Muscle & Money:
Determining the Relationship Between Occupational Physical Demands and Individual Earning Power

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1 INTRODUCTION

The disparity in wages between women and men in the United States persists despite legislation, advocacy, and social change. Women continue to earn considerably less than their male counterparts in the U.S. for performing similar work (Blau, Feber &Winkler, 2006; Blau Simpson & Anderson, 1998; Bradbury, 2002; Hamil-Luker, 2005; Karamessini & Ioakimoglou, 2007; Maume, 2004; Boraas & Rodgers III, 2003; Frome, Alfeld, Eccles & Barber, 2006). While progress has been made to reduce the wage inequality, the gender wage gap was 19 percent in 2006 when comparing annual wages for full-time, year round workers and 30 percent when examining lifetime earnings (Kongar, 2008; Karamessini & Ioakimoglou, 2007). Women's reduced wages in relation to men's wages are explained by a range of variables including a systemic cultural bias favoring male employees, choices made by workers about their education and employment, and institutional and employer-based characteristics.

While the systemic origins of the gender wage gap are widely debated, there is an agreement that the number of women relative to the number of men employed within each occupation influences an individual's wage (Blau, Ferber & Winkler, 2006; Rose & Hartmann, 2004; Frome, Alfeld, Eccles & Barber, 2006; Kongar, 2008; Boraas & Rodgers III, 2003; Karamessini & Ioakimoglou, 2007). Women tend to participate in occupations held predominantly by women, as men participate in male-dominated positions. Occupational segregation is seen as a significant reason why women earn less than men in comparable jobs with comparable skills. Female-dominated positions tend to be low-skilled and low-wage careers, associating women's undervalued informal labor with their underpaid occupations (Frome, Alfeld, Eccles & Barber, 2006; Blau, Simpson & Anderson, 1998; Jaquette & Summerfield, 2006). This "feminization of labor" depresses wages for all workers in female-dominated sectors (Jaquette & Summerfield, 2006). Because male-dominated occupations currently tend to provide higher wages for all workers, the gender wage gap may be lessened by

increasing women's participation in traditionally male-dominated careers (Rose & Hartmann, 2004).

Some of the last bastions of male-dominated occupations are those within natural resource extraction and production, construction, and manufacturing. Careers like these often have a high level of physical demands, requiring strength, endurance and/or repetitive motions. Physically demanding jobs represent men's last 'natural advantage' in the labor market, where greater strength should supposedly create greater pay. Men's natural advantage largely stems from the perception that they are stronger than women, particularly in upper body strength. Women are excluded from these physically demanding positions because they do not see themselves, and are not viewed as, physically competent to hold these types of jobs. In the U.S. at the end of 2006, 2.4% of non-managerial occupations in construction and extraction were held by women, 4.1% of installation, maintenance and repair occupations, 12.5% of transportation and material moving occupations, and 15.3% of farming, fishing, and forestry occupations were performed by women (United States Census Bureau, 2006 American Community Survey). Women still dominate low-skilled, low-wage service sector positions. For example, in 2006 73.0% of office and administrative support occupations and 75.14% of personal care and service occupations were held by women (United States Census Bureau, 2006 American Community Survey). Of those employed in female-dominated occupations in 2006, 13 percent earned more than the national median income, while 41 percent of those in male-dominated positions earned above median earnings (United States Department of Labor, Current Population Survey 2006)

The Pacific Northwest region provides a good illustration of the effects of different job structures because it has been greatly affected by economic restructuring. Oregon and Washington specifically have experienced a recent transition from a goods-based economy to a service-based economy. The northwest region has been affected by the shift from a historically large number of natural resource and manufacturing jobs to a large number of service sector positions due to global restructuring efforts and ecological service depletion. These economic transitions have created varying gender wage disparities within different occupational sectors. The areas that have experienced the most significant shifts are the non-metropolitan and non-micropolitan areas, as defined by the Office of Management and Budget as areas with less than 50,000 residents (United States Office of Management & Budget, Federal Register, 122700). The economic impacts were experienced by the two states in similar ways because of the nearly equal

divide between urban and rural residents, 51% rural inhabitants in Oregon, 49% for Washington (USDA). I also chose to use Oregon and Washington in hopes that the findings may produce regional strategies to lessen the wage gap. Oregon and Washington have often used similar policy proscriptions to support and protect their workers, such as minimum wage laws, comparable worth acts to reduce gender wage inequality, and economic development packages.

The Pacific Northwest is used as a case study to see if the gender wage gap would be reduced if more women had male-dominated, physically demanding occupations, controlling for theoretically determined variables. I use the Current Population Survey, Annual Social and Economic Supplement from March 2006 combined with occupational characteristics found in the Dictionary of Occupational Titles to determine how various wage determinants affect full-time, year-round, civilian employees over the age 17. I use Ordinary Least Squares regression modeling to determine how supply and demand-side determinants as well as variables which would imply labor market discrimination affect individual earnings. Variables included in this study are level education, age, usual number of hours worked in a week, the percent female within each occupation, the organizational size of an employer, union representation, the type of industry, marital status, race/ethnicity, and gender. Wages in Oregon and Washington are constructed by a variety of cultural, institutional, and economic factors. Understanding the impact of different wage determinants, particularly occupational physical demands, can identify constraints to gender wage parity and potentially illustrate new strategies to lessen the regional gender wage gap in the Pacific Northwest.

2 LITERATURE REVIEW

2.1 History and Evidence of the Gender Wage Gap

Women's wages lag behind men's wages in the United States, and while the ratio has decreased over time, women earn at most 81 percent of what men earn (Blau, Feber &Winkler, 2006; Blau Simpson & Anderson, 1998; Bradbury, 2002; Hamil-Luker, 2005; Karamessini & Ioakimoglou, 2007; Maume, 2004; Boraas & Rodgers III, 2003). The gender wage gap is a difference in earnings among women and men for performing similar work, assuming comparable factors like experience, age, and education remain constant (Lips, 2003; Blau, Ferber & Winkler, 2006; Weinberg, 2007; Reskin & Roos, 1990).

Relative wages between women and men are most often constructed by comparing weekly or annual earnings between full-time, year-round, non self-employed, civilian workers. Men tend to earn more overtime and bonuses than women, indicating a greater disparity in annual earnings as compared to weekly earnings (Blau, Feber, &Winkler, 2006; Rose & Hartmann, 2004). Figure 1 demonstrates the patterns in women's weekly and annual earnings relative to men's earnings. Women were earning nearly 59 cents to every dollar earned by men throughout the 1960's and 1970's. The gender wage gap was narrowed in the 1970's and 1980's primarily because a significant number of women occupied traditionally male-dominated positions (Blau, Simpson & Anderson, 1998). The wage disparity in the 1980's dropped even further as women's education and experience increased, men's access to high-paying blue collar jobs decreased (Blau, Simpson, & Anderson, 1998; Rose & Hartmann, 2004; Blau, Feber & Winkler 2006; Kongar, 2008). The gender wage gap in the 1990's did not decrease at a similar rate as it did in the 1980's, and instead women's wages relative to men's wages remained relatively stagnant. Women's education and relevant experience increased in the 1990's which was expected to raise their wages in relation to men's wages. However, men's wages also increased at a high rate which negated women's increased earnings. One reason for this is that men entered the service sector more than they previously had due to restructuring efforts and earned more than women in those positions (Kongar, 2008). The other reason the 1990's had a more stagnant gender wage gap change can be explained by patterns of re-segregation, where the

number of female employees was equal to, or greater than, the number of male employees in occupations traditionally held by men, thus lowering their wages (Kongar, 2008; Blau, Simpson & Anderson, 1998). The early 2000's have shown signs that the gender wage gap will narrow again, though the rate is expected to be slight. As women's education and experience levels grow, economists anticipate a drop in wage disparity; however, women are also entering the low-wage, low-skilled service sector positions in record numbers (Kongar, 2008; Blau, Feber, & Winkler, 2006; Flynn, 2003). According the United States Census Bureau, full-time, year-round, non self-employed female workers in 2006 earned $0.80 in annual wages to each $1.00 of men's annual wages.

The three points in Figure 1 where women's median weekly income was the same ratio as women's median annual income, 1990, 1997 and 2001, could suggest that women transitioned from hourly to salaried work. However, economic factors including restructuring and the 2001 recession have likely caused greater unemployment for men and decreased hourly work available for workers, thus creating a somewhat artificial gender wage gap decrease.

Figure 1: Gender Wage Gap between Female and Male Workers

The Gender Wage Ratio for Median Weekly Earnings, 1955-2007, Full-Time Workers

Source: Institute for Women's Policy Research, Gender Wage Gap Update; http://www.iwpr.org/pdf/C350.pdf, accessed on 4.12.08

While the gender wage gap has lessened over time, women are still out-earned by men performing similar work with similar qualifications. The gender wage gap is even more pronounced when lifetime earnings are calculated because single year measurements are restricted to a portion of the workforce (Rose & Hartmann, 2004). Career interruptions are often identified as a strong indicator of women's reduced earnings because women's wages have risen in response to their increased labor force participation (Boraas & Rodgers III, 2003; Rose & Hartmann, 2004). Lifetime earnings show a much greater wage disparity than annual snapshots for two reasons: men earn exponentially more every year than women and women work on average 700 hours less per lifetime than men. When comparing full-time, year-round employees aged 26 to 59 years of age who worked every year consecutively for fifteen years, women earn 69.6 percent of what men earn. Further, women are more likely to be long-term, low-wage earners while men's wages tend increase exponentially throughout their careers. The average earnings for all workers for the U.S. from 1983 to 1998 was $25,000-$50,000, but 42 percent of

men earn more than $50,000 while only nine percent of women earn more than the top amount (Rose & Hartmann, 2004).

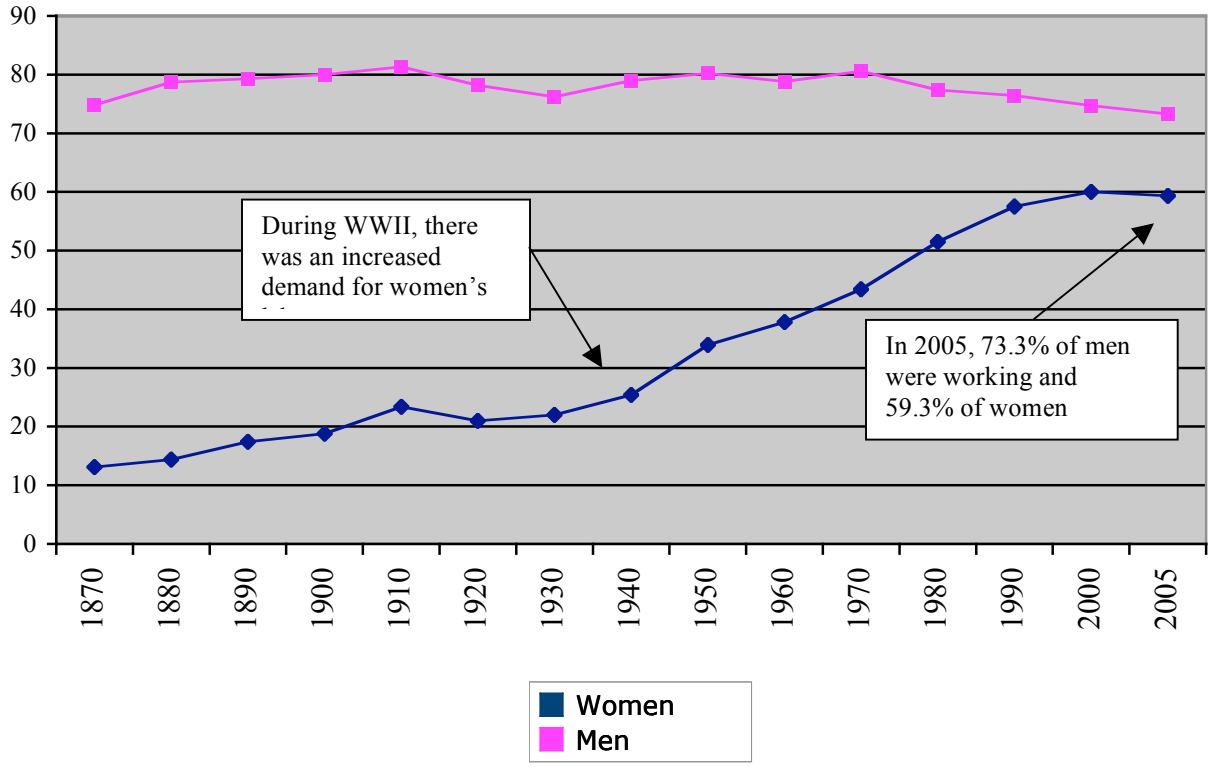
Women's depressed wages are explained by a range of variables including discontinuous labor force participation, lack of labor force commitment, industry and occupational characteristics, and a persistent cultural bias. While the systemic origins of the gender wage gap are widely debated, there is an agreement that the percentage of women within each occupation determines an individual's wage to some extent (Blau, Ferber & Winkler, 2006; Rose & Hartmann, 2004; Kongar, 2008; Boraas & Rodgers III, 2003; Frome, Alfeld, Eccles & Barber, 2006; Lips, 2003). Women are more likely to work in occupations that are predominately done by women and men are more likely to work in male-dominated positions. Women's wages are consistently lower in female-dominated positions as compared to both men and women who work in either integrated or male-dominated positions (Kongar, 2008; Rose & Hartmann, 2004; Blau, Simpson & Anderson, 1998). Women also earn less in integrated and male-dominated occupations, signifying a tendency to undervalue women's formal labor (Lips, 2003).

Occupational segregation has been particularly pronounced in jobs requiring physical demands, particularly in the skilled blue-collar occupations. These positions still carry a stigma that strength-requiring jobs are 'men's jobs.' However, women have had a long history in performing physically rigorous work. In the pre-industrial revolution era women had very few opportunities within the professional sector, but routinely performed physically demanding tasks in agriculture, specifically working-class, rural women (Stern, 1939). Even though women's strength was seen as inferior to men, women were considered competent at extremely heavy labor in domestic building, maintenance, and agricultural-related tasks. During the period before WWII, women who did productive physical labor increased their social status as they worked for their family's survival (Cotter, DeFiore, Hermsen, Marsteller-Kowalewski, & Vanneman, 1998). The burgeoning industrial era in England and the United States revealed a great dependence on female manual laborers, shifting production at home to production within manufacturing, factories, and general machine operation (Stern, 1939).

The U.S. economy shifted during World War II as women re-entered the industrial workforce to compensate for the shortage of mechanical workers. The U.S. government sponsored a campaign to successfully recruit women into the positions left vacant by the soldiers in order to maintain the necessary production for the war effort. Through billboard and

newspaper ads, and personal recruitment done through informal networks, women were persuaded that these occupations required skills they were already capable of, such as following sewing blueprints and lifting objects lighter than most toddlers. Thousands of women served as ship builders, longshoremen, welders, sheet metal workers, and mechanics. Nearly ninety percent of the industrial professions that manufactured crafts, weapons and other goods associated with the war were held by women (Honey, 1984). As Figure 2 demonstrates, women had an increased demand for their labor because of WWII.

Figure 2: Women's and Men's Percentage of Labor Force Participation: 1870-2005



Source: Data for 1870-1960 come from Historical Statistics of the United States, Colonial Times to 1970, Part 1, Series D 11-25. United States Bureau of the Census, Data from 1970-1999 come from Statistical Abstract of the United States: 2000, No. 645. Date from 2000-2005 calculated from: http://www.census.gov/prod/2006pubs/07statab/labor.pdf table 577. Compiled by Rebecca Warner.

After WWII, the U.S. government launched another effective campaign to pressure female industrial workers to leave their jobs and return to more feminine and informal occupations in order to have their jobs become available to the returning soldiers. If women persisted in their war-time jobs, or held other physically demanding occupations, they lost cultural status and were seen as unfeminine and uncommitted to their families (Cotter et al, 1998). Women lost representation in physically demanding jobs overall and were viewed as being incapable of the work they once performed (Nelson, 1999). The 1950's did continue to have increased labor force participation from women, but at a much slower rate which was reflective of the pre-war era (Kessler-Harris, 1984; Cotter et al, 1998). Men's participation in formal economies dropped since the 1970's due to economic restructuring efforts. As shown in

Figure 2, in 2005 women's labor force participation was 59.3 percent and men's participation was 73.3 percent.

