How Does the Motherhood Wage Penalty Vary Across Occupations?

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Abstract

Within the field of economics, parental wage gaps are a feature that have been extensively explored but many questions remain as to their causes. The primary goal of this paper is to better understand what job characteristics based on occupation either increase or decrease motherhood wage penalties. The hypothesis to be tested is that the motherhood wage penalty will be larger for those working in male-dominated occupations where there is expected to be a higher level of human capital depreciation during career interruptions. The methods of estimation employed are OLS and two-way fixed effects with data analyzed from years 2000 to 2018 ACS. The motherhood wage penalty is found to be non-existent among women working in male-dominated occupations causing a rejection of this hypothesis, but the reasons for this are unclear. Unobservable factors are likely the cause of the discrepancies between supporting theory and estimated results.

Table of Contents page

I. Introduction

Parental wage gaps are a persistent phenomenon in many economies. In most cases, mothers face a motherhood wage penalty while fathers enjoy a wage premium. Why is it that for similarly qualified women, those with children often earn less than their childless counterparts and that the opposite is true for fathers versus their childless counterparts? The most frequently noted explanations are that mothers must allocate much of their time to childcare and therefore are likely to choose jobs with flexibility or to opt for part-time work which can lead to lower wages. Time spent out of the labor force while having children also leads to a decrease in human capital accumulation from on-the-job training and it can lead to a depreciation of skills thus further lowering earnings. Mothers also may experience discrimination (statistical or otherwise) at work due to the perception that they are less productive because of the demands of child-rearing.

The motherhood wage penalty could partially be explained by unmeasurable idiosyncratic factors that contribute to the choice to have children as well as the level of education they obtain and their choice of occupation. This is a major drawback in the search for a causal relationship between observable factors such as parental status and wages. Some women may choose occupations where they will have greater flexibility and continuity of skills because they plan to have children in future, while others choose occupations without family concerns in mind since it has been found that flexible schedules or part time work can lower wages.

What is the effect of motherhood on women's wages working in different occupations? This is the research question to be addressed here. In prior research, different factors including marital status, education level, industry and work effort have been found to have large impacts on parental wage gaps. Occupation has been found to also have impact on these wage gaps, particularly for highly skilled professional occupations as well as female-dominated occupations.

The entry of many women into male-dominated occupations and the near equity of women's representation in fields such as business and law lead to the question of whether working mothers enjoy more favorable earning outcomes in these fields versus those working in fields where women still are the majority of workers such as social work and primary education. As parental and gender wage gaps persist to a greater degree within certain job categories versus others, we need to understand what factors contribute to mothers successfully maintaining the work-home balance when working in those fields.

In attempt to estimate the effect of children on women's wages in the current economic environment, this study will use the most recent data available from the ACS. Controlling for demographic factors, education level and work experience should allow for precise estimation of the effect of parenthood on women's wages compared to their childless counterparts. By focusing on different occupations women are working in, we can better understand what job characteristics are a better fit for mothers and how their wage-earnings potential may be improved.

II. Literature Review

A review of the available literature reveals that mothers often face a wage penalty versus their childless counterparts. The estimation and stratification techniques in the research varies leading to differences in the findings. Deborah J. Anderson, Melissa Binder and Kate Krause (2002) examine the differences in the motherhood wage penalty for women with either one or two or more children compared to childless women based on education level to understand the effect of time out of the work force for child rearing. Claudia Buchmann and Anne McDaniel (2016) examine the differences in the wages of mothers compared to both fathers and childless women working in highly skilled professional and managerial occupations. Guanlin Gao, Susan

E. Long and Hong Zhuang (2016) use the 1997-2011 NLSY to estimate the effect of motherhood on wages based on education level, experience and part time status for a younger cohort than prior studies. They noted that along with most other studies' findings of decreases in human capital due to motherhood, part time status and children's age (as a proxy for effort at work) also may affect wages.

