FACTORS AFFECTING FEMALE EMPLOYMENT IN MALE-DOMINATED OCCUPATIONS: EVIDENCE FROM THE 1990 AND 2000 CENSUS DATA

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ABSTRACT

We investigate the effects of age, marital status, number of children, and education on the probability of female presence in traditionally male-dominated occupations using the PUMS 1990 and PUMS 2000 data. The results indicate that being married with husband present decreases the probability of female presence in traditionally male-dominated occupations, whereas college education has changed from having a positive effect in the 1990 data to a negative effect in the 2000 data. We also find that there are significant regional variations with regard to the effects of these factors.

JEL: J71; J31

I. INTRODUCTION

By understanding the history and the factors that have affected an economic outcome in the past one may be able to devise policies that influence the future and help remedy the past. Studies point to the presence of segregation between the male and female labor markets. Sanborn (1964) uses the Census data and the US Bureau of Labor Statistics data, and found that women had a higher concentration in lower paying occupations. Ferber and Speath (1984) find evidence of the presence of "dual labor markets." They also find that women were assigned "peripheral" jobs even if they were in the same industry that was dominated by men. Mason (1999, p.261) tests the implications of the so-called job competition model. The results point out that the ability to get in "… white (especially) male-dominated jobs increases an individual's wage rate—regardless of race." Discussing the roles of number of children, age, and education in explaining the earnings gap, Darity and Mason (1998, p.70) note, "These differences cannot be explained well by human capital differences between men and women; women continue to be more concentrated in lower-paying jobs than men with equivalent levels of education."

Since these studies also point out that male-dominated occupations typically pay higher salaries, a natural extension is the investigation of factors affecting female presence in male-dominated occupations. The understanding of these factors should, at least partly, explain the lower financial status of women. According to the 2000 U.S. Census, females constitute about 50.9 percent of the total population. This fact makes females' financial standing, relative to their male counterparts, of significant interest.

In this study we investigate the roles of age, number of children, education, and marital status on the probability of female presence in male-dominated occupations. We also inquire if the effects of these factors on female presence in male-dominated occupations are region sensitive. This insight may help the authorities to target the problem areas and formulate and implement relevant policies more efficiently. We define an occupation to be traditionally male-dominated where at least 75 percent of the total workforce is male. These occupations include, but are not limited to, doctors, lawyers, scientists, college and university professors, construction workers, etc. The data section and appendix to the study provide further details.

II. LITERATURE REVIEW

One of the most prominent features of the labor market is its discrimination against minorities and women. In the U.S., numerous efforts have been made to eliminate labor market discrimination. In this regard the first step towards reforms was the formation of the Presidential Commission on the Status of Women in 1961. Shortly thereafter the Equal Pay Act of 1963 was passed. It was followed by Title VII of the Civil Rights Act of 1964, and the Executive Order 11375 in 1967, which prohibited discrimination in employment. In the field of education, Title IX of the Education Amendments of 1972, which barred sex discrimination in federally assisted educational programs, had far reaching effects. Other significant legislative acts that followed include formation of the Equal Employment Opportunity Commission and amendments to the act in 1972 and 1978 (See Randor, Strasburg and Lipman-Blumen, 1982; Ethington, 1988; Ferber and Lowery, 1976).

The impact of these legislative acts has been the topic of many studies. Employing a time series analysis approach and using data for the years between 1948 and 1970, Richard Freeman (1973) finds that government legislation was an important cause of the African-American economic progress in the labor market. Testing the effectiveness of the affirmative action programs, Jonathan Leonard (1984) finds that the programs affected the employment of African-American males, African-American females, and white females positively. A number of studies have examined the impact of these laws on the earnings of women. The results indicate a positive effect. However the degree of impact differs across ethnic groups (See Leonard, 1989; Blau and Kahn, 1997, 2000). Recent literature on labor market discrimination also looks at the effects of sexual orientation (Weichselbaumer, 2003).

All these results did not go without criticism. Numerous studies suggested that the gains in employment and earnings were due to factors other than the impact of legislative acts (Heckman, 1978). Some studies suggested that affirmative action programs might lead to inefficient resource allocation (Griffin, 1992). Using a theoretical approach towards labor market discrimination, Adamson and Fausti (2004) show that asymmetry of information about worker characteristics may result in reduced marginal as well as average worker productivity. This in turn may lead to wage and employment disparity. In other words, Adamson and Fausti argue that wage and employment disparities are generated through market outcomes rather than discrimination.

Even after all these legislative acts, labor market discrimination is still present along race as well as gender lines and almost all areas of labor market appear to be segregated (See Darity and Mason, 1998; Mason, 1999).

Dickens and Lang (1985) find that females and minorities were primarily hired in secondary labor markets. Mainly relying on National Center for Education Statistics and the American Council on Education data, Randor, Strasburg and Lipman-Blumen (1982) find that women were still earning degrees in female intensive and lower status fields. The study also found an inverse relationship between the level of degree and the percentage of women earning degrees in that respective field. Another finding of the study is enrollment of women on a part-time basis, which in turn delayed their labor market entrance.

