market selection.

The final two panels of Table 2 present similar models for married women with college and graduate degrees. Married women with a college degree paid a 12.5% motherhood wage penalty in 1980, and they earned a 2.5% motherhood wage premium by 2010. Married women with a graduate degree paid a 4.8% motherhood wage penalty in 1980, and they earned a 4.2% motherhood wage premium by 2010. Budig and Hodges (2010) drew on a different data source (the NLSY) and also found that top-earning women earned a wage premium for motherhood. I

explore reasons for this wage premium, below, but first I comment on the explanatory mechanisms presented in Tables 4 and 5.

Labor supply, job benefits, and spousal characteristics do not fully account for trends in the motherhood wage penalty among highly educated married women. However, labor supply explains about 34% of the baseline motherhood wage penalty for married women with a college degree and about 38% of the baseline penalty for married women with a graduate degree. These findings are similar to Budig and Hodge's (2010) findings. Namely, labor supply explains more of the motherhood wage penalty among higher earners.

The Motherhood Wage Premium

Why do highly educated married women appear to earn a motherhood wage premium? Table 6 presents Heckman estimates that include period effects and their interactions. The motherhood wage penalties for each time period are displayed at the bottom of the table. Model 1 presents results similar to Table 2. Namely, the motherhood wage penalty incurred by married women with low educational attainment remained constant across the thirty year time period. The second model traces the decline in the motherhood wage penalty incurred for married women with some college to the late 1990s. The third model traces the decline in the penalty for college educated married women to the late 1990s. By the 2005-2010 time period, these women earned a 2.2% hourly wage premium for motherhood. The fifth model indicates that married women with a graduate degree starting earning an hourly wage premium for motherhood beginning in the late 1990s.

The motherhood wage premium for highly educated married women runs counter to expectations, and it may reflect variable changes in annual earnings and hours worked. Table 6 presents OLS estimates of log annual earnings for married women with a college or graduate

degree. The first model includes control variables, and the second model includes a measure of usual hours worked per week.

Similar to the motherhood wage penalty, the motherhood annual earnings penalty has declined over time for highly educated married women. But at no time period have these women earned a motherhood earnings *premium*. In the early 1980s, college educated married women paid an X% motherhood earnings penalty, and by the late 2000s, they paid an X% earnings penalty. In the early 1980s, graduate educated married women paid an X% earnings penalty, and by the late 2000s, they paid an X% earnings penalty. These findings for annual earnings differ from those reported for hourly wages.

On the inclusion of weekly work hours, the motherhood wage premium returns. These findings suggest that the proportional decline in annual earnings is smaller than the proportional decline in usual work hours. Highly educated women tend to be salaried workers. Following the transition to motherhood, if their hours decrease and their annual earnings do not, then their hourly wage would appear to increase. Thus, the findings suggest that highly educated women still pay an earnings penalty for motherhood. But they may work in jobs where they can reduce their usual weekly work hours (by an hour or two per week) without compromising their annual earnings. Thus, the wage premium for motherhood for these women may be a measurement effect rather than a causal motherhood effect.

Unmarried Mothers

Unmarried mothers have fared differently than married mothers. As indicated in the first model of Table 6, unmarried women with low educational attainment did not incur a motherhood wage penalty in 1980. By 2010, these women paid a 10.2% wage penalty, net of their age, race, region, and broad occupational sector. In other words, the penalty increased more than six fold

over the thirty year time period. The motherhood wage penalty increased by 64% for unmarried women with some college (from -4.7% to -7.7%). The motherhood wage penalty for unmarried women with a college degree declined over the thirty year time period, but it did not decline for unmarried women with a graduate degree.

Differences by number of women's children (ROUGH)

High school educated married women do not pay a wage penalty for their first child, but they do for their subsequent children. They pay a 2.8% wage penalty for having two children as compared to having no children, and this penalty has not declined over time. They pay a 5.2% penalty for having three or more children, although this penalty has declined over time to a 2.2% penalty by 2010 (for a 57.7% decline).