Based on human capital theory, Anderson et.al (2002) hypothesized that less-skilled workers would experience less depreciation of skills during time out of the work force versus higher skilled workers. Their sample was separated into three educational categories: high school dropouts, high school graduates and college graduates using the 1968 through 1988 NLSYW survey. Two econometric models were employed, OLS and fixed effects. It was estimated that while mothers with less than high school education experienced little to no wage penalty for having children, mothers with college degrees suffered a penalty of 4% for one child and 15% with two or more children. Guanlin et.al (2016) employed a fixed-effects model and found similar results to other studies: a wage gap increase with part time status and for those with higher education levels (due to depreciation of skills during time out of the work force). The surprising result when including a set of dummy variables for the children's age, it was found that mothers of older children suffered a larger wage penalty in contrast to the hypothesized larger wage loss for younger children due to the work-effort hypothesis.

As women have moved into traditionally male-dominated profession such as STEM occupations, medicine and law in higher numbers, Buchman and McDaniel (2016) chose to estimate if this trend has decreased the motherhood penalty despite the loss of human capital during career interruptions generally associated with childbearing. The data used is from 1980 and 2010 ACS and IPUMS surveys to evaluate how not only the wage gaps, but also labor force

participation had changed in that time frame. The authors employ OLS estimation with the dependent variable being the log of the hourly wages for six occupational categories. It was found that, over the time period analyzed, the motherhood penalty decreased in all the selected fields while the fatherhood premium remained nearly unchanged. The surprising result is that although in female-dominated occupations a motherhood wage penalty persisted, it disappeared for mothers in business and post-secondary education and mothers in medicine, STEM and law were found to enjoy a wage premium over childless women.

Rebecca Glauber (2018) chose to examine the parental wage penalties based on income levels. Due to increasing overall income inequality along with decreasing gender income inequality in recent years it was hypothesized that the motherhood wage penalty would differ based on income level. The data source for this study was 1980-2014 CPS. Unconditional quintile regression was used to understand the differences in trends across income levels. The primary findings were that the motherhood wage penalty decreased for all income groups, but the decrease was much larger in magnitude for the top income level; the fatherhood wage premium increased for all groups in the same time frame but more so for the top income level. This study points out the important fact that although the motherhood wage penalty has decreased overall, it is still most concerning for those at the bottom of the earnings distribution.

Ipshita Pal and Jane Waldfogel (2016) examine trends in the motherhood wage penalty over a nearly fifty-year time span based on characteristics such as education level, race/ethnicity and marital status. The main goal is to describe how the large-scale societal changes in policy, family composition and women's labor force participation have impacted the parental wage gaps. The data used in their analysis is from 1968-2014 CPS and estimates are found using OLS estimation. It was found that for most groups the motherhood wage penalty decreased over the time period.

Surprisingly the authors find that while married mothers face nearly no penalty by the end of the period, unmarried mothers still face a significant one.

This paper will be a modified replication of the research conducted by Buchman and McDaniel. The time period of the sample will be the most recent available from IPUMS, examining ACS data from 2000-2018. Also, for the sake of simplicity only two occupational categories (versus six categories in the prior study) will be singled out for estimation.

III. Theoretical Model

The economic theory that applies to the analysis of wage gaps is the human capital theory developed by Gary Becker. According to the theory, wages are determined on the supply side of the labor market by the level of human capital a worker has. Human capital is acquired through formal education, on the job training and work experience. The decision to invest in human capital is based on personal characteristics and tastes. Factors involved in these decisions are age, gender, race and other traits (Blau, Francine and Winkler, Anne E. 2018).