Although the overall labor force participation rate of females has increased from 20.6 percent in 1900 to 59.2 percent in February 2006 (seasonally adjusted data)[1], this increased share has been accompanied by a relatively modest increase in their relative economic standing compared with their male counterparts. Studies show that although the male-female wage gap has been declining over the years, females still earn only about 77 percent of their male counterparts (Blau and Kahn, 2000). Blau and Kahn (1994), making an international comparison, also show that, although U.S. women compare favorably with respect to their qualifications and "occupational status," the gender pay gap is larger than most of the countries studied by the authors.

Research literature considers occupational segregation as one of the major factors creating this male-female earnings differential (Darity and Mason, 1998; Heckman, 1978; Ferber and Speath, 1984; Sanborn, 1964). Darity and Mason (1998, p.69) note that,"…the index of occupational dissimilarity was 53 percent in 1990…,which means that nearly half of women (or men) would have to change occupations to have equal gender representation in all occupation." Some studies provide evidence that this division of occupations is due to self-selection (Desai and Waite, 1991; Fleisher and Rhodes, 1979). According to these studies women go for occupations where there are fewer penalties for leaving the labor force due to child bearing and rearing, and provide relative flexibility of schedules. Other studies have rejected these hypotheses. Ferber and Kordick (1978) conduct a study about sex differentials in the earnings of Ph.D.s. Their results led them to reject the proposition that lower earnings of female Ph.D.s were caused by their own voluntary decisions.

Most studies related of occupational segregation analysis are focused on the labor market discrimination aspect of it. A few studies paid attention to educational and training structure and how different kinds of academic training might lead females into different labor market fields (Duncan and Hoffman, 1979; Ethington, 1988; Randor, Strasburg, and Lipman-Blumen, 1982).

Whether the wage and employment level differentials are the manifestations of market outcomes or discrimination, the fact remains that females and minorities earn lower wages than their white male counterparts, and that the labor market is segregated. Because of the resulting production inefficiencies, wage and employment disparities and segregated labor markets have major consequences for an economy as a whole, and the affected groups in particular. These concerns prompt further investigation of the issue.

Since male-dominated occupations typically pay higher salaries than female-dominated occupations (Darity and Mason, 1998; Mason, 1999; Blau and Kahn, 1994, 1997, 2000), the study of structural and institutional factors that affect female presence in male-dominated occupations should, at least partly, explain the lower female financial status and employment disparities. Although there is a rich body of literature that looks at the impact of social and human capital variables on the earnings of women (Heckman, 1978; Ferber and Speath, 1984; Sanborn, 1964; Darity and Mason, 1998; Mason, 1999; Duncan and Hoffman, 1979; Ethington, 1988; Randor, Strasburg, and Lipman-Blumen, 1982; Blau and Kahn, 1997, 2000; Desai and Waite, 1991; Fleisher and Rhodes, 1979; to name a few), to our knowledge, few studies address the roles of factors such as age, marital status, number of children, and education, in determining the probability of female presence in a traditionally male-dominated occupation. We define an occupation to be traditionally male-dominated where at least 75 percent of the total workforce is male.[2] These occupations include, but are not limited to, doctors, lawyers, scientists, college and university professors, construction workers, clergy, announcers, earth drillers, etc. Since space limitations prohibit a detailed description of these occupations, we provide a list of the Census codes in appendix to the study.[3]

In this study we focus on the employment disparities faced by women and investigate the roles of age, number of children, education, and marital status on the probability of female presence in male-dominated occupations. We use 1990 and 2000 Census data to measure the impact of these factors on the female presence in male-dominated occupations. We compare the results of these two datasets to see the changing roles of these variables over time.

Since US regions differ along economic, political, and social dimensions, one may find that the effects of the variables studied in this paper are region sensitive. Topel (1994) shows that in the U.S. wage inequality coefficients are not only race and gender sensitive, they are also region sensitive. In order to check for regional sensitivity we divide our dataset into four regions: Midwest, Northeast, South, and West. In order to divide the dataset into four regions, we follow the Bureau of Labor Statistics classification. The study of these variables at a regional level may add to our understanding of the labor market disparities faced by females and guide regional authorities in formulating and implementing relevant policies.

The rest of the paper is organized as follows: section III presents the model used in this paper; section IV explains the data; section V presents and discusses the results and section VI concludes the paper.

III. MODEL

In this study we use a logit model. The dependent variable is the odds of a female's presence in male-dominated occupations. The complete model tested takes the following form:

$$\ln \Phi = \beta_0 + \sum_{i=1}^{n} \beta_i X_i + e$$

Where Φ represents the odds of a female's presence in a traditionally male-dominated occupation, βs are the coefficients to be estimated, Xs are the independent variables, and e is the random error term. A list of the independent variables included in the model is presented in table 1. The definitions of the variables are according to the Census documentation.

(<INSERT TABLE 1 HERE>)

The role of experience on earnings is well documented (Blau and Kahn, 1997, 2000; Dickens and Lang, 1985; Duncan and Hoffman, 1979; Ferber and Lowery, 1976).

To measure the impact of experience on the probability of female employment in male-dominated occupations we use age.[4] The inclusion of AGE and AGE^2, age and age squared respectively, as independent variables helps us ascertain the role of experience, albeit imperfectly, on the probability of female presence in male-dominated occupations. We would expect the coefficient of age to carry a positive sign. To capture possible non-linearities, we have also included age squared.