For women with some college, they pay a penalty for one, two, and three or more children. The declines in the penalty, however, vary across their number of children. The decline in the one child penalty has been most pronounced, at 214%. The decline in the penalty for two children is 102%, and for three children it's 57%. In fact, by 2010, it's only for having three or more children that married women with some college pay a penalty. A similar pattern holds for married women with a college degree. The decline in the motherhood wage penalty has been most steep for the one child penalty (214%), less steep for two children (131%), and even less steep for three or more children (89.1%). For women with an advanced degree, the pattern is somewhat different. There has been no change in the premium for one child. There has been a 206% decline in the motherhood wage penalty for two children, and a 110% decline in the motherhood wage penalty for three or more children.

Conclusion (ROUGH)

This study points to increasing inequality among women. With respect to the wage penalty, married mothers have done better, whereas unmarried mothers have done worse. Between 1980 and 2010, the wage penalty associated with motherhood increased for unmarried women, particularly those with less education. Unmarried women with a high school degree or less did not incur a motherhood wage penalty in 1980, but by 2010, they incurred a 10.2% wage penalty. Unmarried women with some college experience (but not a four-year degree) incurred a 4.7% motherhood wage penalty in 1980, but by 2010, they incurred a 7.7% wage penalty.

In contrast, the motherhood wage penalty declined for most married women, particularly those with more education. By the late 2000s, married women with a college degree started earning a wage premium for motherhood. The wage premium for motherhood runs counter to expectations, but others have reported similar results among women with high educational attainment or high earnings (Anderson, Binder, and Krause 2002; Budig and Hodges 2010).

There is only one published study (to date) that has explored variation in the wage penalty between two cohorts of U.S. mothers.

Limitations

The findings from this study are based on cross-sectional data. Most of what we know about the motherhood wage penalty comes from fixed effects models that control for all individual-level factors that do not change over time.

College graduates are increasingly delaying first births (Goldstein and Kenney 2001; Martin 2004, 93-94). The motherhood wage penalty may be declining among college-educated married women because these women have become older mothers.

Figure 1. Unadjusted Motherhood Wage Penalty by Marital Status (with trendlines)

Table 2. Regressions of Log Hourly Wage by Motherhood and Year for Married and Unmarried Women, 1980-2010 (standard errors)

	Married							
Variables	Model 1		Model 2		Model 3		Model 4	
Mother	-0.041**	(0.007)	-0.061**	(0.005)	-0.041**	(0.005)	-0.052**	(0.004)
Year	0.010**	(0.000)	0.010**	(0.000)	0.009**	(0.000)	0.009**	(0.000)
Mother * year	0.001**	(0.000)	0.002**	(0.000)	0.002**	(0.000)	0.002**	(0.000)
Age	0.006**	(0.000)	0.005**	(0.000)	0.006**	(0.000)	0.006**	(0.000)
African American	-0.016**	(0.005)	-0.018**	(0.004)	-0.001	(0.004)	0.003	(0.003)
Region								
Midwest	-0.120**	(0.003)	-0.112**	(0.003)	-0.104**	(0.003)	-0.102**	(0.003)
South	-0.159**	(0.003)	-0.152**	(0.003)	-0.144**	(0.003)	-0.144**	(0.002)
West	-0.042**	(0.003)	-0.044**	(0.003)	-0.046**	(0.003)	-0.047**	(0.003)
Occupation								
Administrative	-0.346**	(0.002)	-0.296**	(0.002)	-0.234**	(0.002)	-0.234**	(0.002)
Service	-0.685**	(0.004)	-0.546**	(0.004)	-0.449**	(0.004)	-0.449**	(0.003)
Farming	-0.460**	(0.008)	-0.383**	(0.007)	-0.286**	(0.007)	-0.286**	(0.006)
Operators	-0.550**	(0.004)	-0.477**	(0.004)	-0.361**	(0.004)	-0.361**	(0.004)
Unknown	-0.499**	(0.006)	-0.329**	(0.006)	-0.275**	(0.006)	-0.275**	(0.004)
Part-time work hours			0.045**	(0.003)	0.025**	(0.003)	0.025**	(0.002)
Full-time year-round			0.032**	(0.003)	0.038**	(0.003)	0.038**	(0.002)
Pension			0.242**	(0.002)	0.227**	(0.002)	0.227**	(0.002)
Health insurance			0.178**	(0.002)	0.180**	(0.002)	0.180**	(0.002)
Spousal Characteristics								
Full-time year-round					0.031**	(0.002)	0.031**	(0.002)
Some college					0.098**	(0.003)	0.098**	(0.002)
College degree					0.215**	(0.003)	0.215**	(0.003)
Graduate degree					0.287**	(0.004)	0.287**	(0.003)
Age					-0.001**	(0.000)	-0.001**	(0.000)
Constant	2.825**	(0.010)	2.484**	(0.008)	2.314**	(0.008)	2.302**	(0.007)
Number of women	529,812		529,812		529,812		382,766	
1980 Penalty	-4.1%		-6.1%		-4.1%		-5.2%	
2010 Penalty	-1.1%		-0.1%		1.9%		0.8%	
Change in penalty	73.2%		98.4%		146.3%		115.4%	