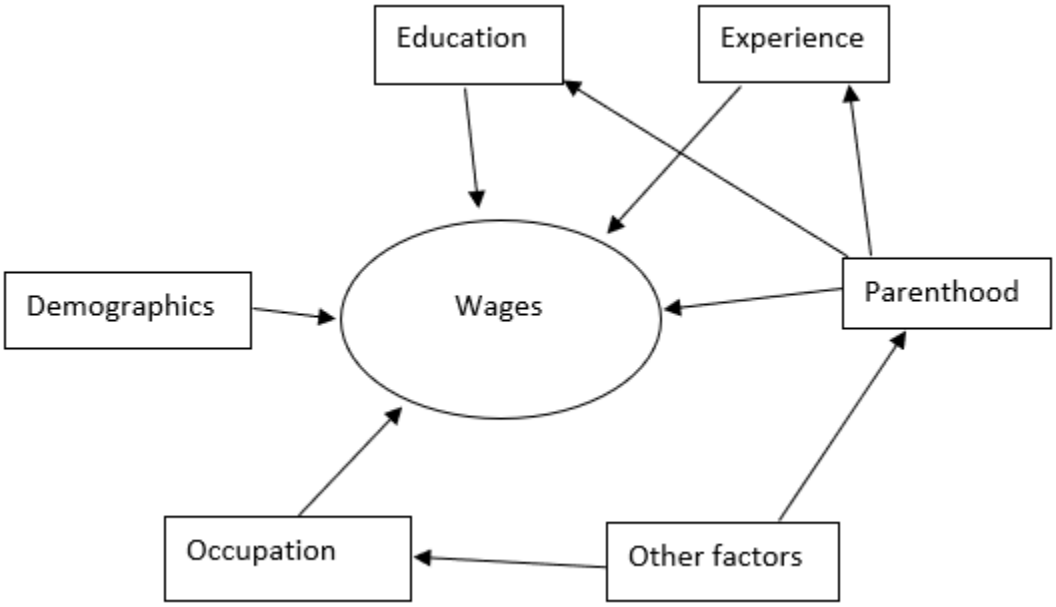
Traditional gender roles, where women are the secondary earners in the household and are the primary caregivers in the family are a large factor contributing to women's human capital investment and other career decisions. Mothers take time out of the workforce to have children, choose flexible or reduced hours, seek out family-friendly industries and may invest less in formal education in anticipation of parenthood all leading to a reduction in their human capital accumulation and earnings potential. Some portion of the motherhood wage penalty may also stem from discrimination by employers because mothers are perceived as less productive due to the high level of responsibility they bear at home; this could be the portion of the gap not explained by human capital proxies and other observable factors (Blau and Winkler, 2018).

Further building on human capital theory, Solomon Polachek theorized that occupational sex segregation can be explained partially by women's anticipation of time out of the workforce for childrearing. By introducing a measure of time spent away from the workforce into the classic Mincer equation, Polachek found that in occupational categories where human capital depreciation or "atrophy" of skills is most modest, women dominate. On the other hand, men dominate in occupations in which this atrophy or human capital depreciation is much greater during career interruptions. Based on these findings, comparing wage penalties for women working in female-dominated occupations versus the same in male-dominated occupations should show different results due to the differences in depreciation rates (Polachek, 1981).

Based on these theories, it is hypothesized that wage penalties for mothers would differ based on the type of work they do. Some occupations may be more attractive because they offer part-time status or flexibility in hours but with a reduction in wages. Some occupations are more demanding requiring longer hours or travel requirements. Whether women have children or not should have a different impact on their wages depending on their occupation and work environment. As has been found in prior research in human capital theory, both years of education and years of work experience are expected to have a significant and positive impact on wages. The hypothesis to be tested is that the motherhood penalty will be larger for those working in occupations where work interruptions cause a large depreciation and slow the accumulation of human capital and smaller in occupations where human capital depreciation and skill advancement loss during interruptions are more modest.

The proposed model: While education and work experience continue to be the primary drivers of wages, along with individual demographics and occupation; parenthood in turn will influence wages as well as educational attainment and work experience. There are also individual

characteristics (other unobservable factors) that will influence family and career decisions; see model graphic below.