Since females are the primary caretakers of children, a female's ability to enter the labor force and hence a male-dominated occupation will be affected by the presence and ages of children. To this end we add the number of children in different age groups as our independent variables. The expected signs of the coefficients on the variables representing children are negative. The control group for CHILD_6 (females with own children under six-years old only) and CHILD_17 (females with own children from six- to seventeen-years old only), are the females with no children.

Education is one of the primary human capital variables to impact the earnings potential (Blau and Kahn, 1997, 2000; Dickens and Lang, 1985; Ferber and Lowery, 1976). We enter SCHOOL_H (females who are high school graduates), SCHOOL_4C (females who are four-year college graduates), and SCHOOL_GS (females who have a masters or higher or professional degrees) are entered as independent variables. We would expect the coefficients on these variables to carry positive signs. The control groups for these educational variables are the females who have less than high school education.

Studies show that marital status of females affects their decision to join the labor force (Dickens and Lang, 1985, among others). We would expect the absence of a husband to have a positive impact on probability of female presence in a male-dominated occupation. In order to control for marital status we use MAR_A (females who are married but spouse is absent), MAR_W (females who are widowed), MAR_D (females who are divorced), MAR_S (females who are separated), and MAR_N (females who were never married). Females who are married and their spouses are present are the control group.

To capture possible interactions between age, children and educational status, we also included three interaction terms: C17_AGE (females with own children from six- to seventeen-years old and age of the female); S4C_AGE (females who are four-year college graduates and age of the female); and SGS_AGE (females who have a masters or higher or professional degrees and age of the female). We estimated various specifications of the model including variables representing the race of a female. However the race variable was not found to be statically significant.[5] This specification of the model was selected using Akaiki's Information Criteria (AIC) and Schwartz's Bayesian Information Criteria (SIC).

IV. DATA

In this study we used the Census 1990 1 percent Public Use Micro Data Samples (PUMS 1990) and the Census 2000 1 percent Public Use Micro Data Samples (PUMS 2000) for the U.S. That is, forty-eight contiguous states along with District of Columbia, Alaska, Hawaii and Puerto Rico. The U.S.-level data were further divided into four regions: Midwest, Northeast, South, and West.[6]

We follow Dalton and Kidd (1994) and Blau and Kahn (1994) and use only full time workers. This practice controls for the seasonal effects on the regression coefficients that may be generated by the inclusion of part-time workers. We use data for females of all races working at least forty hours per week. Tables 2 and 3 provide descriptive statistics of the data used in this study. The data source is the US Census Bureau. The URL is: www.census.gov.

(<INSERT TABLE 2 HERE>)

(<INSERT TABLE 3 HERE>)

V. RESULTS AND DISCUSSION

In this section we present and discuss the results of the study. Subsection A presents and discusses the results using PUMS 1990 and PUMS 2000 data for the U.S. These results are presented in table 4. Subsection B presents and discusses results using PUMS 1990 and PUMS 2000 data at the regional level. Regional results are presented in tables 5 through 8.

In tables 4 through 8, column [1] lists the names of the variables used in the model, column [2] presents the β estimates using PUMS 1990, column [3] provides the standardized β estimates using PUMS 1990, column [4] presents the odds ratio estimates using PUMS 1990, column [5] presents the β estimates using PUMS 2000, column [6] provides the standardized β estimates using PUMS 2000, and column [7] presents the odds ratio estimates using PUMS 2000.

Along with the “regular” regression β estimates and the odds ratios, tables 4 through 8 also present the standardized β estimates. Standardized β estimates help determine the relative importance of a variable in a multiple regression model.

A. Results Using PUMS 1990 and PUMS 2000 Data for the US

In this subsection we present and discuss the results using PUMS 1990 and PUMS 2000 datasets for the US. The coefficient estimates are presented in table 4.

(<INSERT TABLE 4 HERE>)

The results present a very interesting picture. We find, as expected, that age has a positive impact on the probability of female presence in traditionally male-dominated occupations, but at a decreasing rate—the coefficient on age squared carries a negative significant sign. Using age as a proxy for experience, the coefficient estimates imply that experience increases the probability, but at a decreasing rate. However, since age is a rather crude proxy for experience, caution is in order in interpreting the coefficients of age and age squared.

Results using PUMS 1990 data point out that having children under six years old does not have a negative impact on the probability of female presence in a male-dominated occupation. The coefficient, although negative, is statistically insignificant. However, we find a change taking place during the 1990s; using PUMS 2000 data the results indicate that having children under six-year old has a statistically significant negative impact and the odds of female presence decrease significantly.[7]

The results of both datasets indicate that the odds of female presence in a male-dominated occupation increase significantly if a female has children from six- to seventeen-years-old. This may indicate the return of females to the labor market after the children have reached the school age. This may also indicate the higher financial burden[8] that a family faces once children reach a certain age, forcing females to go for relatively high-paying occupations.

Using PUMS 1990 we find that education affects the probability of female presence in male-dominated occupations positively. Notice the size of the odds ratio estimate of having a masters or higher or professional degrees in column [4]: it implies that a female having a masters or higher or professional degree has about 11-times higher odds of being in a male-dominated occupation compared to the control group—females without a high school diploma. A female with a masters or higher or professional degree has about ten-times higher odds of being present in a male-dominated occupation compared to a female who has just a four-year college degree.