While women continued to enter a variety of professions in the 1960's and 1970's, their involvement in physically demanding careers grew at a slower rate. One of the reasons more women did not return to positions they had once held during WWII was because of institutional constraints. It was not until President Carter signed Executive Order 12106 in 1978 that made it illegal for employers to discriminate on the basis of gender and women were protected in performing male-dominated, physically demanding careers (United States Equal Employment Opportunity Commission). Women have since entered the highly-paid skilled trades steadily but very slowly. In 2006, less than three percent of the workforce in natural resource extraction, construction, and maintenance occupations was women (United States Women's Bureau, 2006).

Why women have not infiltrated these physically-demanding, male-dominated positions more is widely speculated. Occupational characteristics are believed to influence the recruitment and retention of women, and in turn depress their wages relative to men's wages. Cultural bias against women is suggested to foster labor market discrimination and to affect individual worker's choices and preferences. Dominant wage determinant theories are presented to understand the how occupational and institutional trends, worker characteristics, and societal predispositions against women affect individual wages and construct the gender wage gap.

2.2 Theoretical Foundations Explaining the Gender Wage Gap

The declining, though persistent, gender wage gap signifies inequity between full-time, wage-earning women and men in the United States. Dominant theoretical perspectives explain the gender wage gap as a product of supply-side factors such as choices made by workers, demand-side wage determinants including labor market trends and occupational characteristics, as well as cultural biases which could illustrate labor market discrimination. Individual choices made by workers, or future workers, are seen as the primary determinant of individual earnings according to human capital theory. Neoclassical theorists ascertain that workers personal investment in education and their commitment to a specific labor market greatly affects their earnings (Karamessini & Ioakimoglou, 2007; Blau, Ferber & Winkler, 2006; O'Neill & Polacheck, 1993). Human capital commitments also include workers' commitment to remain

continuously employed and willingness to migrate to a region with a more promising labor market if needed. Demand side theorists do not see the gender wage gap as a result of choices made on behalf of workers, but instead as a result of more systemic labor market conditions. Influential institutional and occupational characteristics include economic restructuring and deindustrialization, workplace unionization, the size of an employee's organization, the type of industry, and the extent of gender segregation within each profession. Demand and supply-side factors together though, explain less than 30 percent of overall wage determinants, and these models are better predictors of men's wages than women's wages (Lips, 2003). The rest of the wage gap story can likely be explained by indicators of labor market discrimination. Wage determinants are institutionally and culturally-based signifying that inequitable pay is a result of persistent gender bias (Karamessini & Ioakimoglou, 2007; Maume, 2004). Overall, these differing frameworks debate if workers' can actually choose to improve their earnings, or if instead, wage is determined by complex, macro-level cultural and economic factors (Blau, Simpson & Anderson, 1998). Voluntary action, systemic forces, and patterns of labor market discrimination are discussed further as supply-side, demand-side, and culturally-based paradigms for understanding gender inequality in labor market wage compensation.

2.2.1 Supply-Side Determinants of the Gender Wage Gap

Labor market supply theory bases wage inequity on characteristics and choices specific to individual workers. Human capital theorists argue that individuals make rational choices in order to advance their employability and improve their wages (O'Neill & Polacheck, 1993). Investments can be made through educational attainment, remaining in the labor force continuously, choosing an urban location, and deciding on a type of industry that has higher median wages. Wage scales are seen as dependent on personal choices made by workers, and the gender wage gap reflects different choices made by women and men. This hypothesis suggests that women choose to give up opportunities which would lead to a higher wage, by attaining less experience and professional expertise in exchange for a job that allows for either flexible hours or discontinuous labor participation (O'Neill & Polacheck, 1993; McCrate, 2005).

The most important determinant of wage is educational attainment according to supply-side theorists (O'Neill & Polacheck, 1993; Blau, Simpson & Anderson, 1998; Bradbury, 2002;

Mitra, 2003). As individuals invest in their education, they are more apt to be hired, and also to receive on-the-job training. Employers are more likely to invest in educated workers for training because they are seen as being able to retain skills more than uneducated workers, and can therefore become more productive. Higher educational attainment is also commonly associated with a higher level of skill (McCall, 2000). As employers make greater investments in well-trained, highly skilled workers, individual's wages increase (Hamil-Luker, 2005). College attainment specifically increases workers wages (Blau, Simpson & Anderson, 1998). The gap between women with and without college degrees is as significant as the gap between college-educated and non-college educated men (McCall, 2000).

While education is thought of as the primary wage determinant, workers' commitment to stay employed is another explanation for improving one's wage potential. Human capital theorists explain women's negative wages in part because of their inconsistent labor participation. With delayed marriages and lower fertility rates, women have begun to work more continuously and also to earn more money (Blau, Simpson & Anderson,1998). Referring back to Figure 2, women have been in the formal labor market more since the 1960's. Discontinuous labor force participation has been associated with domesticity and child-rearing. While significant changes have occurred as a result of women's movements and civil rights laws, societal expectations persist concerning women's family care responsibilities (Blau, Simpson & Anderson, 1998; Jaquette & Summerfield, 2006). Women's discontinuous labor force participation suggests reduced opportunities to gain experience. As men remain more continuously employed, they gain more experience than women, translating into greater advancement opportunities and higher wages. Experience is often hard to quantify because determining the relevancy of workers' relevant experience is subjective. Employers may gauge experience differently for women and men. Labor economists often use the number of years a worker has been employed as an adult as a proxy for experience to eliminate the potential biases.

Workers' commitment to improve their potential earnings can also include choices about where they live and how many hours a week they work. Employees in urban areas tend to pay more than employees in rural markets (McCall, 2003). While some of the wage inequity is due to a higher cost of living in urban areas, metropolitan employers are believed to pay more for better educated workers. Debate exists about whether or not workers can autonomously choose how many hours they work in a week, given potential constraints from labor market conditions. If

workers can indeed select the parameters of their working hours, the more hours worked in a week will improve their wages. This sentiment among human capital theorists holds true if workers are either salaried or hourly.

Human capital theory asserts that personal investments affect potential earnings more than any systemic determinant. Neoclassical theorists argue that the wage gap will continue to diminish as women invest more in their education and gain experience equivalent to men's experience. The gap will lessen further as fertility rates decline and women have greater labor force continuity (O'Neill & Polacheck, 1993; Blau, Simpson & Anderson, 1998). Further, women can select jobs that require longer areas in urban locations to improve their earnings. Improving the factors which influence employability and retention will increases women's wages relative to men's according to supply-side theorists.

2.2.2 Demand-side Determinants of the Gender Wage Gap

Demand-side theorists focus on macro-level labor market conditions influenced by a large array of global and domestic institutional factors. Demand-side theories explain the gender wage gap as a result of characteristics specific to industries and occupations which affect an individual's mobility, training capacity, advancement opportunities, and overall potential earnings.

Within the U.S. labor market, industrial composition can vary dramatically. Human capital theorists argue that workers can choose their occupation and industry, and therefore can select the types of jobs that provide higher wages. Demand-side theorists do not focus on how potential employees position themselves, but instead focus on institutional characteristics that may influence potential earnings. The distinctive institutional qualities include economic growth potential, the utilization of trade and technology, and compensation of worker's education and skills (Johnson & Solon, 1996; McCall 2003). Industries can be broadly classified as either a goods or non-goods producing sector with the latter associated with higher educational requirements and higher pay (Rose & Hartmann, 2004). The type of industry is a wage determinant, though it is a more influential factor in predicting men's wages rather than women's wages (Boraas & Rodgers III, 2003; McCall, 2000).

The industry type has been particularly determinant of wage during economic restructuring, the transition from a goods-dependent to a service-dependent economy. The restructuring of the world economy in the 1970's and beyond led to both marginalized countries and marginalized workers experiencing increased access to low skilled, low wage jobs. Through the loss of natural resource jobs, such as fishing, mining, forestry, and domestic manufacturing opportunities, U.S. workers had fewer opportunities to earn a living wage. As restructuring diminished manufacturing opportunities, male workers experienced greater unemployment as they tended to dominate those positions. Men then began to enter the traditionally female-dominated service sector in larger numbers than they had before restructuring. Once employed in positions such as food and customer service, men earned more than their female counterparts, even when controlling for experience or tenure. The surge of male workers into the low-paying service positions exaggerated men's heightened labor market value when compared to women (Kongar, 2008; Maume, 2004).

While the service sector worsened gender wage parity, the manufacturing sector actually helped improve it. One of the reasons the manufacturing sector is believed to equivocate wages between women and men is because manufacturing jobs have historically been represented by a union. Jobs which are represented by a union often provide higher wages as compared to non-unionized jobs of a similar skill level. Unionized wages are relatively transparent because of collective bargaining. Pay scales are often determined by the level skill and experience. Jobs that are represented by union or employee contracts also provide a relatively flat wage hierarchy, reducing the possibility for dramatic wage inequities for workers (Fortin & Lemieux, 1997). Because of the relatively transparent, skill-based, horizontal wage structure, it is argued that unionized jobs can provide more equitable wages for women and men as compared to non-organized workplaces.

Another demand-side wage determinant is the number of workers employed at an individual's workplace. Larger employers are believed to provide greater advancement opportunities, better training, and more compensation. Workers can also increase their level of specialization within larger organizations and can potentially increase their value. Organizational size can be seen as a proxy to occupational mobility and greater wages for male workers, but not necessarily for female employees (Mitra, 2003). Based on results of a National Longitudinal Survey of Youth, Mitra finds that the gender wage gap is 29% in small organizations, 15% and

17% in medium and large-sized establishments respectively, and 24% for the organizations with the largest number of onsite employees (Mitra, 2003). While large-scale employers often provide higher wages and better advancement opportunities, women face greater discrimination in large organizations because of unequal access to supervisory positions. Smaller organizations also tend to limit women's supervisory opportunities. As a result, women earn less than men in the smallest and largest organizations in national samples (Mitra, 2003). Within the smallest organizations, women also have a lower educational return as compared to their male colleagues (Blau, Simpson & Anderson, 1998).

Demand-side theorists argue that systemic occupational and industry-specific characteristics determine a workers' wages. The macro-level characteristics create the range of wage potentials for types of occupations and individuals. A plethora of potentially influential characteristics exist, but the largest determinants are whether or not the workers' employer is in a goods-producing sector, represents an organized workplace, and has a large number of employees.

2.2.3 Cultural Determinants Influencing the Gender Wage Gap

Supply and demand-side theories identify many influential wage variables; however, even the most complete economic models representing these paradigms explain only a portion of the overall variation in wage. The overall explanatory power of supply and demand side variables is cited between 30 to 60 percent (Lips, 2003; Blau, Simpson & Anderson, 1998). The unexplained variables suggest that the female-to-male earning discrepancy can be further explained by other factors beyond workers' choices and occupational characteristics which influence wage. Culture represents a system of shared values, beliefs and behaviors and the cultural determinants of wage reflect historical institutional norms and exhibit current social biases. Labor market discrimination transpires when wages between two equally qualified individuals are determined in part or in full by the person's gender, race, age or other irrelevant considerations (Blau, Simpson & Anderson, 1998). Wage determination is constructed within a political, cultural and economic context which devalues women's work (Figart, Mutari & Power 2002; Karamessini & Ioakimoglou, 2007). The persistent gender wage gap is seen as an artifact of bias against female workers (Karamessini & Ioakimoglou, 2007; Maume, 2004; Lips, 2003).

Because wages are associated with the importance of the work performed, women's reduced compensation in relation to men's earnings exemplifies their devaluation both within labor markets and within society (Lips, 2003). Labor market discrimination can be seen in two predominant ways: by the effects of gender segregation within occupations and by the characteristics of individual workers including their gender, marital status, race/ethnicity, and age.

While a variety of occupational characteristics determine wages, many of the factors are highly correlated with the level of gender segregation within each profession (Karamessini & Ioakimoglou, 2007; Rose & Hartmann, 2004; Boraas & Rodgers III, 2003; Flynn, 2003). Human capital theorists argue that women may choose occupations which allow for greater labor force discontinuity and therefore provides lower wages. Cultural determinists argue that women may be influenced by societal pressures to take less male-dominated occupations and therefore receive less pay. Demand side theorists assert institutional characteristics like the ratio of female workers to male workers affects recruitment, hiring, and retention practices (Blau, Simpson &Anderson, 1998). Occupational segregation is the result of gendered socialization and systemic employment constraints (Karamessini & Ioakimoglou, 2007).

In most professions, both women and men earn less in occupations held predominantly by women and more in male-dominated positions (Boraas & Rodgers III, 2003; Karamessini & Ioakimoglou, 2007; Blau, Simpson & Anderson, 1998; Rose & Hartmann, 2004; Bergmann, 1974). The concentration of women's long-term, low-paying jobs is said to be indicative of women's low societal value in regards to unpaid, informal labor (Jaquette & Summerfield, 2006). The "feminization of labor" describes a trend which concentrates low-skilled occupations with poor compensation (Hamil-Luker, 2005; Karamessini & Ioakimoglou, 2007). Occupations which have more men employed, and specifically more Caucasian men, represent greater social status and provide higher wages (Maume, 2004).

Occupational segregation is seen as a large determinant of the gender wage gap. Studies report occupational segregation as explaining a wildly divergent portion of individual wages. Studies have reported that 12 to 89 percent of the overall gender wage gap can be explained by the ratio of gender segregation, depending on the data and control variables (Blau, Anderson, Simpson, 1998; Boraas & Rodgers III, 2003; Mitra, 2003). Women in predominantly female occupations earn 25.9 percent less than women in predominantly male occupations. Men in

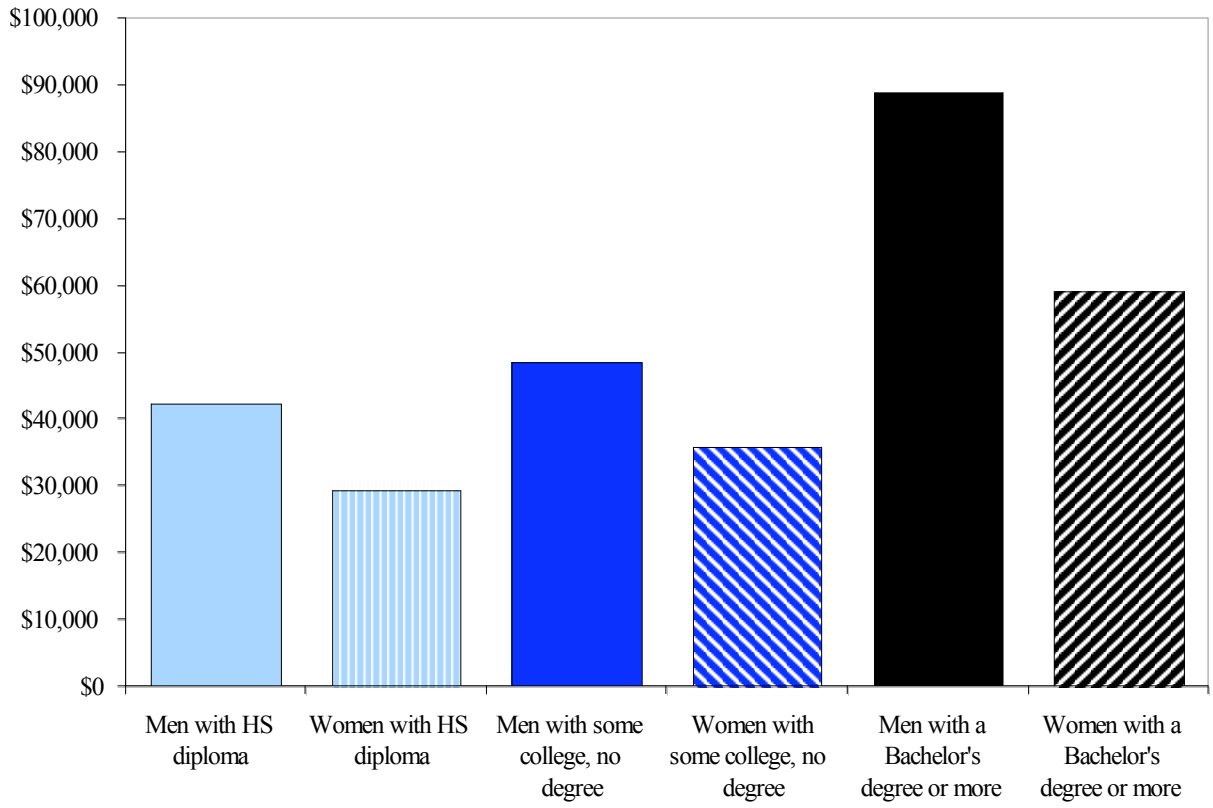
female-dominated occupations earn 12.5 percent less than men who do not hold a job with mostly women (Boraas & Rodgers III, 2003). Women's wages are primarily determined by the percentage of female employees within their occupation, and their education, age, and locale are secondary determinants (Boraas & Rodgers III, 2003). Men's wages, on the other hand, are explained by their educational attainment and the type of industry in which they are employed, such as managerial, professional, or construction sectors (Boraas & Rodgers III, 2003). Debate exists if occupational segregation alone can explain wage differentials between women and men, or if jobs held more by women or men have different skill levels which could correlate with higher or lower wages (Blau, Simpson & Anderson, 1998; Solomon & Polacheck, 1981).