IV. Empirical Examination

A. Data Description

The data to be used in this analysis is from the 2000-2018 ACS (IPUMS USA). The full data set consists of 17,059,313 observations. Descriptive statistics can be found in tables 1 and 2 for the primary variables of interest. The sample consists of only employed workers between the ages of 25 and 65 years, this age group represents workers who have likely completed their formal education and are working in their chosen field. The dependent variable, logwage is the natural log of the real (in constant 2010 dollars) hourly wage, created by taking the yearly earnings, divided by the number of weeks worked, divided by the average reported weekly hours. The variable wage was first bottom coded to $1 and top coded to $300 per hour to

eliminate potential outliers. The primary independent variable, parent is a dummy variable with a value of 1 if the worker has 1 or more own children living in the household, approximately 50% of the workers in the sample are parents. Another related variable is exact number of children in the household and may be used to analyze the effect of number of children on parent's wages.

Other relevant independent variables are years of schooling and years of work experience. Years of schooling was transformed from the original education level variables to represent actual years of education, the average years obtained is 14.8 – just under two years of college. Work experience is measured in years and was calculated by subtracting years of schooling from the worker's age minus 5. Demographic variables such as marital status and race are to be controlled for in the analysis as well. Race and ethnicity are grouped into 5 dummy variables for white, black, native American, Asian and Hispanic status.

Separate regressions will be run for workers in chosen occupations, one category for high skill depreciation occupations and one for low skill depreciation occupations. The occupations in the high depreciation category (hereafter "high group") are engineers and lawyers which remain male-dominated. Workers in the high group have an average 17.33 years of schooling, are 75% male and 25% female and have an average wage of $48.93 per hour. The occupations in the low skill depreciation category (hereafter "low group") are primary teachers and social workers, jobs which are largely female dominated. Workers in the low group have an average of 17.07 years of schooling, are 20% male and 80% female and have an average wage of $21.85 per hour. The large difference in wages and gender makeup between the two occupational groups with similar education levels indicates that the conditions for working parents may also vary across these groups.

For the 8,488,139 men in the sample, the average hourly wage is $27.32, and for the 8,244,974 women in the sample, the average hourly wage is $20.54 revealing an unadjusted wage gap of nearly 25%. Mothers average hourly wage is $20.40 versus childless women's average hourly wage of $20.69 indicating a possible motherhood penalty. Mothers average 37.51 weekly work hours while fathers average 44.78 weekly work hours with an average hourly wage of $29.60. This may offer some explanation for the parental wage gaps as mothers on average work reduced hours compared to their childless counterparts while fathers work more hours versus their childless counterparts.

B. Regression Analysis

The model to be tested is a classic Mincer equation for the determination of wages based on education and work experience. The dependent variable (Y_i) is the natural log of average hourly wage.

Model 1:

$$Y_i = \beta_0 + \beta_1 SCHOOLYR_i + \beta_2 EXPER_i + \beta_3 EXPER_i^2 + \beta_4 PARENT_i + \beta_5 MARRIED_i + \beta_6 RACEB_i + \beta_7 RACEN_i + \beta_8 RA$$

The primary regressor of interest – parent is hypothesized to have a negative coefficient, the square of work experience, and the control variables race (black), race (native American) and Hispanic are also expected to have negative coefficients. Years of schooling, work experience, and the control variables married and race (Asian) are hypothesized to be positive and therefore increase earnings for women. In order to examine the effect of motherhood on wages for the full sample as well as in the chosen occupational categories the regressions will be ran only for women in the dataset. This will allow comparison between mothers and their childless counterparts to estimate the motherhood wage penalty. The estimation will also be ran for all

men in the sample for comparison. The method of estimation is OLS regression. OLS allows for use of the ACS cross sectional data that has a large number of observations over several years. See table 3 for results.

For each of the groups (all women, women in low group, women in high group and all men) all key independent variables were found to be statistically significant at the 99% confidence level and therefore are important to include in estimation of wages. The explanatory power of the model is somewhat weak although with adjusted r-square values ranging from 10 to 23 percent depending on the group tested, although these values are comparable with those from prior research. The SER values of the model range from .54 to .65 depending on the group, which fall just under one standard deviation (0.73) of the log wage variable.