This does not seem to be the case when we use PUMS 2000 data. Having a four-year college degree actually has a negative impact on the probability of female presence in male-dominated occupations, and having a masters or professional or higher degree does not affect the probability significantly.

This result is rather surprising. One would expect higher level of education to pay off in gaining access to a male-dominated occupation. However, this does not seem to be the case. Furthermore, the PUMS 2000 data results contradict with the PUMS 1990 data results where having a four-year college or higher level degrees have rather large premiums in terms of the odds of being in a male-dominated occupation. One explanation may be that the majority of females in this sample are in those male-dominated occupations that do not value higher levels of education.

However, one gets a deeper understanding of the phenomenon by looking at the descriptive statistics provided in tables 2 and 3. Comparing the descriptive details of

PUMS 1990 with PUMS 2000, we find that in the 1990 data about 10 percent of females who were in male-dominated occupation had masters or higher or professional degrees. This percentage dropped to only 0.45 percent in the 2000 data.[9] The decline in the percentage of females carrying a high school diploma or a bachelor's degree is also significant. In the 1990 data about 34 percent of females who were in male-dominated occupations were high school graduates and about 11 percent had a bachelor's degree as compared with about 2.28 percent and 0.96 percent, respectively, in the 2000 data. This means that in the 1990 dataset more females had the "required" human capital for the available jobs as compared with the 2000 dataset. All else equal, the more women there are with the required characteristics, the higher the odds of women being hired for the job, and this is exactly what we find in the regression results.

Descriptive statistics also show that in the 1990 data about 8.1 percent of the females who were working full-time were working in male-dominated occupations. However in the 2000 dataset, only 6.9 percent of the females who were working full-time were working in male-dominated occupations.

Why did the percentage of women, who were working full-time, drop from 8.1 percent in the 1990 dataset to 6.9 percent in the 2000 dataset? The answer to this question may be the change in female preferences towards labor market due to the unprecedented prosperity of the mid to late 1990s. Because of increased household wealth women opted for female-dominated occupations, which tend to have relatively "flexible" schedules, as suggested by some studies (Desai and Waite, 1991). These relatively higher levels of household wealth during the 1990s might also have led women not to seek masters or higher or professional degrees.

Another very interesting result is the impact of marital status. Females, who are married with spouse present, have lower likelihood of being in a male-dominated occupation than either of the other categories of marital status, except females who are separated in PUMS 1990 data.[10] For this category the coefficient is not significant.

To give a specific example using the PUMS 1990 data results, a forty-year-old female who is married with spouse present, has children from six- to seventeen-years-old, and is a high school graduate, has an implied probability of being present in a traditionally male-dominated occupation of about 0.2. A female with similar characteristics, except that she is divorced, has an implied probability of being present in a traditionally male-dominated occupation of about 0.22. That is, her probability increases by 10 percent.[11]

B. Results Using PUMS 1990 and PUMS 2000 Data at the Regional Level

Now we present and discuss the regression results using PUMS 1990 and PUMS 2000 datasets at the regional level. Instead of using regional dummies in a regression model, we ran separate regressions for each region. This method provides us far greater detail and information while keeping the results tractable. To be more specific, we avoid using regional dummies for two reasons. One, using regional dummies will lead to an increase in the number of coefficient estimates. Since the number of observations is large even after we divide the dataset into regions, in our opinion sacrificing the parsimony of the model is uncalled for in this instance. Second, running separate regressions for each region imposes fewer restrictions as compared with the use of regional dummies where the error terms are restricted to be the same.

The results are presented in tables 5 through 8. The layout of the tables and the variables included in the model are the same as in the case of the US level data, table 4.

C. Midwest

The results for the Midwest, presented in table 5, show that age was not a statistically significant factor in affecting the probability of female presence in male-dominated occupations during the 1980s (PUMS 1990). However during the 1990s (PUMS 2000) age became a significant factor in determining the probability of female presence. The results show that age has a positive impact, but at a decreasing rate. Using age as a proxy for experience, the implication is that experience started to matter during the 1990s.

(<INSERT TABLE 5 HERE>)

The presence of children aged six- to seventeen-years-old, has a significant positive impact on the probability of female presence in male dominated occupations. Children under six-years-old do not have a significant impact on this probability.

The impact of college or higher levels of education and marital status are similar to the U.S.-level datasets. Four-year college and master's or professional or higher degrees affect the probability of female presence in a male-dominated occupation positively during the 1980s (PUMS 1990), but the coefficients become negative during the 1990s (PUMS 2000). Marital status also maintains its impact similar to the U.S.-level data. Being married, with spouse present, decreases the odds of female presence in male-dominated occupations.

D. Northeast

The results for the Northeast region are presented in table 6. The coefficient estimates indicate that age affects the probability of female presence in male-dominated occupations positively, but at a decreasing rate. Also the presence of children from six- to seventeen-year old increases the odds significantly. This is true whether we use PUMS 1990 or PUMS 2000.

(<INSERT TABLE 6 HERE>)

As in the case of the U.S. and Midwest datasets, the impact of four-year college, or master's or professional or higher degrees turns negative as we switch from PUMS 1990 to PUMS 2000.