As more women have been employed in formal labor markets, patterns of gender segregation have shifted. During the Industrial Revolution in the U.S. from 1870 to 1900, more women entered a broader array of occupations than they had previously participated in, including many male-dominated occupations. After remaining relatively constant during the first half of the nineteenth century, gender segregation grew slightly during and after WWII as women entered vacant positions in masse. Gender segregation decreased in the 1970's and 1980's as women had a greater range of occupational choices (Blau, Simpson & Anderson, 1998). The workforce demographics remained relatively constant in the 1990's and gender segregation began to diminish slightly in the early 2000's (Rose & Hartmann, 2004; Blau, Simpson & Anderson, 1998). Workforce demographics have shifted in the last twenty years as occupations that were held mostly by workers of one gender became either more heterogeneous or dominated by the other gender (Blau, Simpson & Anderson, 1998; Kessler-Harris, 1984; Frome, Alfeld, Eccles & Barber, 2006). As traditionally male-dominated, goods-based occupations have diminished, male workers have infiltrated the largely female-dominated service sector. Positions in the service sector are generally low-wage positions, yet the gender wage equality is greater as compared to other sectors (Kongar, 2008). While professional-level jobs provide higher wage scales, the gender wage gap is highest in these positions. Overall, the level of occupational gender segregation demonstrates how male-dominated jobs receive more compensation, illustrating that male workers are more valued than their female colleagues.

In addition to the ratio of female workers to male workers, labor market discrimination can be identified by employers' treatment of workers based on individual demographic characteristics. Discrimination can be seen by the unequal returns of educational attainment for

women and men, employers' hiring and promoting biases, and employment benefits experienced differently by women and men. While additional formal education generally improves all workers' wages, men experience a greater return on their educational investment as compared to women (Mitra, 2003; Bradbury, 2002, Hamil-Luker, 2005; Rose & Hartmann, 2004; Blau, Ferber & Winkler, 2006). Men earn more than women at every level of attained formal education, though the wage discrepancy is decreasing over time (Blau, Simpson & Anderson, 1998; Bradbury, 2002). Educational attainment benefits men more than women. The mid-1990's was the first time women with a college degree earned more than men with a high school diploma. Since economic restructuring began in the 1970's, men with less education have had depressed wages compared to men with more education (Blau, Simpson & Anderson, 1998). This trend has lessened the gender wage gap, not because more equity has been achieved and women are earning more relative to men, but because men are paid less. In 2001, women who had a high school diploma earned 73 percent of what men with a high school diploma earned. Women with a professional degree earned 60 percent relative to similarly educated men (Lips, 2001). Figure 3 demonstrates the wage inequity between full-time, year-round workers who have the same educational level in 2006.

Figure 3: Women's & Men's Median Annual Earnings by Education Educational Attainment for Full-Time, Year-Round Workers 18 Years of Age and Older: 2006



Source: United States Census Bureau, Current Population Survey, Annual Social and Economic Supplements (2006) Income Surveys Branch, Housing & Household Economic Statistics Division Retrieved 5.30.08. http://www.census.gov/hhes/www/income/histinc/p32.html

Employer-based biases can limit women's entry, retention, and advancement into specific occupations. Employer-based gender bias is seen in applicant screening, initial job assignments, and performance reviews, particularly in the professional sector where the gender wage inequity has the largest gap (Alter & Seta, 2005; Maume, 2004). Employers also favor male employees in advancement opportunities because they tend to evaluate men's work better than women's work (Lips, 2003; Chung, Marshal, & Gordon, 2001). Men who tend to promote their own competence are more likely to be promoted, while women tend to be disliked for portraying the same sentiments (Lips, 2003; Rudman, 1998). Employers also respond negatively to assertive women but not to assertive men (Carli, 2001; Lips, 2003). Many traits which are seen as a positive, leadership quality in men can be seen as an aggressive, negative trait in women (Blau, Simpson & Anderson, 1998; Maume, 2004).

Employers are particularly biased against their female employees who have children. Mothers are seen as less competent and less committed than employees who are not mothers. Managers often assume mothers are taking advantage of a more flexible schedule as compared to non-mothers and male employees (Correll, Bernard & Paik, 2007). Supply-side theorists argue that women with children choose occupations with flexible hours and therefore receive lower pay because schedule flexibility indicates less labor force dedication. Mothers are perceived as less dependable and more apt to arrive late or leave early without notice. This perception exists among employers, even though research has demonstrated that within high-paying professional careers, men with authority, command, decision-making power, or influence over organizational budgets are the ones to take advantage of a more flexible hour structure, not the women (McCrate, 2005). Motherhood invokes a loss of status and employers give poorer evaluations to women with children and provide them less wages. Working mothers are further biased by each additional child or dependent. Penalties for motherhood are distributed both by male and female employers. Perceptions about reduced competency and lower status for mothers translate into reduced hiring and advancement opportunities and depressed wage scales (Correll, Bernard & Paik, 2007).

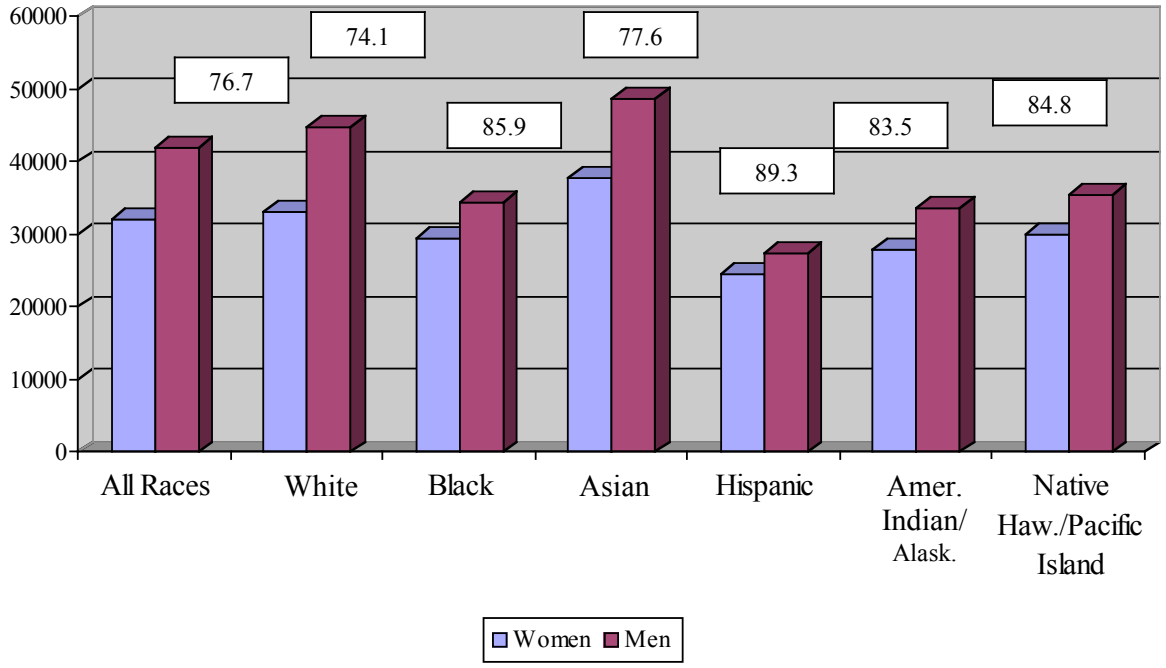
Further gender biases regarding employment can be shown in unionized workplaces. While unionized workplaces could have advantages for workers, the benefits are experienced unevenly across the workforce. Low-skilled workers experience the greatest wage increase from collective bargaining, and low-skilled women benefit more than low-skilled men (Kahn, 2000). Critics of unionization state that higher wages are mitigated by union dues and compromised through increased unemployment. Men are likely to experience a greater increase in unemployment within unionized workplaces as compared to women, and also experience the greatest decline in wages when workplaces de-unionize (Kahn, 2000; Fortin & Lemieux, 1997; Fortin & Lemieux, 2000). Unionization may lessen the gender wage gap, though it may only raise women's wages relative to men's declining wages.

In addition to gender biases evident in employment and unionization, age discrimination exists for potential or current employees (Maume, 2004). The female to male ratio of mean earnings for full-time, year-round workers in 2003 was 85.4 percent for those 25-34, 69.4 percent for those 35-44, 65.8 percent for 45-54, and 60.0 percent for those 55-64 years of age (Blau,

Ferber & Winkler, 2006). The gender wage gap increases as workers age, suggesting that older female workers are even less valued than younger female workers (Maume, 2004; Lips, 2003).

Workers' minority race and ethnicity further marginalizes all workers, and specifically disadvantages minority women. Female minority workers in the workforce earn less than their Caucasian and male colleagues. As shown in Figure 4 below, African American women earned 85.9 percent of African American men and Hispanic women earned 89.3 to the dollar. The higher gender wage equity is because Hispanic men and African American men earn considerably less than Caucasian men. Asian women actually earn more than Caucasian women, but earn 77.6 percent of what Asian men earn (United States Census Bureau, 2005 American Community Survey). The ongoing discrimination between women and men of different racial and ethnic backgrounds reiterates persistent discrimination (Maume, 2004).

Figure 4: Median Annual Income for Full-Time, Year-Round Workers by Race and Hispanic or Latino Origin, and Sex, 2005, and Women's Earnings as a Percent of Men's Within Each Group.



Note: Hispanics can be any race.

Source: United States Census Bureau, 2005 American Community Survey. http://factfinder.census.gov/servlet/STTable?_bm=y&-geo_id=01000US&-qr_name=ACS_2005_EST_G00_S2002&-ds_name=ACS_2005_EST_G00_&-_lang=en&-redoLog=false&-format=&-CONTEXT=st .Retrieved 8-20-2007. Compiled by Rebecca Warner.

2.2.4 Cultural Constraints Affecting Women's Choice to Enter Physically-Demanding Careers

In addition to employer discrimination, social constructions of gender are believed to limit occupational opportunity and depress wages for women (Boraas & Rodgers III, 2003; England, 2004; Rose & Hartmann, 2004; McCrate, 2005; Lips, 2003). The women's movement is believed to have opened up the career possibilities for women after WWII, but the progression is sluggish (Cotter et al, 1998). Nontraditional career access for women has been affected by pervasive assumptions about what women are able to do and what sorts of careers are best suited for women. Occupations requiring a physical demand have traditionally been viewed as a "man's job." In the U.S. at the end of 2006, 2.4% of non-managerial occupations in construction and

extraction were held by women, 4.1% of installation, maintenance and repair occupations, 12.5% of transportation and material moving occupations, and 15.3% of farming, fishing, and forestry occupations were performed by women (United States Census Bureau, 2006 American Community Survey). The underlying basis for why physically demanding jobs are labeled as men's jobs is because men are perceived as stronger than women. The first assumption is that women are not capable of doing manual labor, second that women are not interested in physically demanding, 'unfeminine' careers, and thirdly, an increase of women in these physically demanding careers would limit opportunities for men creating resistance among current workforce.

The first argument for why women are not in physically demanding jobs is that they are incapable of performing jobs requiring large amounts of strength. Various studies disproved the persisting assumption that women are physically incapable of manual labor. Wardle's 1976 report proving that women can do 'very' to 'unduly strenuous work' for 8.5 hours a day, and concluded that the same amount of energy was used to perform the same task, regardless of age or sex (Wardle, 1976). Energy expenditure is closely related to strength as it demonstrates overall capacity to maintain physical exertion. The results of these studies demonstrated women's capacity to perform physically-demanding jobs. Men do generally have stronger upper body strength; however, women can successfully build muscle mass in their upper bodies through targeted exercises. The level which able-bodied women can lift, pull, and throw materials is less than the government standards that regulate the total exertion allowed for various tasks. The Occupational Safety & Health Administration has created maximum strength requirements per worker, such as limiting maximum carrying load to 50 pounds, limiting the number of hours one can perform tasks over their head, and instigating 'team lift' policies for awkwardly shaped or heavy materials. The relatively new standards of maximum strength ensured greater safety for all workers, and also furthered women's access to physically demanding jobs (Occupational Safety & Health Administration; Ringen & Stafford, 1996; Goldenhar & Sweeney, 1996). Stereotypes continue to exist about women's suitability for performing heavy manual labor despite laws and advocacy (Alter, 2005). Examples of this stereotyping are visible in recruitment material for physically demanding jobs within state apprenticeship programs. Over 95 percent of the images featured in flyers collected showed men lifting, operating cranes, carrying heavy materials, etc. (Ashbrook, 2004).

In addition to perceptions about women's strength, there is also a perception that women do not want to perform physically-demanding, male-dominated jobs. Women do not pursue these careers because of their perceptions about the constraints of the job or lack of knowledge about these careers. Often women do not want a male-dominated job because they have a perception that the job will not allow them to balance the needs of both work and family responsibilities. Women also steer away from male-dominated positions because they see themselves as unable to adequately perform the tasks required, particularly as it relates to math and science (Frome, Alfeld, Eccles & Barber, 2006). Many physically demanding jobs do rely on algebra and calculus, such as carpenter, sheetmetal worker, and industrial engineer. Women also do not pursue physically demanding jobs because they lack knowledge about what types of careers are available and how entry-level workers hear about job openings (Ashbrook, 2004). The traditional gateways for securing physically-demanding, high-paying careers in natural resource extraction and construction have been to rely on informal networks of currently employed men. The father, brother, in-law recruitment method has facilitated more men into entry level, physically demanding positions. Women are not as likely to have access to informal network connections in these industries because so few women are currently employed in these positions (Ashbrook, 2004).

Another barrier for women entering physically demanding careers is the fear that their emergence into these careers will create higher unemployment and lower wages for men. The supply for labor positions has been steadily decreasing, even as the number of manufacturing related jobs has been decreasing. The rate in which men in these physically demanding positions have been retiring is exponentially faster than the rate in which new employees are being hired (Ashbrook, 2004). While improving women's skills and access to these positions may mean an increase in their relative earnings compared to men, the wages within these physically demanding positions are expected to remain relatively constant due to the expected supply shortage (Fortin & Lemieux, 2000). Therefore, increasing the number of women in well-paid physically demanding positions may help to fill the supply gap and further close some of the gender wage gap.

3 STATEMENT OF PROBLEM

A range of explanatory variables can explain some of the variation in individuals' wages and earnings, though an inequity in pay between women and men who are full-time, year-round civilian workers persists. Human capital theorists ascertain that workers who invest in their education, gain more experience, work more hours in a week, and locate themselves within urban areas will earn more money than those who do not make the same labor market commitments. They argue that the gender wage gap may be significantly lessened if women choose to make the same investments that men have made. Demand-side wage determinants include occupational and industrial characteristics, including the ratio of gender segregation within different occupations, the organizational size of an employer, the union representation for different positions, and whether or not the industry is a goods-producing sector. Demand-side theorists argue that the wage gap will be reduced if occupations are less gender segregated, large employers become even more prevalent, more jobs are union represented, and the wages increase within the goods-producing industries. Other demand-side wage determinants are the level of strength and physical demands required within different positions. Occupations which require workers to use different skills may influence wages differently for women and men. Given that supply and demand side factors do not fully explain the gender wage gap, it is believed that persistent cultural and institutional biases against women and marginalized workers continue to influence individual wage potentials. Closing the gender wage gap involves recognition of these biases and creating policy-orientated solutions, instructing specific hierarchal changes with employers, and a social awakening to increase occupational choice for women and acknowledge informal labor inequities between women and men.