As hypothesized, each year of schooling completed increases wages by 13.7% for all women, by 12.5% for women in the high group, by 16.8% for women in the low group and by 12.9% for all men holding other factors constant. Educational attainment has the highest positive impact on wages in this estimation. Each additional year of work experience increases wages by 2.1% for women in the low group, and by 4.7% for women in the high group indicating that human capital accrual during time on the job occurs at a higher rate in the high group of occupations increasing wages. For the full sample of women, an additional year of work experience increases wages by 2.5% compared to an increase in wages of 3.8% for all men. As expected, for each of the groups, the coefficients for the square of work experience are negative but very small due to the decreasing returns to experience over time.

Within the high group as well as in the group with all women, the coefficients on the control variables were as expected. Wages are increased by 7.8% for women in the high group, and by 4.5% for all women when they are married. For all men in the sample, marriage had the

highest impact on wages at an 18.3% increase in wages holding other factors constant. Also, being of Asian race increases wages for women overall and those in the high group and being Black, native American or Hispanic decreases wages in those two groups. Being part of each of the race/ethnicity controls decrease wages for all men. Women working in the low occupation group however have different signs on the control variables than hypothesized. The coefficients on each of the race/ethnicity variables are all positive, while wages are decreased by 0.6% if the individual is married.

The regression results for the parent variable also are surprising. For all women in the sample, mother's wages are 1.4% lower versus their childless counterparts. This indicates a small motherhood penalty. Mothers in the low group earn 2.5% lower wages indicating a motherhood wage penalty in these occupations as well. In the high group, surprisingly mothers earn 5.5% higher wages versus their childless counterparts indicating a motherhood wage premium (like fathers often enjoy). For all men in the sample, wages are increased by 7.4% with parenthood holding other factors constant, indicating a fatherhood wage premium. These results align with what Buchman and McDaniel (2016) found in their research.

In order to control for heterogeneity across incomes in different geographical areas as well as across business cycles due to the long time-range of observation, a second model specification was used. Model 2 is a two-way fixed effect with dummy variables added for state as well as year. The dependent variable (Y_{it} ¿ is the natural log of the average hourly wage. The expected signs on the coefficients are the same for model two as in model one, see table 4 for results.

Model 2:

$$Y_{it} = \alpha_i + \gamma_t + \beta_1 SCHOOLYR_{it} + \beta_2 EXPER_{it} + \beta_3 EXPER_{it}^2 + \beta_4 PARENT_{it} + \beta_5 MARRIED_{it} + \beta_6 RACEB_{it} + \beta_7 RACEN_{it} +$$

In estimation of the second model, all primary variables were again found to be statistically significant at the 99% level. The explanatory power of model 2 is a slight improvement over model 1 with adjusted r-square values ranging from 14 to 25%. SER values were not however improved with model 2 with values ranging from .52 to .64 depending on the group which falls just under one standard deviation of the log wage variable.

The fixed effects model estimated roughly the same coefficients for the education and experience variables as in the OLS model confirming the hypothesized signs. The explanatory variable of interest – parent also gave nearly the same coefficients in model 2. For all women and women in the low group the motherhood penalty is 1.5 and 2.4% respectively. Again, women in the high group do not face a penalty, but instead enjoy a motherhood premium of 5.8% increase in wages holding other factors constant. Fathers also enjoy a wage premium of 7% in the fixed effect model.

The difference between the two model specifications shows up in the estimates on the control variables. In model 2 all four groups have an increase in wages with marriage. The increase is modest for women in the low group with a wage increase of only 0.9%, for all women and those in the high group wages are increased by 5.5 and 9.3% respectively if they are married. Again, the highest marriage premium is enjoyed by men at a wage increase of 19%. For all women in the sample wages are again decreased with minority status by 2.5 to 10.4% depending on race/ethnicity. For women in the high group wages are decreased from 2.3 to 12.6% with minority status. Surprisingly for women in the low group however wages are increased by a

small amount if they are black, Native American or Hispanic. Men's wages are decreased by 10 to 23% depending on minority status indicating that race/ethnicity matters much more in determination of men's wages than for women.