Marital status did not affect the likelihood of female presence in male-dominated occupations during the 1980s (PUMS 1990). However this trend changes as we move into the 1990s. Using PUMS 2000 we find females who are married, with spouse present, have lower likelihood of being in male-dominated occupations as compared with the rest of the marital status categories, except widow. In this category, the coefficient, although positive, is insignificant.

E. South

The results using data for the South are presented in table 7.

(<INSERT TABLE 7 HERE>)

As in the case of the US and Northeast data results, age has a positive impact on the likelihood of female presence in male-dominated occupations, but at a decreasing rate. This is true whether we use PUMS 1990 or PUMS 2000 datasets. Children, ages six- to seventeen-years-old carried a positive significant coefficient using the PUMS 1990 data. However, using the PUMS 2000 data the coefficient estimates are not significant.

Four-year college degrees and master's or professional or higher degrees had a significant positive impact using PUMS 1990, but not using PUMS 2000. In the case of PUMS 2000, the coefficient estimates are insignificant.

As in the case of the other data results presented so far, being married, with spouse present, does not bode well for women in terms of the likelihood of being present in male-dominated occupations. This is true for both datasets.

F. West

The results using data for the West are presented in table 8.

(<INSERT TABLE 8 HERE>)

The coefficient estimates indicate that experience, using age as a proxy, has a positive impact on the probability of female presence in male-dominated occupations, but at a decreasing rate using PUMS 2000. Using PUMS 1990, the coefficient of AGE is insignificant. The presence of any age children does not seem to matter using PUMS 1990, but using PUMS 2000, the presence of children under six-year old does have a negative impact.

Four-year college and higher level education carried positive significant coefficients using PUMS 1990, but insignificant coefficients using PUMS 2000 with varying signs. Another coefficient value that is different in the case of the West is the coefficient signs and significance levels for the high school diploma. It had insignificant coefficients using PUMS 1990 data, but positive significant coefficients using PUMS 2000 data. This change may reflect the changing job market conditions and requirements from the 1980s to the 1990s.

VI. CONCLUSION

In this study we investigate whether age, education level, number of children, and marital status affect the probability of female presence in male-dominate occupations. We use 1% PUMS 1990 and 1% PUMS 2000 datasets for the US, as well as, for four census regions: Midwest; Northeast; South; and West. The results are rather interesting. For the U.S.-level data, experience, using age as a proxy, affects this probability positively, but at a decreasing rate, and the presence of spouse lowers the probability of female presence in a male-dominated occupation. This is true for both years of data. College-level education positively affected this probability in PUMS 1990 dataset, but in PUMS 2000 dataset college level education had a negative impact.

We find that there are significant differences among regions, as measured by the coefficient estimates, which may reflect institutional and structural variations. For instance, having masters, professional, or doctorate degrees carried the highest premium in the Midwest, followed by the West, the Northeast, and the South, respectively, during the 1980s. This higher education premium seems to have disappeared during the 1990s in all four regions. This may point to a “convergence” among regions.

APPENDIX

Traditionally Male-Dominated Occupations (at least 75 percent male workers)

PUMS 1990 Occupation Codes

002, 019, 028, 035, 043 to 049, 053 to 059, 063, 069, 074, 075, 077, 079, 084, 085, 087, 088, 111 to 113, 116, 119, 121, 124, 126, 127, 131, 132, 141, 161, 162, 171, 178, 198, 211 to 215, 217, 218, 221, 224, 226 to 228, 231, 233, 241, 242, 251, 252, 258, 259, 261 to 263, 269, 271, 272, 281, 282, 284, 311, 312, 321, 322, 341, 342, 351, 352, 361, 362, 366, 371, 372, 411 to 418, 421 to 426, 431, 432, 441, 442, 451, 452, 454, 455, 457, 471, 473 to 482, 485, 486, 494 to 581, 584 to 646, 651 to 657, 659 to 662, 671, 672, 675, 676, 681, 686, 689, 694 to 705, 707 to 715, 719 to 727, 729 to 734, 741, 742, 751, 752, 755 to 757, 759 to 763, 766, 768, 771 to 773, 781 to 783, 803 to 806, 809 to 876, 883 to 887, 889 to 905.

(For detailed occupation descriptions, please see Occupation Appendix H, Census 1990 Technical Documentation)

PUMS 2000 Occupation Codes

001, 016, 020 to 022, 030, 032, 051, 060, 110, 121, 130 to 136, 140 to 146, 150 to 156, 164, 170, 171, 174, 193, 194, 204, 280, 290, 292, 296, 300, 301, 312, 371 to 375, 382, 383, 385, 392, 400, 421, 424, 425, 441, 446, 450, 453, 475, 493, 551, 553, 600, 610 to 613, 620 to 626, 630 to 633, 635, 636, 642, 644, 646, 650 to 653, 660, 670 to 676, 680, 682, 683, 684, 691 to 694, 700 to 705, 710 to 716, 720 to 722, 724, 726, 730 to 736, 741 to 743, 751, 752, 754 to 756, 760, 761, 762, 770, 773, 774, 790, 792, 793, 796, 800 to

804, 806, 813 to 816, 820, 821, 824, 826, 836, 843, 850, 852, 853, 855, 860 to 865, 881, 890, 892, 894, 900, 903, 904, 913 to 915, 920, 923, 924, 926, 930, 931, 933 to 936, 941, 942, 950 to 952, 956, 960, 961, 962, 965, 972 to 975, 980 to 983.