While there is a clear problem that the gender wage gap exists, there are not succinct, easy solutions. Changing the political, social, and economic structures which determine wage is mired with complexity regarding gender construction, work/life balances, and labor market discrimination. To further lessen the gap in pay between women and men, multifaceted strategies presented in the burgeoning women's movement in the 1960's continue to ring true today. Many of the once-radical solutions are the same recommendations proposed today because so little has changed. Even though women have made progress in earning more money relative to men, women are still significantly disadvantaged in the labor market. Much work remains to close the

gender wage gap and to acknowledge how the persistent pay inequity has signified an unacceptable devaluation of women.

4 METHODOLOGY

4.1 Sample

To examine the relationship between occupational physical demands and individual wages in Oregon and Washington, I used the Current Population Survey (CPS), Annual Social and Economic Supplement (ASEC) from 2006 for those two states. The United States Census Bureau and the Bureau of Labor Statistics conduct the CPS annually to measure a range of labor force indicators. The CPS is a multistage, stratified sample which uses households for a period of four months, removes them from the survey rotation for eight months, and re-interviews families for the following four months. The CPS data are designed to be representative of the population through the mixed sampling frame (Polivka, 2000; U.S Census Bureau). The ASEC specifically focuses on annual employment trends for adult wage earners, families, and households. While data are collected over a three-month period in the spring, the ASEC supplement is commonly referred to as the March edition of the CPS. The March 2006 CPS had 824 sample areas, resulting in 76,700 interviewees among 83,800 eligible household interviewees (United States Census Bureau). Nonsampling errors are measured by how well the sample covers the target population. For the March 2006 CPS, 89 percent of people 15 years of age and older had an equal chance of being asked to participate. The CPS uses a weighting procedure to help adjust the sample to be representative of the population, though the survey is biased to those who have a residential phone (U.S Census Bureau).

My units of analysis for the Oregon and Washington Current Population Survey are individual wage earners. I restricted the sample to workers who were 18 years of age or older and worked as full-time, year-round, civilian, non-self employed workers in 2006. The total sample of Oregon and Washington respondents from the 2006 CPS was 6,317 and the restricted sample used for this project was 2,033 individuals.

4.2 Measures

4.2.1 Dependent Variable

My dependent variable is total individual wages and earnings. Measurement errors exist because respondents self-report their income, though the CPS is designed to triangulate the information. Because the variable of individual wages and earnings was positively skewed given the fixed lower limit of zero, I transformed the variable by using the natural log of earnings. The transformation results in a very mild negative skew because of influential outliers, but the natural log was the best transformation when comparing overall skew and kurtosis (Hamilton, 1992). The natural log is a standard transformation for income variables and the results in this project are similar to the results described in other wage models (Karamessini & Ioakimoglou, 2007; Borass & Rogers III, 2003; Allison, 1999).

4.2.2 Supply-side Measures

Based on the current literature, the following variables capture supply-side wage determinants which can be measured by the 2006 Current Population Survey: education, experience, number of hours worked in a week, and location of residence. Education was measured as the level of highest degree attained. I tested education as an interval variable and while income does increase at every additional year of formal education, the attainment of a Bachelor's degree or higher was found to a critical point in altering wages. I use a dummy variable for Bachelor attainment or greater coded as '1' and without a Bachelor's degree coded as '0.'

The CPS ASEC supplement does not include specific variables concerning relevant work experience, labor force continuity, or tenure at current job. Because experience is generally believed to increase as workers mature, age is used as a proxy for experience. Using age for experience produces an overgeneralization, particularly for women who have traditionally had greater labor force discontinuity, though it is the best alternative measure (Polivka, 2000; Boraas & Rodgers III, 2003). Workers have greater earning potential as they gain more experience

though the benefit associated with experience levels off over time. The squared variable of age tests for a nonlinear relationship of age over time.

Workers' commitment to their profession or industry was measured by the usual number of hours they worked in a week. For this sample of full-time employees, the usual number of hours worked is between 35 and 90 hours a week. The variable was normally distributed with the majority of the data centered around the mean of 40.25 hours usually worked in a week. Some error in this variable is expected because the data is based on the worker's perception of their average time worked, rather than empirical data. Increasing the number of hours worked in a week is associated with higher wages. It is possible that earnings level out at a certain number of hours worked, but the potential nonlinear relationship is not visible because the high-paying professional careers are associated with a greater number of worked hours.

Choosing an urban employment location can also exemplify workers' labor market commitment, according to supply-side theorists. As wages are regionally constructed, the location of the worker's employer can influence different wage structures. Because wages are often depressed in rural economies, workers in an urban area have a potentially greater wage opportunity (Boserup, 1998). Given that data on the employer's location is not provided, I use the worker's residential address to measure their commitment to an urban labor market. Given the increasing commute times and growth of suburban areas surrounding metropolitan areas in the Pacific Northwest, this may not be a true measure. I use a dummy variable to measure metropolitan status as '1' and nonmetropolitan status as '0.'

4.2.3 Demand-side Measures

Demand-side measures influencing individual earnings include characteristics specific to an employer, occupation, or industry. For this project, the variables of organizational size of an employer, representation by a union or labor association, and type of industry in which one is employed are tested as wage determinants. As part of demand-side characteristics, the occupational strength and physical demands required of each position are also wage determinants. However, I examine demand-side and physical requirements separately to understand their unique effects.

The organizational size of an employer was measured by the number of onsite employees. The Current Population Survey recorded responses as a limited ordinal scale. The variable is coded as '1' when there are less than 10 employees on the site where the interviewee is employed, '2' is 10-24 persons, '3' is 25-99, '4' is 100-499, '5' is 500-999 and '6' is 1000 or more onsite employees. I examined the possibility of a quadratic relationship (organization size squared, and organizational size cubed) as suggested by Mitra (2003), and both were found to be non-significant and therefore not included in the regression models (Allison, 1999).

As unions have been seen as a wage equalizer between women and men, a dummy variable was created to represent a unionized workplace, including those covered by a union, a labor union, or an employee association '1' and those not in an organized workplace '0'. While it is argued that labor unions alone may help increase women's wages, the sample for CPS 2006 Oregon and Washington residents did not warrant enough cases to study labor unions separately from unions and employee associations.

The type of industry in which a worker is employed can represent different wage potentials. The CPS has 11 major industry classifications, which can be reduced to either goods-producing or non-goods producing industries. The U.S. Department of Labor defines the goods-producing sector as production work in constructing, manufacturing, and natural resource extraction, including mining and agriculture that directly engages in the production of the establishment's products. The goods-producing sector is believed to depress wages because of the limited opportunities for advancement and the decreased number of available jobs due to restructuring. Because the non-goods producing sector is widely divergent, representing different requirements for education and training, it is not used in this analysis. The goods-producing industries used in this report include 'Farming, fishing and forestry occupations'; 'Construction and extraction occupations'; 'Installation, maintenance, and repair occupations'; 'Production Occupations'; ' Transportation and material moving occupations'. The occupations not considered goods-producing are 'Management, business and financial occupations'; 'Professional and related occupations'; 'Service occupations'; 'Sales and related occupations'; and 'Office and administrative support occupations. ' An indicator variable is used to represent goods-based industries as '1' and non-goods-producing as '0.'

4.2.3.1 Occupational Physical Demand Measures

I used the Dictionary of Occupational Titles (DOT) created by the U.S. Department of Labor, Employment and Training Administration in order to determine the level of physical demand within each occupation. The DOT was first created in 1977 and the fourth and final version used in this project was complete in 1991(http://www.oalj.dol.gov/libdot.htm). The occupational characteristics in the DOT were not based on workers' self-assessments but were instead empirically designed by the U.S. Department of Labor. The DOT was updated by labor economists to reflect the changing occupational demands from its conception through the final version. The DOT categorizes over 16,000 occupations by a wide-array of working conditions to determine the fit between worker and occupation, including work functions, aptitudes needed, and physical demands (Menaghan, 2001). The DOT includes characteristics based on strength, climbing, balancing, stooping, kneeling, crouching, crawling, reaching, handling, fingering, and sensory feeling.

The amount of strength required within each occupation is measured by the Dictionary of Occupational Titles as sedentary, light, medium, heavy, or very heavy. Table 1 below shows the amount of weight or force workers must demonstrate through lifting, carrying, pushing and/or pulling to be considered a strength-inducing occupation. A more detailed description of each category can be found in Appendix A. An interaction term of strength-requirements and being employed in a goods-producing sector is also added. Because strength is required in many low-wage service sector positions, such as childcare and food service, this interaction term examines the effect of strength within the potentially better compensated goods-producing sector.

Table 1: Strength Based Classifications using the Dictionary of Occupational Titles

	Strength as Measured by Force Exerted During Workday		
	Occasionally (0-33% of Workday)	Frequently (34-66% of Workday)	Constantly (67-100% of Workday)
1 Sedentary Work*	Less than 10 lbs.	Negligible	Negligible
2 Light Work*	Up to 20 lbs.	Up to 10 lbs.	Negligible
3 Medium Work	Up to 50 lbs.	Up to 20 lbs.	Up to 10 lbs.
4 Heavy Work	Up to 100 lbs.	Up to 50 lbs.	Up to 20 lbs.
5 Very Heavy Work	Over 100 lbs.	Up to 100 lbs.	Up to 50 lbs.

* Note: "A distinction is drawn between Sedentary and Light work based upon the requirement of the worker to stand and walk on the job. Sedentary work must not require the worker to be out of the seated position for more than 1/3 of the workday" (University of Alabama)

Sources: University of Alabama; United States Department of Labor, United States Employment Service, and the North Carolina Occupational Analysis Field Center; United States Department of Labor, Revised Handbook for Analyzing Jobs

Using a pair-wise correlation matrix, the physical demands that were found to be relevant and have a significant impact on individual earnings for this study are stooping, talking, crouching, kneeling and climbing. These occupational tasks are measured in the DOT by how frequently they are required within a workday. Physical demands are measured as being not present (coded as one), occasionally present when the activity is required up to 1/3 of the workday (coded as 2), frequently present when the demand is 1/3 to 2/3 of the workday (coded as 3), or constantly present when the demand is more than 2/3 of the workday (coded as 4) (U of Alabama; ICPSR).

In order to incorporate these physical demands into the CPS data, a crosswalk was used from the 1991 Dictionary of Occupational Titles (DOT) to the 2000 Standardized Occupational Classification system (SOC) and applied to individual wage earners in the Current Population Survey using a SOC to 2002 Census code crosswalk. In order to merge the 16,000 occupations listed in the DOT with the 503 more generalized occupational categories found in the Current Population Survey, I used averages for the level of strength and physical demands for each broader occupational category. This conversion unfortunately loses the nuances of each physical and strength demand within the occupational code, but the composite results reflect patterns acknowledged in other publications (OSHA).

4.2.4 Cultural Bias Measures

After accounting for supply and demand-side traits, including occupational physical demands identified in the extant literature, a sizable gender wage gap persists. The remaining factors point to potential employer bias against women and marginalized workers, measured by the percent female within each occupation and a range of demographic variables. To measure the cultural constructions affecting women's choices to enter physically-demanding careers, longitudinal data would be needed to study the impact of various recruitment and retention efforts. While cultural beliefs do influence occupational choice, I do not test it in this regression model.

As an indicator of occupational segregation, I used the national percent female for each occupation listed in the 2002 Census Code listed in the Current Population Survey. Using data from the 2006 American Community Survey produced by the United States Census Bureau, I created a variable to reflect the total number of women employed in each occupation compared to the total number of those employed within that occupation. The sample consisted of employed full-time, year-round, civilian workers who were 16 years of age and older.

Some of the individual demographic characteristics which could further illustrate bias are gender, marital status, and race/ethnicity. Gender is measured as an indicator variable for female '1' and male '0'. Marital status is also an indicator variable with '1' being those who report they are married, and married but their spouse is absent but not separated, and '0' for those who are widowed, divorced, separated, or never married. An interaction term was created for those who are both female and married. Race and ethnicity is an indicator variable 'Caucasian' measured as '1' for those who report they are "White only" and are not Spanish, Hispanic or Latino and '0' for those who reported a minority status or answered that they were Spanish, Hispanic or Latino.

4.3 Model Development

I use Ordinary Least Squares (OLS) regression modeling to examine how numerous explanatory variables affect the dependent variable of individual wages. OLS is considered a simple regression function because it has only one dependent variable and the model specifies causality; independent variables affect the dependent variable (Hill, Griffiths & Judge, 2001).

Regression parameters include the intercept and slope coefficient for the effect of each independent variable on wages. The intercept is the expected value of earnings when all independent variables equal zero, and in this project the intercept would be the amount a worker earns if all the independent variables had no effect on wages. Slope shows expected change in natural log of wages for each unit increase in the independent variables. To minimize the sum of squared errors between my predicted and observed results, individual earnings are equal to the intercept plus each coefficient. The model for the population is the transformed variable of earnings = $\beta_{0+}\beta_i X_i$, where X_i is equal to an index of supply and demand side determinants identified in sections 4.2.3 and 4.2.4, as well as potential factors demonstrating labor market discrimination in 4.2.5.

I interpret how these wage determinants predict an individual's earnings through a series of models. By following theory-based explanatory variables, I first examine supply-side determinants, then add demand-side characteristics, occupational physical demands, and lastly, variables which could incite discrimination from employers. The order of variables within each theoretically-based paradigm begins with the variable which is most correlated to individual earnings, and is followed by the variable that has the most explanatory potential, as measured by the adjusted coefficient of determination (Hamilton, 2003). This modified stepwise procedure combines theory discussed in the literature review of this paper with the specific observations in the Current Population Survey ASEC 2006 supplement. Because of my relatively large sample size (2,033), I have more than 20 cases per variable to run my selected multivariate model of 20 variables. Given the large sample, many of the variables are found to be significant and the sampling distribution is centered on the population's mean (Hamilton, 1992).

Independent variables were tested for nonlinearity by squaring the variable and raising it to the third power. If these variables were found to have a significant relationship with individual earnings, such as age, they were added to the model. Nonsignificant variables testing parabolic relationships were omitted from the model. To check for multicollinearity, I ran a pair-wise correlation of my dependent variable of the individual earnings with all of the dependent wage determinants. The correlation matrix found in Appendix B demonstrates a high correlation between strength requirements and many of the physical demands. This was anticipated given the joint physical demands of many occupations and no transformations were performed.