** p<0.01, * p<0.05

Note: Model 4 for married and Model 3 for unmarried present OLS estimates. The others present Heckman estimates.

Table 2 Continued. Regressions of Log Hourly Wage by Motherhood and Year for Married and Unmarried Women, 1980-2010 (standard errors)

	Unmarried					
Variables	Model 1		Model 2		Model 3	
Mother	-0.025**	(0.006)	-0.037**	(0.006)	-0.090**	(0.005)
Year	0.008**	(0.000)	0.009**	(0.000)	0.007**	(0.000)
Mother * year	-0.004**	(0.000)	-0.002**	(0.000)	-0.002**	(0.000)
Age	0.012**	(0.000)	0.008**	(0.000)	0.011**	(0.000)
African American	0.017**	(0.004)	-0.011**	(0.004)	-0.027**	(0.003)
Region						
Midwest	-0.104**	(0.004)	-0.096**	(0.004)	-0.081**	(0.004)
South	-0.151**	(0.004)	-0.124**	(0.004)	-0.130**	(0.003)
West	-0.038**	(0.004)	-0.015**	(0.004)	-0.024**	(0.004)
Occupation						
Administrative	-0.304**	(0.003)	-0.249**	(0.003)	-0.297**	(0.003)
Service	-0.655**	(0.004)	-0.468**	(0.004)	-0.619**	(0.004)
Farming	-0.384**	(0.009)	-0.297**	(0.008)	-0.375**	(0.008)
Operators	-0.527**	(0.005)	-0.426**	(0.005)	-0.508**	(0.005)
Unknown	-0.613**	(0.009)	-0.374**	(0.009)	-0.518**	(0.006)
Part-time work hours			-0.000	(0.005)	-0.129**	(0.003)
Full-time year-round			0.027**	(0.004)	0.128**	(0.003)
Pension			0.217**	(0.003)		
Health insurance			0.267**	(0.003)		
Spousal Characteristics						
Full-time year-round						
Some college						
College degree						
Graduate degree						
Age						
Constant	2.597**	(0.009)	2.283**	(0.009)	2.457**	(0.008)
Number of women	277,071		277,071		223,584	
1980 Penalty	-2.5%		-3.7%		-9.0%	
2010 Penalty	-14.5%		-9.7%		-15.0%	
Change in penalty	-480.0%		-162.2%		-66.7%	
** p<0.01, * p<0.05						

Note: Model 4 for married and Model 3 for unmarried present OLS estimates. The others present Heckman estimates.

Table 3. Regressions of Log Hourly Wage by Motherhood and Year for Married Women by Education, 1980-2010 (standard errors)