(For detailed occupation descriptions, please see Appendix G-47, Census 2000 Technical Documentation)

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ABBREVIATIONS

PUMS 1990: Census 1990 1% Public Use Micro Data Samples

PUMS 2000: Census 2000 1% Public Use Micro Data Samples

TABLE 1
List of Variables

Variable Name	Definition
AGE	Age of the individual. Range: 1 to 89 years.
AGE^2	Age squared.
CHILD_6	With own children under 6 years only.
CHILD_17	With own children ages 6 to 17 only.
SCHOOL_H	High school graduate.
SCHOOL_4C	Bachelor's degree.
SCHOOL_GS	Master's degree, professional degree or doctorate degree.
MAR_A	Married, spouse absent.
MAR_W	Widowed.
MAR_D	Divorced.
MAR_S	Separated.
MAR_N	Never married.
C17_AGE	CHILD_17 × AGE
S4C_AGE	SCHOOL_4C × AGE
SGS_AGE	SCHOOL_GS × AGE

Source: US Census Bureau. (www.census.gov)

TABLE 2

PUMS 1990 (Male: 49.18%; Females: 50.82%)

Characteristics of females working at least 40 hours per week	Count
Females working at least 40 hours per week.	362809
Females working in traditionally male-dominated occupations.	29249
Average age of the female in years. Range: 1 to 89 years.	38.31
Females with own children under 6 years only.	34616
Females with own children ages 6 to 17 only.	79542
Females with a high school diploma.	116023
Females working in traditionally male-dominated occupations with a high school diploma.	9899
Females with a bachelor's degree.	54676
Females working in traditionally male-dominated occupations with a bachelor's degree.	3342
Females with a master's degree, professional degree or doctorate degree.	26086
Females working in traditionally male-dominated occupations with a master's degree, professional degree or doctorate degree.	2859
Females who are married, spouse absent.	6549
Females who are widowed.	14484
Females who are divorced.	51619
Females who are separated.	11224
Females who never married.	77927

Source: US Census Bureau. (www.census.gov)

TABLE 3

PUMS 2000 (Male: 49.1%; Females: 50.9%)

Characteristics of females working at least 40 hours per week	Count
Females working at least 40 hours per week.	439406
Females working in traditionally male-dominated occupations.	30230
Average age of the female in years. Range: 1 to 89 years.	40.13
Females with own children under 6 years only.	37522
Females with own children ages 6 to 17 only.	101669
Females with a high school diploma.	121929
Females working in traditionally male-dominated occupations with a high school diploma.	10013
Females with a bachelor's degree.	78897
Females working in traditionally male-dominated occupations with a bachelor's degree.	4221
Females with a master's degree, professional degree or doctorate degree.	41477
Females working in traditionally male-dominated occupations with a master's degree, professional degree or doctorate degree.	1993
Females who are married, spouse absent.	8806
Females who are widowed.	13577
Females who are divorced.	69443
Females who are separated.	13774
Females who never married.	97164

Source: US Census Bureau. (www.census.gov)

TABLE 4
Coefficient Estimates Using 1% PUMS 1990 and 1% PUMS 2000 Data
Region: USA

[1]	[2]	[3]	[4]	[5]	[6]	[7]
Variable Name	β Est_90	STB_90	[p/1-p]_90	β Est_00	STB_00	[p/1-p]_00
Intercept	-2.71[a]	-	-	-3.74[a]	-	-
AGE	0.041[a]	0.098[a]	1.01	0.059[a]	0.393[a]	1.06
AGE^2	-0.0002[a]	-0.116[a]	1.0	-0.001[a]	-0.411[a]	0.99
CHILD_6	-0.027	-0.004	0.97	-0.138[a]	-0.021[a]	0.87
CHILD_17	0.488[a]	0.111[a]	1.63	0.23[a]	0.054[a]	1.26
SCHOOL_H	0.087[a]	0.022[a]	1.09	0.164[a]	0.04[a]	1.78
SCHOOL_4C	0.622[a]	0.113[a]	1.86	-0.233[a]	-0.049[a]	0.79
SCHOOL_GS	2.379[a]	0.339[a]	10.8	-0.078	-0.013	0.93
MAR_A	0.238[a]	0.017[a]	1.27	0.321[a]	0.025[a]	1.38
MAR_W	0.089[b]	0.01[b]	1.09	0.149[a]	0.014[a]	1.16
MAR_D	0.083[a]	0.016[a]	1.09	0.2[a]	0.04[a]	1.2
MAR_S	0.038	0.004	1.04	0.17[a]	0.016[a]	1.19
MAR_N	0.122[a]	0.028[a]	1.13	0.205[a]	0.047[a]	1.23
C17_AGE	-0.014[a]	-0.129[a]	0.99	-0.008[a]	-0.073[a]	0.99
S4C_AGE	0.026[a]	-0.197[a]	0.97	-0.002	-0.018	0.99
SGS_AGE	-0.051[a]	-0.312[a]	0.95	-0.008[a]	-0.057[a]	0.99

Significance Level: [a] = 1%, [b] = 5%, [c] = 10%.