V. Conclusions

The results of the estimation of parental wage determination ultimately were the opposite of what was hypothesized. Women working in male-dominated occupations (high group) enjoy a wage premium over their childless counterparts while women working in female-dominated occupations (low group) face a motherhood wage penalty. Why is it that although overall women are still facing a motherhood penalty, but those working in male-dominated occupations now enjoy a wage premium over their childless counterparts as men do? It's possible that these women took little or no time off while having children and therefore experienced little to no depreciation of skills and were able to continue to advance their career. This points out a major limitation of this research. Without available measures for time spent out of the workforce, we are unable to estimate the level of human capital depreciation (if any) that should affect earnings potential.

Another possible explanation for the wage premium mothers in certain occupations are enjoying is that in these fields wages are higher overall, as the average wage of the high group is over double that of the average wage in the low group. Therefore, women working in male-dominated occupations can afford quality childcare and other assistance with home responsibilities and as such have a lower burden at home allowing them to focus on career advancement. Another limitation present in this research is that using cross-sectional data, we are unable to estimate a person fixed-effects model where the individual idiosyncratic factors that affect not only occupational choice, but parenthood decisions could be accounted for. Since

roughly 75% of the wages earned by workers remains unexplained in these estimations, unobservable factors could potentially account for a large portion of wage determination. Future research could employ panel data in order to control for some of these factors, although in prior research when estimations were conducted employing person fixed effects the explanatory power was only slightly improved.

The main policy implication of this work would be to investigate the large wage differentials between female and male dominated occupations. At the educational and experience levels, workers in these fields are similar, but the compensation offered varies vastly. Another policy issue is the availability of high quality, affordable childcare for all parents not only those with high incomes. As mothers often work flexible schedules or work part time, the wage penalties for these types of work should be addressed and corrected. Finally, we return to the issue of workplace discrimination for not only mothers, but all women as much of the persisting wage gaps remain unexplained by productivity indicators.

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VII. Appendices

table 1

Variable Definitions and Summary Statistics

Variable Name	Variable Description	Mean	Max	Min
LOGWAGE	Natural log of average hourly wage	2.91	5.94	-0.14
RWAGE	Average hourly wage: yearly wage and salary income/weeks worked previous year/ usual hours worked per week (constant 2010 US dollars)	24.04	379.94	0.87
EXPER	Years work experience: age-years schooling-5	24.48	55	2
EXPER2	Square of years work experience	727.43	3025	4
SCHOOLYR	Total years of schooling	14.8	18	5
PARENT	Dummy variable: value of 1 if at least one own child living in household	0.5	1	0
FEMALE	Dummy variable: value of 1 if female	0.48	1	0
AGE	Age in years	44.29	65	25
NCHILD	Number of own children in household	0.93	9	0
MARRIED	Dummy variable: value of 1 if married	0.63	1	0
UHRSWORK	Usual hours worked per week	41.14	99	1
RACEW	Dummy variable: value of 1 if race is white	0.8	1	0
RACEB	Dummy variable: value of 1 if race is black	0.09	1	0
RACEN	Dummy variable: value of 1 if race is native American	0.008	1	0
RACEA	Dummy variable: value of 1 if race is Asian	0.05	1	0
HISP	Dummy variable: value of 1 if Hispanic	0.11	1	0

Data Source: 2000-2018 ACS

table 2

Average Values by Groups

variable name	all women	mothers	all men	fathers
LOGWAGE	2.78	2.76	3.03	3.11
RWAGE	20.54	20.4	27.32	29.6
EXPER	24.52	22.58	24.45	23.6
SCHOOLYR	14.94	14.83	14.68	14.67
PARENT	0.51	1	0.49	1
AGE	44.45	42.41	44.13	43.27
NCHILD	0.91	1.79	0.94	1.91
MARRIED	0.6	0.7	0.67	0.88
UHRSWORK	38.27	37.51	43.82	44.78
RACEW	0.79	0.76	0.81	0.8
RACEB	0.1	0.11	0.08	0.07
RACEN	0.008	0.009	0.007	0.008
RACEA	0.05	0.06	0.05	0.06
HISP	0.11	0.13	0.12	0.14