	High School or Less								Some College							
Variables	Model 1		Model 2		Model 3		Model 4		Model 1		Model 2		Model 3		Model 4	
Mother	-0.027**	(0.008)	-0.141**	(0.007)	-0.029**	(0.008)	-0.056**	(0.006)	-0.127**	(0.010)	-0.087**	(0.013)	-0.079**	(0.012)	-0.053**	(0.009)
Year	0.005**	(0.000)	0.004**	(0.000)	0.006**	(0.000)	0.005**	(0.000)	0.004**	(0.000)	0.005**	(0.000)	0.005**	(0.000)	0.006**	(0.000)
Mother * year	0.001	(0.001)	0.004**	(0.000)	0.001	(0.000)	0.002**	(0.000)	0.004**	(0.001)	0.003**	(0.001)	0.003**	(0.001)	0.002**	(0.000)
Part-time work hours			0.028**	(0.004)	0.029**	(0.004)	0.029**	(0.003)			0.034**	(0.006)	0.026**	(0.006)	0.026**	(0.004)
Full-time year-round			0.058**	(0.004)	0.048**	(0.004)	0.049**	(0.003)			0.070**	(0.005)	0.069**	(0.005)	0.069**	(0.004)
Pension			0.231**	(0.003)	0.223**	(0.003)	0.223**	(0.003)			0.192**	(0.004)	0.189**	(0.004)	0.189**	(0.004)
Health insurance			0.182**	(0.003)	0.183**	(0.003)	0.183**	(0.003)			0.157**	(0.004)	0.162**	(0.004)	0.162**	(0.004)
Spousal Characteristics																
Full-time year-round					0.046**	(0.003)	0.046**	(0.003)					0.030**	(0.005)	0.030**	(0.004)
Some college					0.057**	(0.004)	0.057**	(0.003)					0.044**	(0.004)	0.044**	(0.004)
College degree					0.116**	(0.006)	0.117**	(0.005)					0.100**	(0.006)	0.100**	(0.005)
Graduate degree					0.133**	(0.011)	0.133**	(0.008)					0.118**	(0.009)	0.118**	(0.007)
Age					-0.001*	(0.000)	-0.001**	(0.000)					0.000	(0.000)	0.000	(0.000)
Constant	2.672**	(0.014)	2.102**	(0.014)	2.282**	(0.015)	2.225**	(0.011)	2.614**	(0.015)	2.380**	(0.018)	2.321**	(0.017)	2.345**	(0.014)
Number of women	######		######		######		######		######		######		######		######	
1980 Penalty	-2.7%		-14.1%		-2.9%		-5.6%		-12.7%		-8.7%		-7.9%		-5.3%	
2010 Penalty	-2.7%		-2.1%		-2.9%		0.4%		-0.7%		0.3%		1.1%		0.7%	
Change in penalty	0.0%		85.1%		0.0%		107.1%		94.5%		103.4%		113.9%		113.2%	

	Bachelor's Degree								Graduate Degree							
Variables	Model 1		Model 2		Model 3		Model 4		Model 1		Model 2		Model 3		Model 4	
Mother	-0.125**	(0.011)	-0.082**	(0.011)	-0.079**	(0.010)	-0.066**	(0.010)	-0.048**	(0.014)	-0.030*	(0.014)	-0.026	(0.014)	-0.004	(0.013)
Year	0.010**	(0.000)	0.010**	(0.000)	0.010**	(0.000)	0.010**	(0.000)	0.014**	(0.001)	0.014**	(0.001)	0.014**	(0.001)	0.015**	(0.001)
Mother * year	0.005**	(0.001)	0.004**	(0.001)	0.004**	(0.001)	0.004**	(0.001)	0.003**	(0.001)	0.003**	(0.001)	0.003**	(0.001)	0.003**	(0.001)
Part-time work hours			0.015*	(0.007)	0.008	(0.007)	0.009	(0.005)			0.001	(0.011)	-0.008	(0.011)	-0.007	(0.008)
Full-time year-round			0.035**	(0.006)	0.036**	(0.006)	0.036**	(0.005)			-0.005	(0.008)	-0.003	(0.008)	-0.003	(0.007)
Pension			0.204**	(0.005)	0.203**	(0.005)	0.203**	(0.005)			0.209**	(0.009)	0.210**	(0.009)	0.210**	(0.007)
Health insurance			0.156**	(0.005)	0.160**	(0.005)	0.160**	(0.005)			0.115**	(0.008)	0.119**	(0.008)	0.119**	(0.007)
Spousal Characteristics																
Full-time year-round					0.017**	(0.006)	0.017**	(0.005)					-0.011	(0.009)	-0.011	(0.007)
Some college					0.038**	(0.007)	0.038**	(0.006)					0.052**	(0.013)	0.053**	(0.012)
College degree					0.099**	(0.006)	0.099**	(0.006)					0.088**	(0.012)	0.088**	(0.011)
Graduate degree					0.103**	(0.008)	0.103**	(0.007)					0.153**	(0.011)	0.153**	(0.010)
Age					0.001*	(0.001)	0.001*	(0.000)					-0.001	(0.001)	-0.001	(0.001)
Constant	2.692**	(0.016)	2.428**	(0.017)	2.340**	(0.018)	2.344**	(0.016)	2.600**	(0.025)	2.430**	(0.026)	2.334**	(0.029)	2.357**	(0.025)
Number of women	######		######		######		77,515		43,094		43,094		43,094		36,099	
1980 Penalty	-12.5%		-8.2%		-7.9%		-6.6%		-4.8%		-3.0%		-2.6%		-4.0%	
2010 Penalty	2.5%		3.8%		4.1%		5.4%		4.2%		6.0%		6.4%		8.6%	
Change in penalty	120.0%		146.3%		151.9%		181.8%		187.5%		300.0%		346.2%		315.0%	

** p<0.01, * p<0.05

Note: All models include controls for age, African American, region, and occupation.