4.3.1 Supply-side Wage Regression Model

Human capital theorists ascertain key wage determinants as education, experience, and commitment to a particular industry or employer. Building from the supply-side measures discussed in 4.2.2, the dummy variable 'college' represents those who have received a Bachelor degree or greater educational attainment. The variable 'age' serves as a proxy for experience. Workers' location is an indicator variable for metropolitan residence. Commitment is further measured through 'usual hours worked in a week' for this sample of full-time, year-round adult employees. The following model reflects the base model of supply-side wage determinants:

$$\textit{Natural log (individual earnings)} = \beta_0 + \beta_1\, \textit{college education} + \beta_2\, \textit{age} + \beta_3\, \textit{age-square} + \beta_4\, \textit{hours normally worked in a week} + B_5\, \textit{residence in urban area} + \acute{\varepsilon}$$

4.3.2 Supply-side Plus Demand-side Wage Regression Model

Demand-side wage determinants include industry and occupation-specific characteristics. The level of gender segregation was measured by the national statistic of the percent of female workers within each occupation. The size of an employer was provided by the CPS interviewee and measured on a scale from least to most number of onsite employees. Union representation is a dummy variable signifying those covered by a union, labor union or employee association contract. The type of industry one is employed in is an indicator variable broadly indicated as a 'goods-based industry.' Building from the base supply-side model, the demand-side determinants added to the model are as follows:

$$\textit{Natural log (individual earnings)} = \beta_0 + \beta_1\, \textit{college education} + \beta_2\, \textit{age} + \beta_3\, \textit{age-square} + \beta_4\, \textit{hours normally worked in a week} + \beta_5\, \textit{residence in urban area} + \beta_6\, \underline{\textit{employer's organizational size}} + \beta_7\, \underline{\textit{union-represented position}} + \beta_8\, \underline{\textit{goods-producing sector}} + \acute{\varepsilon}$$

4.3.3 Supply & Demand-side Plus Occupational Physical Demands Regression Model

The relevant and influential occupational physical demands measured from the Dictionary of Occupational Titles were strength, stooping, talking, crouching, kneeling, and climbing. The interaction term of strength*goods-producing sector measures how the requirement of strength functions in non-service sector positions which tend to provide lower wages. By incorporating occupational physical demands into the supply and demand side models, the new model is:

$$\begin{aligned}\textit{Natural log (individual earnings)} &= \beta_0 + \beta_1\,\textit{college education} + \beta_2\,\textit{age} + \\ &\beta_3\,\textit{age-square} + \beta_4\,\textit{hours normally worked in a week} + \beta_5\,\textit{residence in urban area} \\ &+ \beta_6\,\textit{employer's organizational size} + \beta_7\,\textit{union-represented position} + \\ &B_8\,\textit{goods-producing sector} + B_9\,\underline{\textit{strength}} + B_{10}\,\underline{\textit{stooping}} + \beta_{11}\,\underline{\textit{talking}} + \\ &\beta_{12}\,\underline{\textit{crouching}} + \beta_{13}\,\underline{\textit{kneeling}} + \beta_{14}\,\underline{\textit{climbing}} + \beta_{15}\,\underline{\textit{strength*goods-producing sector}} + \acute{\varepsilon}\end{aligned}$$

4.3.4 Regression Model Adding Potential Factors Demonstrating Discrimination

Cultural biases attempt to explain the remaining unidentified gender wage gap. Persistent discrimination can be exhibited towards women, minority, unmarried, and/or older adult workers. The following model reflects potential cultural and institutional biases which may limit an individual's wages and earnings, in addition to the characteristics identified by human capital and demand-side theorists:

$$\begin{aligned}\textit{Natural log (individual earnings)} &= \beta_0 + \beta_1\,\textit{college education} + \beta_2\,\textit{age} + \\ &\beta_3\,\textit{age-square} + \beta_4\,\textit{hours normally worked in a week} + \beta_5\,\textit{residence in urban area} \\ &+ \beta_6\,\textit{employer's organizational size} + \beta_7\,\textit{union represented position} + \\ &B_8\,\textit{goods-producing sector} + B_9\,\textit{strength} + B_{10}\,\textit{stooping} + \beta_{11}\,\textit{talking} + \\ &\beta_{12}\,\textit{crouching} + \beta_{13}\,\textit{kneeling} + \beta_{14}\,\textit{climbing} + \beta_{15}\,\textit{strength*goods-producing sector} + B_{16}\,\underline{\textit{percent female per occupation}} + \beta_{17}\,\underline{\textit{female}} + \\ &\beta_{18}\,\underline{\textit{married}} + \beta_{19}\,\underline{\textit{Caucasian}} + \acute{\varepsilon}\end{aligned}$$

5 RESULTS

5.1 Sample Descriptive Statistics

The sample from the 2006 CPS ASEC supplement for Oregon and Washington residents consisted of 2,033 full-time, year-round, non-self employed civilian workers over the age of 17. The descriptive statistics in Table 2 illustrates demographic information for women and men in the CPS sample. The gender wage gap in the Pacific Northwest is evident when comparing women's and men's earnings. The median income for the sample was $36,000 and the mean was $48,214. The majority of women (60 percent) earned less than the median income and their mean earnings were $36,715. Men earned more than the average median income (59 percent) and had mean earnings of $56,695.

Supply-side wage determinants showed some gender differences. The attainment of a Bachelor's degree or higher was approximately the same for women and men with no significant difference of means. If age can serve as a proxy for experience, women and men had no significant difference: the average age for both genders was 41. Men worked more hours per week on average than women, significant at the .01 level. More women were residing in urban areas than men.

Demand-side wage determinants had differences between women and men in Oregon and Washington. Men were employed by companies that had a slightly larger workforce, and the difference in means is highly significant. Considerably more men (39.32 percent) were employed in goods-based occupations than women (8.34 percent). Men had more occupational demands regarding strength, climbing, stooping, kneeling, and crouching than women and the differences of means were all found to be highly significant. Women had a greater amount of occupational talking demands than men, also significant at the .01 level. No significant difference in union participation was found.

A key gender difference in the sample was the participation in gender segregated occupations. Over half of all men were in male-dominated occupations, where less than a quarter of women were in female-dominated positions. Because of the low-wage structure in female-dominated careers, more women tended towards positions in an integrated workforce which may provide a higher wage. Similarly, men in male-dominated positions may have less of an

incentive to pursue integrated or female-dominated occupations because the wages are likely to be lower.

TABLE 2: Descriptive Statistics by Gender, Current Population Survey for Oregon & Washington full-time, year-round, civilian workers over the age of 17; 2006 (n=2033)

	% of Women	% of Men
Married	57.13	65.81**
Minority (including Latino or Hispanic)	16.92	16.92
Below median income	60.49	40.09**
Above median income	37.20	58.89**
College degree or higher	31.05	31.28
Residing in an urban area	90.15	86.75*
Union represented occupation	4.63	4.96
Working in goods occupations[1]	8.34	39.32**
Female-dominated occupations[2]	24.57	11.45
Integrated occupations[2]	57.71	34.70**
Male-dominated occupations[2]	17.73	53.85**
	Women Mean (SD)	Men Mean (SD)
Age	41.14 (11.52)	41.02 (11.52)
Usual hours worked	39.12 (10.71)	41.09 (12.37)**
Organizational size[3]	4.39 (1.80)	4.15 (1.85)**
Strength-required occupation[4]	1.83 (0.59)	2.25 (0.72)**
Talking-required occupations[5]	2.55 (0.69)	2.21 (0.82)**
Climbing-required occupations[5]	1.08 (0.17)	1.26 (0.36)**
Stooping-required occupations[5]	1.34 (0.39)	1.53 (0.51)**
Kneeling-required occupations[5]	1.12 (0.22)	1.30 (0.41)**
Crouching-required occupations[5]	1.19 (0.28)	1.37 (0.42)**
Sample	864	1169

Notes: Numbers may not add to 100 due to rounding.
** Difference of means is significant at p<.01, * Difference of means is significant at p<.05
1: Goods based occupations are those in 'Farming, fishing and forestry occupations'; 'Construction and extraction occupations'; 'Installation, maintenance, and repair occupations'; 'Production Occupations'; ' Transportation and material moving occupations'

2: Female-dominated occupations are those that the national workforce is 70% female or greater, integrated occupations are those with 31-69% of the workforce is female, and male-dominated occupations are those equal to, or less than, 30% female.
3: Organizational size is the measurement of how many people a respondent's employer employs where 1 is less than 10, 2 is 10-24 persons, 3 is 25-99, 4 is 100-499, 5 is 500-999 and 6 is 1000+.
4: Strength is measured on a scale 1-5, 1 being sedentary and 5 being very heavy strength requirements.
5. Physical demands outside of strength are measured on a scale 1-4, where 1 is not present, 2 is when the requirement is present less than 1/3 of the workday, 3 is present 1/3- 2/3 of the workday, and 4 is present more than 2/3 of the workday.

Source: 2006 Current Population Survey, Annual Social and Economic Supplement for Oregon & Washington respondents with the Dictionary of Occupational Titles classifications

The occupational characteristics listed in Table 2 are strength and physical demands required of workers in various occupations. Table 3 lists the professions which require the greatest amount of each physical demand. As noted in section 4.2.3.1, the physical demands were empirically measured through the United States Department of Labor and compiled in the Dictionary of Occupational Titles. Strength is measured on an interval scale from 1-5, the least to the most strength required, while the other physical demands are rated from 1- 4, with 1 being the demand is 'not present' and 4 the demand is 'present more than 2/3 of the workday.'

Table 3 shows the professions that require the greatest amount of physical demand in each category. The wages for these occupations within the CPS sample for Oregon and Washington were averaged together. In every category, the mean income is greater than $60,000. The high wage is skewed by some of the top wage earning jobs, as some of the positions listed have a much lower income, such as Hosts & Hostesses; Sales Representatives; and Cleaners of Vehicles & Equipment. Strength-demanding occupations listed in Table 3 have the highest mean income of $70,029. Positions which require a great deal of stooping pay the least of all physical demands with a mean wage of $62,248. The other positions listed as requiring a high level of talking, crouching, kneeling or climbing have a mean individual earnings between $66,605 and $67,426. The average ratio of percent female for the occupations listed as physically demanding are all found to be male-dominated except those requiring high levels of talking. Positions listed as strength-demanding have an average of 21.5 percent female workers, stooping has 22.3 percent women in the workforce, crouching is 22.2 percent female, kneeling is 22.0 percent female, and climbing has the least number of women at 20.5 percent. Occupations requiring a high level of talking have integrated workforces with 40.3 percent of the workforce being women.

Table 3: Occupations Requiring High Levels of Various Physical Demands within the 2006 CPS Sample for Oregon & Washington

Strength (>=3.6)	**Stooping (>=2.82)**	**Talking (>=3.3)**
Ambulance Drivers & Attendants	Cashiers	Bill & Account Collectors
Automotive Service Technicians & Mechanics	Cement Masons, Concrete Finishers & Terrazzo Workers	Computer and Information Systems Manager
Construction & Building Inspectors	Cleaners of Vehicles & Equipment	Computer Software Engineers
Electrical Power-line Installers & Repairers	Elevator Installers & Repairers	Computer Support Specialists
Electricians	Fence Erectors	Financial Managers
Fence Erectors	Highway Maintenance Workers	Loan Counselors and Officers
Firefighters	Hosts & Hostess; Restaurant, Lounge & Coffee Shop	Public Relations Managers
Millwrights	Licensed Practical & Licensed Vocational Nurses	Sales Representatives; Services
Riggers	Painters; Construction & Maintenance	Telephone Operators
Telecommunications Line Installers and Repairers	Sheet Metal Workers	
Percent Female: 21.5	***Percent Female: 22.3***	***Percent Female: 40.3***

Crouching (>=2.6)	**Kneeling (>=2.7)**	**Climbing (>=2.5)**
Carpet, Floor, & Tile Installers & Finishers	Carpet, Floor, & Tile Installers & Finishers	Ambulance Drivers & Attendants
Cement Masons, Concrete Finishers & Terrazzo Workers	Cement Masons, Concrete Finishers & Terrazzo Workers	Cleaners of Vehicles & Equipment
Cleaners of Vehicles & Equipment	Cleaners of Vehicles & Equipment	Elevator Installers & Repairers
Elevator Installers & Repairers	Elevator Installers & Repairers	Painters; Construction & Maintenance
Fence Erectors	Fence Erectors	Riggers
Painters, construction & maintenance	Sheetmetal Workers	Security & Fire Alarm Systems Installers
Pest Control Workers	Structural Iron & Steel Workers	Structural Iron & Steel Workers
Structural Iron & Steel Workers		Telecommunications Line Installers & Repairers
Percent Female: 22.2	***Percent Female: 22.0***	***Percent Female: 20.5***

Source: 2006 Current Population Survey, Annual Social and Economic Supplement for Oregon & Washington full-time, year-round, civilian workers over the age of 17, combined with the Dictionary of Occupational Titles Classification

5.2 Multivariate Regression Results

Multivariate ordinary least squares regression can explain how different theoretical paradigms influence the dependent variable of the natural log of earnings. Because R-square can show a stronger goodness of fit just by adding superfluous variables, I use the adjusted R-square to account for the number of parameters in each model. The adjusted R-square is believed to stabilize when the dependent variable is modeled with an adequate amount of independent variables (Littell, Stroup, & Freund, 2002; Allison, 1999).

With a transformed dependent variable, the coefficients can be hard to understand. In order to review how each variable affects the log transformation of individual earnings, I take the mathematical unit of e (2.71828) to the power of the coefficient and subtract one. The result is converted into percentages, resulting in $100(e^b - 1)$, which shows the percentage change in earnings for unit increases in each independent variable (Allison, 1999; Hamilton, 2003).

5.2.1 Multivariate Regression Results by Theoretical Determinants

Table 4 summarizes the regression results for each of the theoretically-derived models. Human capital characteristics serve as the baseline model. Demand-side characteristics are then added to further explain the variation in individual wage and earnings. While occupational physical demands are part of demand-side determinants, I add them separately to understand their explanatory power as a group over and above other demand-side factors. The fourth model builds on the existing supply and demand-side variables by adding measures of potential bias. To measure goodness of fit for each model, the adjusted R-square is used to account for extraneous variables. F-tests on differences in R-square assess whether adding each set of variables helps explain a significantly greater variation in the natural log of earnings. Each model presented provides a significant difference at the .01 level based on the results of an F-test as compared to the preceding model.

In the supply-side model, each variable is found to be a significant wage determinant. Using the adjusted R-square as a determinant of model fit, human capital characteristics explain 24 percent of the variation in individual wages. Having a Bachelor's degree or more educational attainment increases wages by 63 percent and is highly significant at the .01 level. Age as a proxy for experience also significantly increases wages; however, the relationship between age

and earnings is nonlinear. The significant negative effect of age-square demonstrates that the benefits of age plateau and bias against older workers likely exists. Working more hours in a week increases workers' wages, as does being located in an urban area. When comparing the standardized coefficients for the baseline model, age is the largest determinant. The attainment of a college degree is more influential than the number of hours worked or being located in an urban area.

The demand-side model builds upon the supply-side variables, as shown in the second column of Table 4. Demand-side factors account for occupational and industrial characteristics which influence an individual's wage potential. By controlling for organizational size of an employer, union-representation, and being employed in a goods-based occupation in addition to the supply-side characteristics, 25 percent of the variation in wage is accounted for. Demand-side characteristics increased the adjusted R-square by less than two percentage points compared to the model with only supply-side characteristics. The attainment of a Bachelor's degree becomes slightly less important in determining wage, but remains a significant, positive determinant. Age and age-square have about the same effect as they did in the supply-side model alone. Residing in an urban area becomes insignificant after controlling for demand-side characteristics. While organizational size of an employer and union representation both positively increase workers' wages, only the organizational size is significant. Being employed in a goods-based occupation negatively but insignificantly affects wage according to this model. According to the standardized coefficients, the top wage determinants for the combined model are first age, then age-square, college attainment, and then the organizational size of an employer. Being employed in a goods-based occupation is the least determinant of earnings.

The third model listed in Table 4 incorporates occupational strength and physical demands along with other supply and demand-side factors. By adding these characteristics, the adjusted R-square increases by four percentage points to explain 29 percent of the variation in wage. All of the supply-side characteristics remain a significant determinant of wage; however, a high educational attainment becomes less influential. The effect of age, or experience, also decreases compared to the baseline model and baseline plus demand-side models. Age-square remains a significant and negative determinant of wage, demonstrating that age has a nonlinear relationship with wages. The standardized coefficients reveal that age is still the largest, single determinant. When controlling for physical demands, residing in an urban area becomes significant again at

the .05 level. The demand-side characteristics listed in the second model have the same effect on wage after controlling for strength and physical demands in the third model.

Still referring to the model which includes physical demands, strength is found to be a negative but nonsignificant wage determinant. One reason strength is nonsignificant is because of the diversity of occupations that require heavy amounts of lifting, carrying, pushing or pulling, ranging from the traditionally low-paid service sector positions and the low-skilled blue collar professions to the highly trained physically demanding jobs. When strength in a goods-based occupation was tested, it was also found to be nonsignificant. In addition to variations in skill and training in strength-demanding positions, another important factor determining wage is the ratio of female employees within each occupation, and is tested in the following model. A high level of required stooping in an occupation significantly decreases wages. For each unit of increase for stooping, wage decreases by 39 percent. Stooping is the third largest wage determinant in this model as determined by the standardized coefficients, even greater than a college degree attainment. Talking requirements positively and significantly affect wage by 10 percent, suggesting that positions which require leadership or managerial skills provide better pay. Crouching reduces wages by 10 percent, but it is not a significant result. Because crouching is required in such a wide-array of positions, the presence of this physical demand has a rather diffuse effect compared to other wage determinants. Kneeling and climbing are both large, positive wage determinants, significant at the .01 level.