TABLE 5
Coefficient Estimates Using 1% PUMS 1990 and 1% PUMS 2000 Data
Region: Midwest

[1]	[2]	[3]	[4]	[5]	[6]	[7]
Variable Name	β Est_90	STB_90	[p/1-p]_90	β Est_00	STB_00	[p/1-p]_00
Intercept	-2.51[a]	-	-	-3.53[a]	-	-
AGE	0.004	0.03	1.00	0.05[a]	0.34[a]	1.05
AGE^2	-0.00	-0.03	1.00	-0.00[a]	-0.35[a]	1.0
CHILD_6	-0.07	-0.01	0.93	-0.04	-0.01	0.96
CHILD_17	0.48[a]	0.11[a]	1.61	0.28[c]	0.07[c]	1.33
SCHOOL_H	0.20[a]	0.05[a]	1.22	0.24[a]	0.06[a]	1.27
SCHOOL_4C	0.71[a]	0.14[a]	2.04	-0.33[b]	-0.07[b]	0.72
SCHOOL_GS	2.66[a]	0.36[a]	14.37	-0.29	-0.04	0.75
MAR_A	0.23[b]	0.01[b]	1.25	0.52[a]	0.03[a]	1.69
MAR_W	-0.06	-0.01	0.94	0.16[b]	0.01[b]	1.17
MAR_D	0.11[a]	0.02[a]	1.12	0.19[a]	0.04[a]	1.21
MAR_S	0.23[a]	0.02[a]	1.26	0.25[a]	0.02[a]	1.28
MAR_N	0.07[c]	0.01[c]	1.07	0.19[a]	0.04[a]	1.21
C17_AGE	-0.01[a]	-0.12[a]	0.99	-0.01[b]	-0.08[b]	0.99
S4C_AGE	-0.03[a]	-0.24[a]	0.97	-0.00	-0.02	1.0
SGS_AGE	-0.06[a]	-0.38[a]	0.94	-0.01	-0.04	0.99

Significance Level: [a] = 1%, [b] = 5%, [c] = 10%.

TABLE 6
Coefficient Estimates Using 1% PUMS 1990 and 1% PUMS 2000 Data
Region: Northeast

[1]	[2]	[3]	[4]	[5]	[6]	[7]
Variable Name	β Est_90	STB_90	[p/1-p]_90	β Est_00	STB_00	[p/1-p]_00
Intercept	-2.92[a]	-	-	-4.2[a]	-	-
AGE	0.02[b]	0.13[b]	1.02	0.07[a]	0.48[a]	1.08
AGE^2	-0.00[b]	-0.13[b]	1.0	-0.00[a]	-0.49[a]	1.0
CHILD_6	0.06	0.01	1.07	-0.01	-0.00	0.99
CHILD_17	0.83[a]	0.18[a]	2.3	0.61[a]	0.14[a]	1.84
SCHOOL_H	0.09[a]	0.03[a]	1.09	0.17[a]	0.04[a]	1.19
SCHOOL_4C	0.61[a]	0.13[a]	1.84	-0.37[b]	-0.08[b]	0.69
SCHOOL_GS	2.41[a]	0.39[a]	11.15	-0.14	-0.03	0.87
MAR_A	0.1	0.01	1.1	0.19[c]	0.02[c]	1.21
MAR_W	0.11	0.01	1.11	0.1	0.01	1.1
MAR_D	0.05	0.01	1.05	0.22[a]	0.04[b]	1.25
MAR_S	-0.07	-0.01	0.93	0.17[b]	0.02[b]	1.19
MAR_N	0.05	0.01	1.06	0.21[a]	0.05[a]	1.24
C17_AGE	-0.02[a]	-0.2[a]	0.98	-0.02[a]	-0.15[a]	0.98
S4C_AGE	-0.02[a]	-0.18[a]	0.98	0.00	0.03	1.0
SGS_AGE	-0.05[a]	-0.32[a]	0.95	-0.00	-0.03	1.0

Significance Level: [a] = 1%, [b] = 5%, [c] = 10%.

TABLE 7
Coefficient Estimates Using 1% PUMS 1990 and 1% PUMS 2000 Data
Region: South

[1]	[2]	[3]	[4]	[5]	[6]	[7]
Variable Name	β Est_90	STB_90	[p/1-p]_90	β Est_00	STB_00	[p/1-p]_00
Intercept	-2.88[a]	-	-	-3.80[a]	-	-
AGE	0.02[a]	0.14[a]	1.02	0.06[a]	0.41[a]	1.06
AGE^2	-0.00[a]	-0.16[a]	1.0	-0.00[a]	-0.44[a]	1.0
CHILD_6	-0.03	-0.00	0.97	-0.24[a]	-0.04[a]	0.79
CHILD_17	0.49[a]	0.11[a]	1.63	0.18	0.04	1.19
SCHOOL_H	0.06[b]	0.02[b]	1.06	0.14[a]	0.04[a]	1.15
SCHOOL_4C	0.69[a]	0.13[a]	1.99	-0.08	-0.02	0.93
SCHOOL_GS	2.12[a]	0.29[a]	8.33	-0.09	-0.01	0.92
MAR_A	0.27[a]	0.02[a]	1.31	0.41[a]	0.03[a]	1.5
MAR_W	0.14[b]	0.02[b]	1.15	0.14[b]	0.01[b]	1.15
MAR_D	0.11[a]	0.02[a]	1.11	0.25[a]	0.05[a]	1.29
MAR_S	0.05	0.01	1.05	0.21[a]	0.02[a]	1.24
MAR_N	0.23[a]	0.05[a]	1.25	0.27[a]	0.06[a]	1.31
C17_AGE	-0.02[a]	0.14[a]	0.98	-0.01[b]	-0.06[b]	0.99
S4C_AGE	-0.03[a]	0.23[a]	0.97	-0.01[b]	-0.06[b]	0.99
SGS_AGE	-0.05[a]	-0.28[a]	0.95	-0.01[b]	-0.07[b]	0.99

Significance Level: [a] = 1%, [b] = 5%, [c] = 10%.