Table 4. Regressions of Log Hourly Wage by Motherhood and Year for Unmarried Women by Education, 1980-2010 (standard errors)

	High School or Less						Some College					
Variables	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
Mother	0.018*	(0.009)	0.009	(0.009)	-0.027**	(0.007)	-0.047**	(0.011)	-0.047**	(0.011)	-0.067**	(0.009)
Year	0.005**	(0.000)	0.007**	(0.000)	0.006**	(0.000)	0.005**	(0.000)	0.005**	(0.000)	0.005**	(0.000)
Mother * year	-0.004**	(0.000)	-0.002**	(0.001)	-0.000	(0.000)	-0.001*	(0.001)	-0.000	(0.001)	0.001	(0.000)
Part-time work hours			-0.008	(0.007)	-0.009*	(0.005)			-0.013	(0.009)	-0.014*	(0.006)
Full-time year-round			0.040**	(0.005)	0.042**	(0.004)			0.051**	(0.007)	0.051**	(0.005)
Pension			0.228**	(0.004)	0.229**	(0.004)			0.181**	(0.005)	0.181**	(0.004)
Health insurance			0.259**	(0.005)	0.260**	(0.004)			0.236**	(0.006)	0.236**	(0.005)
Constant	2.545**	(0.015)	2.224**	(0.019)	2.146**	(0.012)	2.443**	(0.016)	2.203**	(0.016)	2.185**	(0.014)
Number of women												
	136626		136626		97786		75704		75704		65360	
1980 Penalty	1.8%		0.9%		-2.7%		-4.7%		-4.7%		-6.7%	
2010 Penalty	-10.2%		-5.1%		-2.7%		-7.7%		-4.7%		-6.7%	
Change in penalty	666.7%		666.7%		0.0%		-63.8%		0.0%		0.0%	

	Bachelor's Degree						Graduate Degree					
Variables	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
Mother	-0.115**	(0.016)	-0.096**	(0.015)	-0.101**	(0.015)	-0.059**	(0.020)	-0.060**	(0.019)	-0.062**	(0.020)
Year	0.009**	(0.000)	0.009**	(0.000)	0.009**	(0.000)	0.012**	(0.001)	0.012**	(0.001)	0.012**	(0.000)
Mother * year	0.002*	(0.001)	0.002*	(0.001)	0.002**	(0.001)	0.001	(0.001)	0.001	(0.001)	0.001	(0.001)
Part-time work hours			0.003	(0.014)	0.003	(0.009)			0.019	(0.021)	0.018	(0.014)
Full-time year-round			0.025**	(0.009)	0.025**	(0.007)			0.004	(0.013)	0.004	(0.010)
Pension			0.169**	(0.006)	0.169**	(0.005)			0.175**	(0.011)	0.175**	(0.009)
Health insurance			0.224**	(0.009)	0.224**	(0.007)			0.211**	(0.016)	0.211**	(0.011)
Constant	2.352**	(0.019)	2.109**	(0.020)	2.105**	(0.017)	2.398**	(0.031)	2.174**	(0.033)	2.157**	(0.027)
Number of women												
	44705		44705		41592		20036		20036		18846	
1980 Penalty	-11.5%		-9.6%		-10.1%		-5.9%		-6.0%		-6.2%	
2010 Penalty	-5.5%		-3.6%		-4.1%		-5.9%		-6.0%		-6.2%	
Change in penalty	52.2%		62.5%		59.4%		0.0%		0.0%		0.0%	
** p<0.01, * p<0.05												