Because supply and demand-side variables account for less than 30 percent of overall wage (.2924), when using the adjusted R-square as a model fit, we can determine that there are many other dominant wage determinants. The fourth model in Table 4 controls for employee choices to better their wages as discussed in human capital theory and the influential occupational characteristics including physical requirements as presented in demand-side theory, but includes measures of potential cultural bias. The fourth model adds the ratio of gender segregation within each profession and indicator variables of being female, married and Caucasian. The result is a significant increase of five percent in the adjusted R-square when comparing this model to the supply and demand-side model and a nearly 12 percentage point increase when compared to the supply-side model alone. The full model explains 36 percent of the variation in earnings when using the adjusted R-square as a model fit. With all of these controls, the effect of having a Bachelor's degree or higher educational attainment is nearly half as important as it was when

only examining supply-side factors. Standardized coefficients demonstrate that age is still the most influential characteristic, followed by gender and then college attainment. The effects of the demand-side characteristics of size of an employer, union representation, and being employed in a goods-based occupation remain unchanged after controlling for cultural bias. The physical demands however do alter. Strength becomes a significant, negative wage determinant, depressing wages by 13 percent for every increased unit of strength. Stooping still depresses wages, but less so than it did when the factors of cultural bias were not controlled for. Talking becomes slightly less significant and crouching remains nonsignificant. While kneeling is still a positive wage determinant, it is less influential when controlling for gender, race and marital status. Climbing becomes an insignificant factor.

The starkest findings in Table 4 are the highly significant results for each of the variables representing potential bias. Percent female within an occupation is a highly significant wage deterrent. Even after controlling for all other variables, being female depresses wages by 28 percent and is highly significant at the .01 level. These results highlight the gender wage gap in the Pacific Northwest and suggest that even when controlling for supply and demand-side variables, employers are biased against their female employees. Further bias exists against non-legally married workers, for workers who are married are likely to earn 15 percent more. Nearly as influential as gender is race/ethnicity. Being Caucasian increases expected earnings by 21 percent, suggesting that minority workers experience depressed wages because of their race/ethnicity. Using the standardized coefficients as a comparison, being female depresses wages more than the attainment of a college degree will improve wages. The number of women employed within an occupation is a larger determinant of earnings than the number of hours usually worked in a week.

When the variables are reviewed across each of the models listed in Table 4, the attainment of a college degree significantly, positively affects earnings in all of the models. However, the magnitude of a Bachelor's degree or more is reduced by half after controlling for demand-side variables, gender, marital status, and race/ethnicity (63 percent to 38 percent). Age is used as a proxy for experience and while it positively influences wage, age-square negatively influences earnings, suggesting bias against older workers. In all models, the more hours an employee works in a week, the more they earn, though it is not one of the most influential wage determinants when comparing standardized coefficients. Having a residence in an urban area is a

significant positive factor, and becomes highly significant when controlling for gender and minority status. The organization size of the employee's workplace is directly correlated with earnings, but being employed in a goods-producing industry is negatively correlated with an individual's wages. Being covered by a union, labor union, or employee association contract is non-significant in all the models. Union coverage does not impact wages, all else being equal. While this holds true for the subsequent models, I leave the variable in each model to show that unionization may not be best way to mitigate wage inequity between women and men in Oregon and Washington. Occupations that require stooping significantly depress wages. Jobs that require talking will significantly improve wages, but not as much as the jobs that require kneeling.

Table 4: OLS results by four theoretical paradigms

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Table 4: OLS results by four theoretical paradigms CONTINUED

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5.2.2 Multivariate Regression Results for Wage Determinants Disaggregated by Gender

Human capital characteristics, demand-side determinants, and cultural constraints can be explored to see if women are affected differently than men. As shown in Table 5, supply and demand-side variables affect women and men in similar ways. Attaining a college degree, working more hours in a week, and being in an urban location all significantly, positively affect both women's and men's wages. A college degree improves women's wages by 43 percent and men's wages by 35 percent. Aging improves everyone's wages, but only until a certain point as older workers earn less. Across the board, workers also get paid more as the size of their employer increases. For both women and men, organizational size increases wages by five percent and is found to be highly significant at the .01 level. Union representation is not significant for men or women. Being in a goods-producing sector negatively affects women's wages and positively affects men's wages; however, neither result is significant.

Occupational physical demands show some variation by gender. Strength negatively affects wage for all workers, and is more of a wage deterrent for women. Stooping requirements are nonsignificant for women, but significantly depress men's wages by 31 percent. While positions that require crouching will earn women considerably less money, the positions that require them to kneel will positively affect their earnings. Some of the positions which women kneel are Network Systems & Data Communication Analysts; Licensed Nurses; Physical Therapist Assistants & Aides; Electricians; Radio & Telecommunications Equipment Installers & Repairers; and Miscellaneous Assemblers & Fabricators. Further research may indicate that positions requiring kneeling provide a greater level of on-the-job-training which may be correlated with higher pay. The requirement of climbing improves men's wages. Positions that require men to climb include Painters; Structural Iron & Steel Workers; Elevator Installers & Repairers; Security & Fire Alarm Systems Installers; Telecommunications Line Installers & Repairers; Riggers; Ambulance Drivers & Attendance; and Cleaners of Vehicles & Equipment. No significant result for the interaction term of strength & goods-based occupation was found for women or men.

Both women and men employed in occupations that are female-dominated earn significantly less at the .01 level. Labor market discrimination is further exemplified by biases based on race/ethnicity and marital status. Being Caucasian positively, increases workers' wages

and is even more significant for men than women. Minority workers are still disadvantaged in Oregon and Washington occupations, regardless of gender. Results from Table 4 showed that married workers overall do better than unmarried workers; however, a very different story is told when controlling for gender in Table 5. Marital status is a nonsignificant determinant of earnings for women, but being married and male increases wages by nearly 30 percent, significant at the .01 level. Married men are perceived by their employers as being more responsible on the job, but women are not viewed the same way. Married men are conjectured to be able to work more hours as a result of doing less household labor, a burden still largely conducted by women. The benefits of being married are a stark difference between women and men in Oregon and Washington.

Another important gender difference in Table 5 is the explanatory power the model presented has in determining wage. The theory-driven variables explain only 27 percent of wage potential for women and 37 percent of wage potential for men when using the adjusted R-square as a model fit. The discrepancy suggests that omitted variables may influence women's earning more greatly than men's earnings. Economic models are often built from a male-dominated perspective where wage determinants are directly related to the idea of an individually-based progression of employable skills. The variables that influence wage according to traditional economic theory do not account for informal labor demands and instead, identify variables that are associated strictly with the idea of hard work and a related compensation structure. Human capital characteristics specifically measure individual labor force commitment separate from external social pressures which are intertwined with individual wage determinants. These constructions reiterate the idea that formal labor is somehow removed from informal labor. Because men still do not contribute nearly the same to household demands as their female counterparts, the framework explains more of men's economic situation relative to women's situation.

TABLE 5: OLS Regression Model by Gender PAGE 1/2

TABLE 5 OLS Regression Model by Gender CONTINUED
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5.2.3 Multivariate Regression Results by the Level of Gender Segregation within Occupations

The level of gender segregation is clearly an issue in determining wage. In Table 6, we see that supply, demand, and cultural bias variables affect earnings in similar ways in segregated and integrated occupations, though some key differences are also apparent. Occupations are separated into three categories: those that are female-dominated with 70 percent or more of the workforce is women, integrated occupations with 31 to 69 percent of the workforce is female, and majority male occupations with 30 percent or less female workers. Table 6 demonstrates the advantages workers have in the occupations employing mostly men, suggesting a devaluation of women in the labor market.

The model for female-dominated occupations in Table 6 shows similar patterns as the model in Table 5 did for women. The model for female-dominated occupations explains 34 percent of the variation in wages, considerably less explanatory power than the male-dominated model. In these female-dominated occupations, a college degree is a very important wage determinant, suggesting a nearly 61 percent wage increase for those with the highest educational attainment. Age remains a significant positive factor, although the impact declines over time. This is the only model where the usual number of hours worked per week dropped in significance from the .01 level to the .05 level. Because there were not enough goods-based, female-dominated occupations in the Oregon and Washington CPS sample, it was dropped from this model. In female-dominated professions, every occupational physical demand is insignificant, implying other factors are larger determinants of wage. Being either female or Caucasian in female-dominated occupations is also nonsignificant. Working with mostly with women affects wages so significantly that it trumps the effect of gender or race/ethnicity. Being a married man in a female-dominated occupation significantly increases wages by 41 percent, but being a married woman significantly decreases wages by 35 percent.

Integrated occupations are similar to female-dominated occupations with a few exceptions. The explanatory power of the model for integrated positions is considerably weaker, identifying only 26 percent of the variation in wage. This helps demonstrate the influential capacity of the level of gender segregation within each occupation. Residing in an urban area and being employed within an integrated workforce increases wages by nearly 27 percent. Two occupational physical demands are significant deterrents in the integrated workforces that were

not in the female-dominated occupations: strength and crouching. Kneeling requirements increase wages in mixed workforces. As expected, being female negatively affects wages, by a highly significant four percent. Being married also significantly improves wages within male-dominated occupations, but only for male workers. In integrated occupations, a non-minority racial/ethnic status significantly improves individual wage potentials by almost 27 percent.

Male-dominated occupations are best represented by the human capital, demand-side, and cultural constraint variables, as determined by the adjusted R-squares in Table 6. Male-dominated occupations explain 45 percent of the variation in wage. In these positions, the attainment of a college degree is still a significant determinant in wage, but is much less influential when compared to female-dominated occupations: A Bachelor's degree increases wages by 29 percent in male dominated sectors and 61 percent in female-dominated positions. Age consistently affects wages in similar ways as demonstrated in previous models. Being in an urban area is a nonsignificant factor of wage when working with mostly men. The size of the employer indicates a positive relationship with wage. Being a married woman is still a wage depressor and sporting a ring for men is a wage booster in male-dominated occupations. Being a Caucasian worker also provides economic benefits, reiterating a bias against minority workers.

Working in a goods-based, male-dominated occupation significantly disadvantages workers by 45 percent. This is the first model where working in a goods-based sector is found to be significant. However, the interaction term between strength in a goods-based occupation is found to be a significant, positive variable. Strength alone significantly decreases wages in these positions, but the use of strength in the goods-producing sector when the workforce is largely male is a positive wage determinant. Another key findings from Table 6 is that occupations which are both male-dominated and require climbing significantly increases workers' wages. Male-dominated positions with a high level of climbing required include: Painters; Structural Iron & Steel Workers; Elevator Installers & Repairers; Security & Fire Alarm Systems Installers; Telecommunications Line Installers & Repairers; Riggers; Ambulance Drivers & Attendance; and Cleaners of Vehicles & Equipment. Positions which require strength and heavy manual labor, and those requiring climbing and lifting above one's head are dominated by men because this type of work is still seen as 'men's work.' Men are seen to have a 'natural advantage' because of their physical strength and therefore deserve more money. The last bastions of highly-skilled, high-wage, male-dominated jobs are those that require the use of muscle and are based in

natural resource extraction, construction, or fishing, farming and forestry occupations. These types of positions provide higher wages for workers in the Pacific Northwest, but the occupational demands are secondary wage determinants when compared to occupational demographics of significantly more male workers. In short, occupations which require strength may be better paying only because these positions are overwhelmingly held by men. Male-dominated positions also tend to pay significantly better if a worker is required to do more talking. This may illustrate further relationships between gender and wage, suggesting that men are more often seen as leaders and women as supporters. As occupational requirements have shifted and more women have been able to consider these nontraditional careers, they still occupy very little space in these potentially better paying positions. In fact, even when employed in positions dominated by male employees, women are still significantly disadvantaged as illustrated in Table 6.

Table 6 OLS Regression by level of gender segregation
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Table 6 OLS Regression by level of gender segregation CONTINUED
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6 DISCUSSION

The central question proposed in this study was whether or not occupational physical demands influence individual earnings for workers in the Pacific Northwest when controlling for a range of theoretically determined variables. The results show that certain physical demands may in fact increase earnings. Strength and climbing-required occupations within the goods-producing sector positively increase wages. Yet the reason these positions are so well paid is that the workforce is extremely male-dominated and male workers have a significant labor market advantage. In nearly every occupational group, workers earn less money when the workforce is dominated by women. Occupational segregation illustrates a persistent devaluation of women's contribution in formal labor markets. Women may be able to earn more relative to men by entering positions that require a greater level of upper body strength; however, as soon as a critical mass of female employees is reached, wages would likely decrease for all workers.

The low-paying nature of female-dominated positions exhibits institutional bias, but individual gender prejudice exists as well. Even after controlling for a range of employee choices presented by human capital theorists and influential occupational characteristics including the level of physical demand required within professions, being female significantly lowers overall wage potential. Women in Oregon and Washington labor markets are still economically disadvantaged because of their gender alone.

Findings illustrate patterns of persistent labor market discrimination related to race/ethnicity, marital status, and age in addition to gender. Caucasian workers earn significantly more than minority workers, suggesting a persistent bias among employers. Marital status is another factor implying bias. While married workers are generally better off than non-legally wed workers, men are significantly compensated when married, yet married women receive no economic benefit. It is speculated that married men have more of their informal labor needs met and can dedicate more to their professional lives, and are viewed accordingly by employers. Age also affects wages. Age positively affects wages, but only until a certain point as older workers experience bias. Institutional labor market bias against women, minority, unmarried and older workers is unacceptable.

Remedying inequities for women and other marginalized workers will require many different strategies. While different employment strategies and policy implementations can

continue to be tried, no solution will be truly effective unless women are valued in the same capacity as men. In the interim of radical social change, structural change originating from the government and employers can be instigated. Bolstering women's recruitment and retention into traditionally high-paying, male-dominated occupations may also help raise women's wages in relation to men's wages, if only for a short time.

6.1 Strategies to Alleviate the Gender Wage Gap

6.1.1 Institutional Structural Changes

Institutional changes include domestic policy applications, employer-based solutions, and cultural shifts which would potentially allow opportunities for higher wages for women. Government enforced policy proscriptions can help regulate discriminatory practices against women. The largest employers can be monitored the most closely and actions can set the way for smaller employers. Equal employment opportunities (EEO) efforts also work to establish specific comparable-worth initiatives and increase women's high-wage representation (Rose & Hartmann, 2004). Policies such as Comparable Worth Acts, Equal Pay, and Title IX have had positive, though uneven impacts for female wage earners. Further regional, policy applications should be further researched to lessen gender wage disparity (Johnson & Solo, 1996; Rose & Hartmann, 2004).

Employer-based initiatives can improve gender wage equity through recruitment, retention, training, and advancement opportunities. Attention to initial job assignments and starting pay, mentoring systems, and advancement opportunities may mitigate gender bias. Because informal labor responsibilities significantly contribute to women's depressed wages in relation to men, it is critical that employers address women's 'second shift.' Family friendly policies could be established to encourage flexible hours, paid time off can be provided for both maternity and paternity leave, and affordable child care options can be created (Frome, Alfeld, Eccles & Barber, 2006; Rose & Hartmann, 2004). Government intervention may help to stimulate flexible hour structures and better paid time off. These remedies can be applied specifically to heavily male-dominated positions for the most economic benefit.

6.1.2 Integrating Women into Male-Dominated, Physically Demanding Jobs

The barriers women face in entering physically demanding jobs can be overcome through systemic efforts. An important distinction is made between the promotion of low-skilled, low-paying, strength-required positions predominately located in the service sector and the well-compensated, physically-demanding positions mostly in the goods-producing sector. As noted earlier, the well-paid positions are largely a result of the occupation being male-dominated. However, women can still earn more in these positions, albeit temporarily. Further, having more women in positions identified as strenuous and labeled as 'men's work' broadens occupational choices and in many ways, defies the perception that women are weak. Employers can actively support women's entry into these positions and provide opportunities for women to see themselves as successful doing this work. A central component for promoting job success for both women and men is the development of family friendly policies that support the household and formal labor demands. Informal networks and mentorship systems can also be created to recruit and retain women into specific occupations. State apprenticeship models can also help recruit and retain women into the traditionally male-dominated careers in the trades specifically. Formal classroom instruction accompanies on the job training requiring very little economic investment on behalf of the apprentice. Finishing with journey level, or master certification, a trades occupation leads to wages $25 to $32 per hour in Oregon with retirement and medical benefits throughout the apprenticeship and into the career (Bureau of Labor & Statistics, Historical CPS). State apprenticeship models have been seen as the last way to transcend class in the U.S. because of the high wage structure in exchange for little economic investment on behalf of the worker. State apprenticeship models pay workers to learn a trade skill that becomes commensurate with experience. The government model also allows for more systemic ways to encourage and enforce gender wage parity. Overall, encouraging women to enter physically-demanding positions requires many different kinds of support and keen attention to the possible ramifications.