Data Source: 2000-2018 ACS

table 3

Model 1

Results of Regression Estimation

Dependent variable: Natural log of average nominal hourly wage

	1	2	3	4
Regressor	all women	women in "high" group	women in "low" group	all men
SCHOOLYR	0.137***	0.125***	0.168***	0.129***
	(1261.73)	(44.87)	(321.98)	(1266.79)
EXPER	0.025***	0.047***	0.021***	0.038***
	(290.25)	(42.32)	(73.34)	(408.77)
EXPER2	-0.0004***	-0.0008***	-0.0003***	-0.0006***
	(-212.71)	(-30.84)	(-47.22)	(-315.11)
PARENT (DV)	-0.014***	0.055***	-0.025***	0.074***
	(-29.59)	(9.12)	(-15.49)	(142.11)
MARRIED (DV)	0.045***	0.078***	-0.006***	0.183***
	(94.49)	(13.33)	(-3.61)	(335.70)
RACEB (DV)	-0.065***	-0.088***	0.007***	-0.199***
	(-87.22)	(-8.25)	(3.02)	(-236.65)
RACEN (DV)	-0.109***	-0.185***	-0.006	-0.174***
	(-44.80)	(-4.57)	(-0.74)	(-68.19)
RACEA (DV)	0.055***	0.054***	0.011***	-0.031***
	(55.82)	(5.93)	(2.53)	(31.59)
HISP (DV)	-0.045***	-0.079***	0.052***	-0.103***
	(-60.49)	(-7.31)	(20.04)	(-145.49)
Intercept	0.385	0.826	-0.216	0.509
Summary Statistics				
SER (RMSE)	0.63	0.65	0.54	0.65
Adjusted R-Square	0.188	0.101	0.164	0.234
N	8244974	64943	609321	8814339

Note: ***Denotes a 99% confidence level; t-values in parenthesis

table 4

Model 2

Results of Regression Estimation

Dependent variable: Natural log of average nominal hourly wage

	1	2	3	4
Regressor	all women	women in "high" group	women in "low" group	all men
SCHOOLYR	0.132***	0.112***	0.163***	0.124***
	(1225.0)	(40.77)	(320.84)	(1225.79)
EXPER	0.025***	0.047***	0.021***	0.037***
	(289.17)	(42.99)	(75.23)	(408.24)
EXPER2	-0.0004***	-0.0008***	-0.0003***	-0.0006***
	(-211.66)	(-31.32)	(-48.81)	(-313.91)
PARENT (DV)	-0.015***	0.058***	-0.024***	0.070***
	(-31.24)	(9.67)	(-15.57)	(136.92)
MARRIED (DV)	0.055***	0.093***	0.009***	0.190***
	(117.62)	(16.21)	(6.04)	(352.14)
RACEB (DV)	-0.069***	-0.109***	0.019***	-0.213***
	(-92.78)	(-10.33)	(7.90)	(-250.27)
RACEN (DV)	-0.083***	-0.126***	0.053***	-0.151***
	(-33.94)	(-3.17)	(6.66)	(-59.24)
RACEA (DV)	-0.025***	-0.023***	-0.072***	-0.100***
	(-24.73)	(-2.46)	(-15.91)	(-98.50)
HISP (DV)	-0.104***	-0.111***	0.0017***	-0.159***
	(-134.58)	(-10.25)	(6.53)	(-214.72)
YEAR (DV)	yes	yes	yes	yes
STATE (DV)	yes	yes	yes	yes
Intercept	0.764	1.417	-0.051	0.862
Summary Statistics				
SER (RMSE)	0.62	0.64	0.52	0.64

Adjusted R-Square	0.211	0.141	0.216	0.252
N	8244974	64943	609321	8814339

Note: ***Denotes a 99% confidence level; t-values in parenthesis

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