Table 5. Heckman Regression Estimates

	Married							
VARIABLES	High School Or Less		Some College		College		Graduate Degree	
Mother	-0.015	(0.009)	-0.123**	(0.013)	-0.086**	(0.014)	-0.061**	(0.017)
Period								
1985-1989	0.028*	(0.012)	0.075**	(0.015)	0.153**	(0.014)	0.108**	(0.020)
1990-1994	0.036**	(0.012)	0.069**	(0.014)	0.202**	(0.014)	0.173**	(0.020)
1995-1999	0.054**	(0.013)	0.072**	(0.015)	0.222**	(0.014)	0.245**	(0.021)
2000-2004	0.126**	(0.014)	0.129**	(0.015)	0.336**	(0.014)	0.323**	(0.021)
2005-2010	0.117**	(0.014)	0.125**	(0.015)	0.286**	(0.014)	0.360**	(0.019)
Interactions								
Mother * 1985-1989	-0.005	(0.013)	0.008	(0.017)	-0.037*	(0.019)	0.032	(0.025)
Mother * 1990-1994	-0.026	(0.013)	0.033	(0.017)	0.017	(0.018)	0.057*	(0.025)
Mother * 1995-1999	0.009	(0.015)	0.068**	(0.017)	0.067**	(0.019)	0.105**	(0.027)
Mother * 2000-2004	-0.004	(0.015)	0.078**	(0.017)	0.057**	(0.018)	0.124**	(0.025)
Mother * 2005-2010	0.028	(0.015)	0.079**	(0.017)	0.108**	(0.017)	0.085**	(0.023)
Constant	2.687**	(0.015)	2.595**	(0.016)	2.643**	(0.017)	2.617**	(0.026)
Observations	250935		135640		100143		43094	
Motherhood Wage Penalty								
1980-1984	0.0%		-12.3%		-8.6%		-6.1%	
1985-1989	0.0%		-12.3%		-12.3%		-6.1%	
1990-1994	0.0%		-12.3%		-8.6%		-0.4%	
1995-1999	0.0%		-5.5%		-1.9%		4.4%	
2000-2004	0.0%		-5.3%		-2.9%		6.3%	
2005-2010	0.0%		-4.4%		2.2%		2.4%	

Table 5. Heckman Regression Estimates

	Unmarried							
	High School Or Less		Some College		College		Graduate Degree	
Mother	-0.007	(0.010)	-0.073**	(0.015)	-0.099**	(0.022)	-0.019	(0.026)
Period								
1985-1989	0.022*	(0.010)	0.031*	(0.013)	0.074**	(0.013)	0.118**	(0.016)
1990-1994	-0.002	(0.011)	0.029*	(0.012)	0.122**	(0.013)	0.163**	(0.017)
1995-1999	0.023	(0.012)	0.056**	(0.013)	0.134**	(0.013)	0.217**	(0.019)
2000-2004	0.109**	(0.011)	0.114**	(0.012)	0.245**	(0.012)	0.304**	(0.019)
2005-2010	0.119**	(0.011)	0.120**	(0.012)	0.226**	(0.012)	0.316**	(0.017)
Interactions								
Mother * 1985-1989	-0.013	(0.014)	0.048*	(0.020)	0.019	(0.029)	-0.059	(0.034)
Mother * 1990-1994	0.010	(0.015)	0.020	(0.019)	-0.012	(0.028)	-0.022	(0.036)
Mother * 1995-1999	-0.040*	(0.016)	-0.022	(0.019)	0.012	(0.029)	-0.048	(0.041)
Mother * 2000-2004	-0.096**	(0.015)	0.000	(0.018)	0.017	(0.027)	-0.024	(0.038)
Mother * 2005-2010	-0.091**	(0.014)	-0.010	(0.018)	0.053*	(0.026)	-0.011	(0.036)
Constant	2.573**	(0.016)	2.460**	(0.017)	2.351**	(0.020)	2.395**	(0.031)
Observations	136626		75704		44705		20036	
Motherhood Wage Penalty								
1980-1984	0.0%		-7.3%		-9.9%		0.0%	
1985-1989	0.0%		-2.5%		-9.9%		0.0%	
1990-1994	0.0%		-7.3%		-9.9%		0.0%	
1995-1999	-4.7%		-7.3%		-9.9%		0.0%	
2000-2004	-10.3%		-7.3%		-9.9%		0.0%	
2005-2010	-9.8%		-7.3%		-4.6%		0.0%	