6.2 Proposed Future Research to Reconceptualize Labor Market Models

As with many data sets that aim to predict wage, the CPS does not have an exhaustive list of questions to control for all hypothesized wage determinants. Some of these omissions may

have intervening or direct effects with the variables used in this analysis and explain more of the gender wage gap story. The CPS could more accurately tease apart occupational classification and earnings for worker's primary, secondary, and tertiary occupations. I focus on primary jobs to determine wage inequities, thus overlooking nuances of those who do contract and seasonal work. Because many physically demanding jobs, such as fishing and construction, employ temporary workers, I am missing important employment patterns. Adding the variable of tenure at a worker's current job could explain more supply-side determinants (Polivka, 2003), while initial job assignment comparisons, presence of mentors, and the impacts of supervisor evaluations could illuminate more demand-side determinants (Maume, 2004). Positions that require cognitive skills, managerial authority, and/or hazardous working conditions have also been shown to increase individual wage and are not represented in the CPS (Maume, 2004; England, 1992). Parent's level of education and profession could also influence an individual's occupational choice and their earnings (Maume, 2004). The percent of female employees within each profession could be broken down more to determine if a female or male-dominated managerial workforce determines greater wage inequity for employees. Lastly, informal labor demands need to be an important component of how formal labor is measured, including family care responsibilities (McCrate, 2005; Rose & Hartmann, 2004). Different measurement scales should be identified by working women in order to tell a more complete story regarding wage setting. Because the models I have used better predict men's wages than women's, it is likely that many of these omitted variables would add a greater understanding about women's wage determinants.

By adding the Dictionary of Occupational Titles' strength and physical demand requirements with the Oregon and Washington Current Population Survey data, I was able to determine how these corporal occupational demands interact with earnings. However, the DOT provides outdated strength and physical demands because the last version was finalized in 1991 (http://www.oalj.dol.gov/libdot.htm). Many professions have changed dramatically since the early 1990's due to the enormous effect of technology and industrialization. The era that went unstudied from 1990 until 2006 corresponded with many of the global restructuring efforts, increasing technological advancement in the North and manual labor 'opportunities' in the South. Due to increased industrialization, many professions that once required a worker to manipulate, handle, or move objects now rely more on mechanical processes. While

occupational classification is a cantankerous issue among labor economists, employer associations, and workers, a more recent skill-based taxonomy may help to describe a different story regarding occupational physical demands and individual earnings.

7 CONCLUSION

Despite differing theoretical frameworks explaining the gender wage gap, there is strong agreement that a disparity exists between female and male wage earners. The residual gender wage gap is seen to have significant repercussions not only for women, but indicates systemic social and economic problems in the United States (Blau, Simpson & Anderson, 1998; Bradbury, 2002; Hamil-Luker, 2005; Karamessini & Ioakimoglou, 2007; Rose & Hartmann, 2004; Flynn, 2003; Maume, 2004). This paper investigates how women's and men's wages are affected by different wage determinants, namely supply-side, demand-side characteristics including occupational physical demands, and other factors illustrating labor market discrimination. Supply-side factors examined were the level of education a worker has attained, level of experience, number of hours usually worked in a week, and the location a worker resides. All of these characteristics were found to have a significant, positive influence on wage; however, age when used as a proxy for experience had a nonlinear relationship with wages. While educational attainment was found to be a key factor in wage setting, it was a more important determinant for women and for those employed in female-dominated occupations. Working more hours in a week will improve wages, but is slightly less significant in female-dominated occupations.

Demand-side factors included in this study were organizational size of an employer, occupational representation by a union, and being employed within a goods-based occupation. Physical demands within various positions are also a part of occupational and industrial characteristics. Results showed that the larger the size of an employer, the greater the wages for both women and men, though employer size was more significant for those employed within male-dominated occupations. Union representation was not found to be significant in any model. Being employed in a goods-based occupation affected wages negatively unless workers have a high requirement of strength and are employed in a male-dominated occupation.

Occupational physical demands also influenced wages and the effects varied for women and men, and from female-dominated to male-dominated occupations. Kneeling generally improved workers' wages, while stooping depressed them. Jobs requiring kneeling have a considerable amount of on-the-job-training, a variable which should be considered in future models. The requirement of kneeling was a significant, positive determinant for women and not for men. Stooping requirements are often found in female-dominated, low-skill, low-wage

service sector positions and negatively influence wage. Because of the gender segregation found within positions that require stooping, only men are significantly disadvantaged by this occupational demand because they are likely employed within a female-dominated industry. Climbing requirements only significantly, positively affected men and are closely associated with the demographics of an occupation, such as the level of gender segregation. While strength negatively affected earnings for both women and men, when strength is required within male-dominated positions that also require climbing, workers earned significantly more. These well-paid positions represent the last bastion of men's economic advantage, equating their perceived upper body strength with greater economic gain.

The gender differences highlighted by supply and demand-side characteristics illustrate that there are important characteristics related to wage setting which are not fully represented in those two paradigms. Adding variables which could imply labor market discrimination, such as gender, level of gender segregation per occupation, race/ethnicity, and marital status were all found to be highly significant influences on wage. Being female was a highly significant, negative wage determinant in every model presented. Biases against women were also demonstrated by the percentage of female workers within each occupation. Female-dominated occupations significantly, negatively influence wages, while male-dominated occupations have the opposite effect. The level of gender segregation was a highly significant result: For every percentage increase of female workers, workers' expected earnings drop significantly. In addition to gender, racial bias is also demonstrated. Caucasian workers are significantly advantaged in Oregon and Washington labor markets, demonstrating discrimination against minority workers. Being married is also a very significant influence on wage, but only for men. Marital status is either negative, or nonsignificant for female workers. The difference is related to informal labor inequity, where married men tend to have more of their households needs met and therefore can dedicate more to work, or are at least perceived as more dedicated by employers.

Wage setting is a complex process set in political, cultural, and economic contexts. My central hypothesis was that occupations which required a high level of physical demand would increase workers' wages. Increasing women's participation in these types of positions would improve their expected earnings and further lessen some of the gender wage gap in Oregon and Washington. However, I found that the wage increase for women entering physically demanding occupations would be temporary because as soon as male-dominated, strength-demanding

positions like electricians, sheet metal workers, steel workers, and cement masons have more female employees, everyone's wages would fall. Being female and working with a majority of women significantly and negatively affects individual earning potential in the Northwest Occupational physical characteristics are secondary to a persistent labor market bias against women.

To remedy the cultural bias and subsequent gender wage inequity, multifaceted strategies are needed. First, institutional supports through government and employment channels can help mandate equal wage laws and equal opportunities. Second, in order to better identify the factors which determine wages, especially for women, new ways of conceptualizing labor economics are needed. New indicators measuring informal labor need to be instigated to tell a more complete story. Third, increasing women's participation in physically-demanding jobs would at least provide some temporary increase of wages, if the positions were in male-dominated occuaptions. Much work remains to understand the extent of labor market discrimination and the proposed solutions are temporary given the persistent and unacceptable gender bias. Women will continue to be devalued and underpaid until the labor market bias is address. While no easy solution exists, it is my hope that lessening the societal constructions which limit women's occupational opportunities will not only reduce the gender wage gap, but work to address a systemic bias against women.

6 REFERENCES

Allison, P. (1999) *Multiple Regression: A Primer*. Pine Forge Press.

Alter, R. & Seta, C. (2005) Compensation for Inconsistencies: The Effects of Stereotype Strength on Expectations of Applicant's Job Success and Satisfaction. *Sex Roles.* 53, 7(1).

Ames, B., Brosi W. & Damiano-Teixeira, K. (2006) 'I'm Just Glad my Three Jobs Could Be Done During the Day:' Women and Work in a Rural Community. *Family Relations.* 55(1): 119-131.

Ashbrook, C. (2004) Oregon Plan of Action: Objectives & Action Steps for Recruiting, Training, Hiring, Retaining and Advancing Youth of Color and Women in the Highway Construction Trades in Oregon. *Oregon Department of Transportation, Office of Civil Rights as produced by Oregon Tradeswomen, Inc*.

Bertaux, N. (1991) The Roots of Today's 'Women's Jobs' and 'Men's Jobs': Using the Index of Dissimilarity to Measure Occupational Segregation by Gender. *Explorations in Economic History*. 28(4): 433-59.

Blau, F., Ferber, M. & Winkler, A. (2006) *The Economics of Women, Men & Work*, 5th edition. Uppersaddle River: Pearson: Prentice Hall.

Blau, F., Simpson, P. & Anderson, D. (1998) Continuing Progress? Trends in Occupational Segregation in the United States over the 1970's and 1980's. *Feminist Economics.* 4(3) 29-71.

Boraas, S. & Rodgers III, W. (2003) How Does Gender Play a Role in the Earnings Gap?: An Update. *Monthly Labor Review*. Bureau of Labor Statistics. Prepared for the National Economic Association in Atlanta, 1/4/2002.

Boserup, E. (1989) Population, the Status of Women, and Rural Development. *Population and Development Review, Supplement: Rural Development and Population: Institutions and Policy*. 15: 45-60.

Bradbury, K. (2002) Education and Wages in the 1980's & 1990's: Are all groups moving up together? New England Economic Review, Federal Reserve Bank of Boston. 1: 19-46.

Correll, S., Bernard & S., Paik, I. (2007) Getting a Job: Is There a Motherhood Penalty? *American Journal of Sociology*. 112(5): 1297-1338.

Cotter, D., DeFiore, J., Hermsen, J., Marsteller-Kowalewski, B. & Vanneman, R. (1998) The Demand for Female Labor. *The American Journal of Sociology.* 103(6): 1673-1712.

England, P. (1992) *Comparable Worth: Theories and Evidence*. New York: Aldine de Gruyter.

Flynn, N. (2003) The Differential Effect of Labor Market Context on Marginal Employment Outcomes. Sociological Spectrum. 23(3): 305-330.

Figart, D., Mutari, E. & Power, M. (2002) *Living Wages, Equal Wages: Gender and Labor Market Policies in the United States*. Routledge.

Figart, D. & Lapidus, J. (1998) Remedying 'Unfair Acts': United States Pay Equity by Race & Gender. *Feminist Economics*. 4(3): 7-28.

Fortin, N. & Lemieux, T. (1997) Institutional Changes and Rising Wage Inequality: Is There a Linkage? *Journal of Economic Perspectives.* 11(2): 75-96.

Fridley, D. (2006) Metro & Rural Average Pay Diverges. Oregon Employment Department: Oregon Labor Market Information System. Retrieved 2.10.08. http://www.qualityinfo.org/olmisj/ArticleReader?itemid=00005024

Frome, P., Alfeld, C., Eccles, J. & Barber, B. (2006) Why Don't They Want a Male Dominated Job? An investigation of young women who change their occupational aspirations. *Education Research & Evaluation*. 12(4): 359-371.

Goldenhar, L. & Sweeney, M. (1996) Tradeswomen's Perspectives on Occupational Health and Safety: A Qualitative Investigation. *American Journal of Industrial Medicine*, 29(5): 516-520.

Gringeri, C. (2001) The Poverty of Hard Work: Multiple Jobs and Low Wages in Family Economies of Rural Utah Households. *Journal of Sociology and Social Welfare*. 28(4).

Hamilton, L. (1992) *Regression with Graphics: A Second Course in Applied Statistics*. Brooks-Cole.

Honey, M. (1984) Creating Rosie the Riveter: Class, Gender and Propaganda during WWII. University of Massachusetts Press.

Institute for Women's Policy Research Center. (2006) Gender Wage Ratio, 1955-2006, Full-Time Workers. Retrieved 5.4.07. http://www.iwpr.org/index.cfm.

Information Technology Associates. Dictionary of Occupational Titles, Appendix C: Components of the Definition Trailer. Retrieved 5.03.2007 http://www.occupationalinfo.org/appendxc_1.html#STRENGTH

Jaquette, J. & Summerfield, G. (2006) *Women and Gender Equity in Development Theory & Practice: Institutions, Resources & Mobilization.* Durham & London: Duke University Press.

Jolliffe, D. (2004) Persistent Poverty is More Pervasive in Nonmetro Counties. *Amber Waves*. 2(4).

Karamessini, M. & Ioakimoglou, E. (2007) Wage Determination & the Gender Pay Gap: A Feminist Political Economy Analysis & Decomposition. *Feminist Economics*. 13(1): 31-66.

Kahn, L. (2000) Wage Inequality, Collective Bargaining, and Relative Employment from 1985 to 1994: Evidence from Fifteen OECD Countries. *The Review of Economics and Statistics.* MIT Press. 82(4): 564-579.

Kongar, E. (2008) Is Deindustrialization Good for Women? Evidence from the United States. Feminist Economics. 14(1)

Kessler, Harris, A. (1982) *Out to Work: a History of Wage-Earning Women in the United States.* New York: Oxford University Press.

Lips, H. (2003) Gender Pay Gap: Concrete Indicator of Women's Progress towards Equality. *Analysis of Social Issues & Public Policy*. 3:87-109.

Lips, H. (2008) Women's Earnings in Relation to Similarly Educated Men's Earnings. Retrieved 4.18.08. http://www.womensmedia.com/new/Lips-Hilary-gender-wage-gap.shtml

Maume, Jr., D. (2004) Wage Discrimination over the Life Course: A Comparison of Explanations. *Social Problems*. 51(4): 505-527.

McCall, L. (2000) Gender and the New Inequality: Explaining the College/Non-College Wage Gap. *American Sociological Review*. 65(2): 234-255.

McCrate, E. (2005) Flexible Hours, Workplace Authority, and Compensating Wage Differentials in the U.S. Feminist Economics, Taylor & Francis Journals. 11(1): 11-39.

McLaughlin, D., Gardner, E. & Lichter, D. (1999) Economic Restructuring and Changing Prevlaence of Female-headed Families in America. *Rural Sociology*. 64(3):394-416.

Menaghan, K. (2001) Measuring Occupational Conditions: Using the Dictionary of Occupational Titles and the Census Occupational Coding Systems.

Miller, A., Trieman, D., Cain, P., & Roos, P. (1980) *Work, Jobs, and Occupations: A Critical Review of the Dictionary of Occupational Titles.* Final Report to the United States Dept. of Labor from the Committee on Occupational Classification and Analysis. Washington, DC: National Academy Press.

Mitra, A. (2003) Establishment Size, Employment, and the Gender Wage Gap. *Journal of Socio-Economics*. 32(3): 317- 331.

Myers, D., Gebhardt, D., Crump C., & Fleishman, E. (1993) The Dimensions of Human Physical Performance: Factor Analysis of Strength, Stamina, Flexibility, and Body Composition Measures. *Human Performance*. 6(4): 309-345.

Nelson, M. (1999) Economic Restructuring, Gender, and Informal Work: A Case Study of a Rural County. *Rural Sociological Review.* 64(1): 18-43.

O'Neill & Polacheck, (1993) Why the Gender Wage Gap in Wages Narrowed in the 1980's. Journal of Labor Economincs. 11: 205-28.

Polivka, A. (2000) Using Earnings Data from the Monthly Current Population Survey. Bureau of Labor & Statistics.

Reskin, B. (1993) Sex Segregation in the Workplace. *Annual Review of Sociology*. 19(1): 241-270.

Ringen, K. & Stafford, E. (1996) Intervention Research in Occupational Safety and Health: Examples from Construction. *American Journal of Industrial Medicine*. 29:314-320.

Rose, S. & Hartmann, H. (2004) The Unequal Society: The Long-Term Gender Gap. *Challenge*. 47(5): 30-50.

Stern, B. (1939) The Family and Cultural Change. *American Sociological Review*. 4(2): 199-208.

Shu, X., PiLing, F., Xiaoli, L. & Margaret M. (1996) Characterizing Occupations with Data from the Dictionary of Occupational Titles. *Social Science Research*. 25(2): 149-173.

United States Census Bureau (2006) American Fact Finder: Your source for population, housing, economic, and geographic data Retrieved 2.4.08. http://factfinder.census.gov/home/saff/main.html?_lang=en

United States Census Bureau (2005) Source and Accuracy of Estimates for Income, Poverty, and Health Insurance Coverage in the United States. Retrieved 2.10.08. http://www.census.gov/hhes/www/ioindex.html

United States Census Bureau. (2002) Industry & Occupation 2002: 2002 Census Classified Index of Occupations Mapped to SOC, sorted by SOC. Retrieved 2.14.08.. http://www.census.gov/hhes/www/ioindex/ioindex02/soc02_11.html

United States Census Bureau. Census (2000) Occupational Classification System and Crosswalk to Standard Occupational Classification (SOC). Retrieved 5.10.07. http://www.census.gov/hhes/www/ioindex/crosswalks.html

US Census Bureau (200) American Community Survey. Retrieved 8.20.07. http://factfinder.census.gov/servlet/STTable?_bm=y&-geo_id=01000US&-qr_name=ACS_2005_EST_G00_S2002&-ds_name=ACS_2005_EST_G00_&-_lang=en&-redoLog=false&-format=&-CONTEXT=st .