TABLE 8
Coefficient Estimates Using 1% PUMS 1990 and 1% PUMS 2000 Data
Region: West

[1]	[2]	[3]	[4]	[5]	[6]	[7]
Variable Name	β Est_90	STB_90	[p/1-p]_90	β Est_00	STB_00	[p/1-p]_00
Intercept	-2.46[a]	-	-	-3.59[a]	-	-
AGE	0.01	0.07	1.01	0.06[a]	0.37[a]	1.06
AGE^2	-0.00[a]	-0.12[a]	1.00	-0.00[a]	-0.4[a]	1.0
CHILD_6	-0.06	-0.01	0.95	-0.18[a]	-0.03[a]	0.84
CHILD_17	0.26	0.06	1.30	-0.05	-0.01	0.96
SCHOOL_H	-0.03	-0.01	0.97	0.08[b]	0.02[b]	1.08
SCHOOL_4C	0.63[a]	0.13[a]	1.87	-0.18	-0.04	0.84
SCHOOL_GS	2.52[a]	0.36[a]	12.49	0.2	0.03	1.22
MAR_A	0.30[a]	0.02[a]	1.36	0.13	0.01	1.14
MAR_W	0.15[c]	0.02[c]	1.17	0.2[b]	0.02[b]	1.22
MAR_D	0.05	0.01	1.05	0.12[a]	0.02[a]	1.12
MAR_S	0.02	0.00	1.03	0.09	0.01	1.1
MAR_N	0.1[b]	0.02[b]	1.10	0.15[a]	0.03[a]	1.16
C17_AGE	-0.01[c]	-0.09[c]	0.99	-0.00	-0.01	1.0
S4C_AGE	-0.02[a]	-0.18[a]	0.98	0.00	0.01	1.0
SGS_AGE	-0.05[a]	-0.31[a]	0.95	-0.01[b]	-0.07[b]	0.99

Significance Level: [a] = 1%, [b] = 5%, [c] = 10%.

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[1] Table A-1: Employment status of civilian population by sex and age. Employment Situation Summary, Bureau of Labor Statistics (www.bls.gov).

[2] The definition of a male-dominated occupation to have at least 75 percent of male workers is arbitrary. One may argue that any occupation where there are more than 50 percent male workers can be considered male-dominated. We reached at this number by taking the average of 50 percent—an occupation that is evenly populated by males and females, and an occupation that has 100 percent male workers.

[3] The list is based on Occupation Appendix H from the Census 1990 Technical Documentation and Appendix G-47 from the Census 2000 Technical Documentation.

[4] Dolton and Makepeace (1993) use age as a proxy for human capital (pp.1397-1398). We thank an anonymous referee for providing this reference.

[5] Except for the 2000 data where being an African American female affects the probability of being in a male-dominated occupation negatively. The coefficient value was -0.06 with a p-value of 0.002. The values of the rest of the coefficients in the model remained effectively unchanged.

[6] States included in each region are: Midwest—Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, N. Dakota, Ohio, S. Dakota, Wisconsin; Northeast—Connecticut, Maine, Massachusetts, New Hampshire, New York, New Jersey, Pennsylvania, Rhode Island, Vermont; South—Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, N. Carolina, Oklahoma, S. Carolina, Tennessee, Texas, Virginia, Washington DC, W. Virginia; West—Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming. Following the US Census Bureau in partitioning states into regions, Puerto Rico was not included in any region. Please see Figure A–3, Census Regions, Census Divisions, and Their Constituent States, www.census.gov.

[7] An odds ratio of 1 implies a 50-50 chance of either outcome.

[8] Studying the probability of a female to join labor force, Dolton and Makepeace (1993, p.1400) find similar results with respect to the ages of children. They call it the impact of "family commitments" on a female's decision to join the labor force.

[9] Please recall that we define an occupation to be a male-dominated occupation if there are at least 75 percent male workers. A decline of females with master's or higher or professional degrees to 0.45 percent in the 2000 data dose not mean that 99.55 percent of highly educated females were working in

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"female-dominated" occupations. It only means that 99.55 percent of females were working in occupations where there were less than 75 percent male workers.

[10] Dolton and Makepeace (1993, p.1399) find similar effect of marital status on a female's probability of participating in labor force.

[11] In order to calculate the probability, please recall that $\ln\Phi = \ln\left(\frac{p}{1-p}\right)$; where *p* is the probability of female presence in a male-dominate occupation. Taking the exponent and plugging-in the coefficient estimates for a female with the characteristics presented in the above example with spouse present give us: $\frac{p}{1-p} = e^{-1.373}$. Solving for *p* we get 0.2.