United States Department of Agriculture (2007) Economic Research Service. Retrieved 5.10.06. http://www.usda.gov/wps/portal/usdahome

United States Department of Agriculture (2006) Economic Research Service: Rural Definitions, National & State Indicator Tables. Retrieved 2.20.08. http://www.ers.usda.gov/Data/Ruraldefinitions/Indicators.htm

United States Department of Labor, Bureau of Labor & Industries. Construction of Average Weekly Hours for Supervisory and Nonproduction wage and Salary Workers in Detailed Industries. 8/05. Retrieved 5.8.08. http://www.bls.gov/lpc/iprswawhtechnote.pdf

United States Department of Labor, Bureau of Labor & Industries. Revised Handbook for Analyzing Jobs. U.S. Department of Labor

United States Department of Labor, Bureau of Labor & Industries. United States Employment Service, and the North Carolina Occupational Analysis Field Center (1999) Dictionary of Occupational Titles (DOT) Revised Fourth Edition, 1991 Inter-university Consortium for Political and Social Research (ICPSR). ISPSR 6100.

United States Department of Labor, Bureau of Labor & Statistics. Economic Change and Structures of Classification. Retrieved 3.1.07. http://www.bls.gov

United States Department of Labor, Bureau of Labor & Statistics. Historical CPS Employment for 1983-99 on the 2002 Census industry and occupational classifications. Retrieved 2.17.08. http://www.bls.gov/cps/constio198399.htm

United States Department of Labor, Bureau of Labor & Statistics Occupational and Industry Classification Systems used in the Current Population Survey. Retrieved 2.10.08. http://www.bls.gov/cps/cpsoccind.htm

United States Department of Labor, Office of Administrative Law Judges. Dictionary of Occupational Title Description. Retrieved 1.28.08. http://www.oalj.dol.gov/libdot.htm

United States Equal Employment Opportunity Commission. "Executive Order 12106: Transfer of Certain Equal Employment Enforcement Functions" Published 12.28.1978. Retrieved 4.15.08. http://www.eeoc.gov/federal/eo11478/eo12106.html

United States Office of Management & Budget. Federal Register, 122700: Standards for Defining Metropolitan and Micropolitan Statistical Areas, Notice. 12.28.2000. Retrieved 6.9.08. http://www.whitehouse.gov/omb/fedreg/metroareas122700.pdf

University of Alabama, College of Education. A Guide to Occupational Codes. Retrieved 5.17.07 http://www.bamaed.ua.edu/counselor-ed/bce545/guide.pdf

Wardle, M. (1976) Women's Physiological Reactions to Physically Demanding Work *Psychology of Women Quarterly*. 1(2): 151-160.

Weinberg, D. (2007) Earnings by Gender: Evidence from Census 2000. United States Department of Labor. *Monthly Labor Review*: 1-33.

APPENDICES

APPENDIX A: Dictionary of Occupational Titles Description on Strength Required in a Particular Occupation

"The Physical Demands Strength Rating reflects the estimated overall strength requirement of the job, expressed in terms of the letter corresponding to the particular strength rating. It represents the strength requirements which are considered to be important for average, successful work performance.

The strength rating is expressed by one of five terms: Sedentary, Light, Medium, Heavy, and Very Heavy. In order to determine the overall rating, an evaluation is made of the worker's involvement in the following activities:

A. Standing, Walking, Sitting

Standing - Remaining on one's feet in an upright position at a work station with-out moving about. Walking - Moving about on foot. Sitting - Remaining in a seated position.

B. Lifting, Carrying, Pushing, Pulling

Lifting - Raising or lowering an object from one level to another (includes upward pulling). Carrying - Transporting an object, usually holding it in the hands or arms, or on the shoulder. Pushing - Exerting force upon an object so that the object moves away from the force (includes slapping, striking, kicking, and treadle actions). Pulling - Exerting force upon an object so that the object moves toward the force (includes jerking).

Lifting, pushing, and pulling are evaluated in terms of both intensity and duration. Consideration is given to the weight handled, position of the worker's body, and the aid given by helpers or mechanical equipment. Carrying most often is evaluated in terms of duration, weight carried, and distance carried.

Estimating the Strength factor rating for an occupation requires the exercise of care on the part of occupational analysts in evaluating the force and physical effort a worker must exert. For instance, if the worker is in a crouching position, it may be much more difficult to push an object than if pushed at waist height. Also, if the worker is required to lift and carry continuously or push and pull objects over long distances, the worker may exert as much physical effort as is required to similarly move objects twice as heavy, but less frequently and/or over shorter distances.

C. Controls

Controls entail the use of one or both arms or hands (hand/arm) and/or one or both feet or legs (foot/leg) to move controls on machinery or equipment. Controls include but are not limited to buttons, knobs, pedals, levers, and cranks.

Following are descriptions of the five terms in which the Strength Factor is expressed:

S-Sedentary Work - Exerting up to 10 pounds of force occasionally (Occasionally: activity or condition exists up to 1/3 of the time) and/or a negligible amount of force frequently (Frequently: activity or condition exists from 1/3 to 2/3 of the time) to lift, carry, push, pull, or otherwise move objects, including the human body. Sedentary work involves sitting most of the time, but may involve walking or standing for brief periods of time. Jobs are sedentary if walking and standing are required only occasionally and all other sedentary criteria are met.

L-Light Work - Exerting up to 20 pounds of force occasionally, and/or up to 10 pounds of force frequently, and/or a negligible amount of force constantly (Constantly: activity or condition exists 2/3 or more of the time) to move objects. Physical demand requirements are in excess of those for Sedentary Work. Even though the weight lifted may be only a negligible amount, a job should be rated Light Work: (1) when it requires walking or standing to a significant degree; or (2) when it requires sitting most of the time but entails pushing and/or pulling of arm or leg controls; and/or (3) when the job requires working at a production rate pace entailing the constant pushing and/or pulling of materials even though the weight of those materials is negligible. NOTE: The constant stress and strain of maintaining a production rate pace, especially in an industrial setting, can be and is physically demanding of a worker even though the amount of force exerted is negligible.

M-Medium Work - Exerting 20 to 50 pounds of force occasionally, and/or 10 to 25 pounds of force frequently, and/or greater than negligible up to 10 pounds of force constantly to move objects. Physical Demand requirements are in excess of those for Light Work.

H-Heavy Work - Exerting 50 to 100 pounds of force occasionally, and/or 25 to 50 pounds of force frequently, and/or 10 to 20 pounds of force constantly to move objects. Physical Demand requirements are in excess of those for Medium Work.

V-Very Heavy Work - Exerting in excess of 100 pounds of force occasionally, and/or in excess of 50 pounds of force frequently, and/or in excess of 20 pounds of force constantly to move objects. Physical Demand requirements are in excess of those for Heavy Work."

Source: http://www.occupationalinfo.org/appendxc_1.html#STRENGTH

Additional Source: United States Department of Labor, United States Employment Service, and the North Carolina Occupational Analysis Field Center. May 1999. Dictionary of Occupational Titles (DOT) Revised Fourth Edition, 1991 Inter-university Consortium for Political and Social Research (ICPSR). ISPSR 6100

APPENDIX B: Correlation Matrix based on Pair-wise Deletion

Dependent variable:

- Natural log of individual earnings (lgpearnval)

Independent variables:

- College degree attained (college)
- Age (age)
- Age over time (age2)
- Usual hours worked in a week (uslhrs)
- Urban residing (urban)
- Percentage female per occupation (percentfemale)
- Employer's organizational size (orgsize)
- Union represented position (union)
- Working in a goods-based occupation (goodsocc)
- Strength required*Goods-based occupation (stgoods)
- Strength required within occupation (strength)
- Stooping required within occupation (stooping)
- Talking required within occupation (talking)
- Crouching required within occupation (crouchin)
- Kneeling required within occupation (kneeling)
- Climbing required within occupation (climbing)
- Female (female)
- Married (married)
- Married*Female (marfemale)
- Non racial or ethnic minority including Latino or Hispanic (Caucasian)

	lgpear~l	college	age	age2	uslhrs	urban	percen~e
lgpearnval	1.0000						
college	0.3282	1.0000					
age	0.2748	0.0927	1.0000				
age2	0.2328	0.0743	0.9871	1.0000			
uslhrs	0.2249	0.0826	0.0361	0.0154	1.0000		
urban	0.0765	0.1147	-0.0191	-0.0258	-0.0157	1.0000	
percentfem~e	-0.0766	0.1414	0.0484	0.0544	-0.0805	0.0794	1.0000
orgsize	0.1976	0.1541	0.0728	0.0665	0.0491	0.0638	0.0614
union	0.0431	0.0022	0.0592	0.0512	0.0072	-0.0173	-0.0475
goodsocc	-0.1303	-0.3211	-0.0305	-0.0299	0.0082	-0.1013	-0.6054
strength	-0.2181	-0.3245	-0.0802	-0.0691	-0.0401	-0.1086	-0.4415
stooping	-0.2256	-0.2631	-0.1104	-0.0981	-0.0429	-0.0500	-0.3652
talking	0.2174	0.3746	0.0392	0.0296	0.0516	0.0779	0.4250
crouchin	-0.1534	-0.2446	-0.0961	-0.0894	-0.0180	-0.0386	-0.4189
kneeling	-0.0859	-0.1954	-0.0777	-0.0743	-0.0025	-0.0202	-0.4429
climbing	-0.0457	-0.2082	-0.0479	-0.0457	0.0002	-0.0588	-0.4786
stgoods	-0.1274	-0.3168	-0.0358	-0.0329	0.0089	-0.1077	-0.6223
female	-0.1878	-0.0024	0.0054	0.0052	-0.0831	0.0521	0.3595
married	0.2330	0.0725	0.2914	0.2543	0.0690	-0.0248	-0.0196
marfemale	-0.0869	0.0328	0.1077	0.0889	-0.0361	0.0114	0.2644

```
   caucasian |   0.1623   0.0335   0.1331   0.1287   0.0408  -0.0615   0.0400

             |  orgsize    union goodsocc strength stooping  talking crouchin
-------------+------------------------------------------------------------------
     orgsize |   1.0000
       union |   0.0791   1.0000
    goodsocc |  -0.1401   0.0907   1.0000
    strength |  -0.1564   0.0977   0.6703   1.0000
    stooping |  -0.1678   0.0922   0.5522   0.7995   1.0000
     talking |   0.1104  -0.0571  -0.6899  -0.6033  -0.5292   1.0000
    crouchin |  -0.1644   0.0841   0.5387   0.7227   0.9090  -0.4855   1.0000
    kneeling |  -0.1383   0.0970   0.5044   0.6870   0.8490  -0.4226   0.9363
    climbing |  -0.1311   0.1325   0.5357   0.6382   0.7012  -0.4274   0.7724
     stgoods |  -0.1436   0.0978   0.9835   0.7190   0.6030  -0.6954   0.5973
      female |   0.0631  -0.0074  -0.3483  -0.2914  -0.2000   0.2134  -0.2359
     married |   0.0558   0.0526  -0.0127  -0.0448  -0.0409   0.0316  -0.0037
   marfemale |   0.0626   0.0227  -0.2428  -0.2196  -0.1396   0.1442  -0.1472
   caucasian |   0.0333  -0.0044  -0.0676  -0.0520  -0.0785   0.1422  -0.0550

             | kneeling climbing  stgoods   female  married marfem~e caucas~n
-------------+------------------------------------------------------------------
    kneeling |   1.0000
    climbing |   0.8281   1.0000
     stgoods |   0.5669   0.5834   1.0000
      female |  -0.2580  -0.2809  -0.3614   1.0000
     married |   0.0035   0.0182  -0.0157  -0.0885   1.0000
   marfemale |  -0.1652  -0.1883  -0.2513   0.6588   0.4418   1.0000
   caucasian |  -0.0503  -0.0166  -0.0556   0.0104   0.0309   0.0094   1.0000

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APPENDIX C: United States' History of Occupational Coding & Project-Specific Data Mergers

Standardizing occupational codes like the DOT has been a complicated process in the U.S. because of the multifarious and ever-changing occupational and industrial structure. No single taxonomy can convey all the occupational detail. Occupational responsibilities can change rapidly to meet a wide-variety of fluctuating economic structural changes and increased specialization. Because different occupational classifications are being updated and adopted concurrently through numerous channels, crosswalks are difficult to develop and implement. Further, industry leaders, government analysts, academics, employment agencies, and workers often disagree about how to classify the enormous diversity of jobs. Classification systems are a work in progress and often reflect gaps in economic concepts or lack practical applications (United States Department of Labor, Bureau of Labor Statistics).

The Dictionary of Occupational Titles was the result of one of the first occupational classifications after the U.S. when the American Statistical Association and the Central Statistics Board convened a committee to cluster jobs by a variety of characteristics in 1938 (United States Department of Labor, Bureau of Labor Statistics). Since the 1940 Census adoption of the DOT, the economy changed dramatically in response to post-industrialization, globalization, and increased job specialization. The Standard Occupational Classification (SOC) replaced the DOT in the 1980 Census to reflect some of these changes (United States Department of Labor, Bureau of Labor Statistics). The 2002 Census occupational system, adopted by the Current Population Survey in 2003, consisted of a combination of the 2002 North American Industry Classification System (NAICS) and the 2000 SOC (Bureau of Labor & Statistics, Historical CPS).

In order to combine the DOT's occupational strength and physical demands with the Current Population Survey's Census-based occupational structure, a series of data mergers was performed for this project. The DOT classification has 16,000 occupational categories while most classifications, including the 2002 Census codes, have much less detail. In 1970 and 1980, the DOT codes were mapped directly to the Census occupation codes through factor analysis and reliable crosswalks were established (Menaghan, 2001; Shu, Fan, Li & Marini, 1996). A 1990 crosswalk was not developed because the occupational structures evolved in different directions and little agreement could be made about the comparability of each data classification (Menaghan, 2001). Attempts were made to compare occupational characteristics to industry

characteristics through the North American Industry Classification System (NAICS) 2002 revision as it officially replaced the previous U.S. Standard Industrial Classification (SIC) system and incorporated some of the DOT system. While NAICS created greater industry relevance and comparability across markets, it does not include specific skills required for each occupation (United States Department of Labor, Bureau of Labor Statistics Ch. 3). The industry and occupational coding process has evolved to reflect more modern economic concepts, though a single conceptual framework is far from developed (United States Department of Labor, Bureau of Labor Statistics, Economic Classifications). For this project, a crosswalk was used from the 1991 DOT codes to the 2000 SOC and applied to individual wage earners in the Current Population Survey using a SOC to 2002 Census code crosswalk.

In order to merge the 16,000 occupations listed in the DOT with the 503 more generalized occupational categories found in the Current Population Survey, I used averages for the strength and physical demands for each broader occupational category. This conversion unfortunately looses the nuances of each physical and strength demand within the occupational code, but the composite results reflect patterns acknowledged in other publications.

By adding the Dictionary of Occupational Titles' strength and physical demand requirements with the Oregon and Washington Current Population Survey data, I was able to determine how these corporal occupational demands interact with earnings. However, the DOT provides outdated strength and physical demands because the last version was finalized in 1991 (Many professions have changed dramatically since then due to the enormous effect of technology and industrialization. The era that went unstudied from 1990 until 2006 corresponded with many of the global restructuring efforts, increasing technological advancement in the North and manual labor 'opportunities' in the South. Due to increased industrialization and electronic systems, many professions that once required a worker to manipulate, handle, or move objects now rely more on mechanical processes. Domestic occupations such as assemblers and fabricators, plant and system operators, and bookkeeping, accounting and auditing clerks have experienced a decline in the amount of strength and physical demands required in each position since the early 1990's. Despite many problems with the crosswalk between the 1991 DOT and the 2002 Census codes used in the CPS, it was determined to be the best information available for the project. Similar conclusions were drawn during the 1980 Census to DOT crosswalk conversion (Miller et al, 1980).