An Examination of Gender Income Gaps in and out of Government

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A classic topic in labor economics and other social sciences is the estimation of a gender gap in income, i.e. the estimated difference in income or wages statistically attributed to gender while controlling for other explanatory variables related to the labor market, occupations, and industries. U.S. laws include the right to equal pay for equal work established by the Equal Pay Act of 1963, but equal work is not immediately and clearly measurable. This paper seeks to estimate whether government employers, as a proxy for pay scale models, is effective in reducing the gender income gap through an apples-to-apples examination of pay assigned in and out of government, using a large sample from the Current Population Survey and extensive statistical controls.

Recent studies indicate that women earn 21 percent less than men based on median and mean income data (Schieder & Gould, 2016). That might result from career choices women make. However, several studies that control for variables like education, experience, industry, and job classification still find a gender income gap. This capstone was inspired by a trend analysis I completed using monthly Current Population Survey data from the Census Bureau for May 2012 through September 2015 that analyzed different variables to identify trends in gender income gaps. Table 1 displays the results by category of job with no statistical controls. Government employees have a smaller gender income gap than workers in private industries (15% to 19% versus 23% to 29%). This data is based solely on raw averages and does not control for other income determining variables, which are likely to reduce the residual gender income gap and can alter the ranking of the different types of jobs.

Table 1: Difference of Mean Weekly Wage for Males vs. Females by Class of Worker

Variable	Difference in Mean Weekly Income	Income Gap
Females in Federal Government	-199.55	-15%
Females in Local Government	-180.11	-18%
Females in State Government	-192.39	-19%
Females in Private Not-for-Profit Industries	-237.91	-23%
Females in Private For-Profit Industries	-281.08	-29%

n=0.5m

Government use of pay scales should in theory reduce income inequality, although not to exactly zero, given that some variation in pay is possible with pay scales. I intend to further examine government salaries controlling for income-determining variables such as education, experience, industry classification, and occupation classification. The purpose of the estimation is to determine whether government, as a proxy for systematic pay scales, is effective in reducing the gender income gap.

The results of this analysis could help gage how effective various employers are in terms of reducing the gender income gap in accordance with the Equal Pay Act. It may also speak to the effectiveness of pay scales in closing the gender income gap. I would expect government employers to lead the way in abiding by the Equal Pay Act because of their structured pay systems. If my results find that is the case, government wage determinations would need to be examined more closely to discern if pay schedules are the difference maker. While advantages of salary ranges include consistency of pay assignments, flexibility within the range, and easier budget projections for wages, they may not be appropriate for all organizations. Disadvantages

of salary ranges include limitations to performance-based pay and reduced competitiveness compared to organizations with more discretion in pay assignments. If government pay systems do result in a reduced gender income gap, their pay assignment methods would need to be more closely examined to determine which, if any, practices could be translated into the private market. On the other hand, if my analysis finds no significant difference between government and private industry with regards to the gender income gap, an investigation into the effectiveness of government pay assignment systems may be warranted since they are designed to equalize pay. This analysis will only indicate which topic warrants further examination.

Literature Review

While there is no specific literature on the effectiveness of pay scales in reducing gender income gaps, there is still much insight that can be gained by existing literature on the gender income gap. Labor market discrimination is defined as the unequal treatment of equally qualified workers (Becker, 1957), which is one of the many hypotheses offered to explain gender income gaps.

Most studies are consistent in their use of the human capital model that controls for variables likely to explain income such as education, experience, cost of living, type of work performed, etc. (Mincer & Polachek, 1974). The greatest variation in the current literature is the method of data analysis. While many of the statistics quoted in the media and on modern websites such as Payscale.com are derived using raw calculations of median and/or mean wages, even the publications that criticize that practice use a variety of different methods to measure the gap.

Residual regressions and panel data analysis control for individual fixed effects and therefore reduce the unobserved factors in models and are, as a result, the two most common

models. Proponents of panel analysis note that residual comparisons still have some potential for omitted variable bias (Blau & Kahn, 2000). Unexplained differences in earnings might or might not involve discrimination as opposed to some variable that was excluded from the model, so there is no way to show that discrimination is present or absent in statistical regression models. That would require forensic or other data concerning individual situations. However, the panel studies speak to changes in the gender income gap across time and make historical comparisons or comparisons across groups or types of jobs, whatever the cause of the gap might be. The present research is in that spirit, comparing types of employers.

Alterations of residual regression models are also seen in the literature such as a quantile regression using data from Spain. Garcia, Hernandez, and Lopez-Nicolas (2001) posited that traditional regressions overstate the gender income gap and examined gender earning differences within several different pay levels. Weichselbaumer and Winter-Ebmer (2007) showed in a meta-analysis to synthesis the findings of existing literature that competition and equal pay regulation affect the gender income gap internationally. Another study examining the effectiveness of equal pay regulations in the United Kingdom elected to use only qualitative analysis, specifically interviews and anecdotes (Deakin, McLaughlin, & Chai, 2011).

Despite the inconsistency in methodology, there are some cohesive findings that emerge. First and foremost is that after controlling for income-determining variables, an unexplained gap still exists between male and female earnings. Studies also find that the gap increases with educational attainment; career advancements, and family expansion. In other words, the difference in what women earn compared to their male counterpart, increases as women obtain advanced degrees, receive promotions, and have children. The literature generally attributes the

existence of the gender income gap to traditional gender roles and finds that it is decreasing due to equal pay regulations and changing cultural norms.

The greatest contention in the literature involves theories on why the gap still exists. Indeed, many explanations have been proposed. Some of these theories include:

- Family responsibilities hinder the earnings of women.

- There is a difference in educational attainment between the genders

- There is a performance difference in results achieved along the gender line.

- Income differences are explained by the career choices of men versus women

- Men are more successful at salary negotiation

All of these theories have been tested. The family explanation is twofold. First, women do not work as many hours as men in order to care for their family which results in the wage difference (Dubner & Rosalsky, 2016). Studies that have examined only full time employees or that control for these variables still find a gender income gap. The other half of the family argument is that employers see married women with children as a risk when it comes to executive positions that are harder to replace. Studies have shown that while women do hold these positions, they tend to make less than single childless women in the same position. The opposite is true of men however. Married men with children make 122% of what their single male counterparts earn. Men in these executive positions generally earn more than women in similar positions (Compton, 2007). The gender gap is reduced but not entirely explained by the family responsibility theory. This would indicate that there is merit in the argument that employer perceived risks make them less likely to invest in women.

The educational attainment argument proposes that the earning difference is explained by the fact that there are more men in the labor market with advanced degrees than women (Council on Economic Advisers Issue Brief, 2015). While that is true, women are outpacing men in attaining advanced degrees for the working population under the age of 45 (Perry & Gundersen, 2011). Further, most of the quantitative analysis that controls for education finds that the gap increases as educational attainment increases. Therefore, the education argument does not fully explain the gender income gap.

The performance theory essentially states that the difference in male and female earnings can be attributed to results achieved (Greszler & Sherk, 2014). However, no evidence is offered to support this argument. In fact, this argument is successful negated by studies that indicate the opposite is true. Fortune 500 companies with higher representation of women on their board achieved 53% higher returns on equity, 42% higher returns on sales, and 66% higher returns on capital investments compared to competitors with less female representation (Catalyst, 2008). However, while men do not outperform women in the data, that doesn't mean that such a perception does not exist. In controlled scenarios in both a manager/customer and doctor/patient interaction where all "managers" and "doctors" responded the same way to their client, white men were routinely rated as performing better than women and minorities, even by women and minority observers (Hekman et al., 2010).

The career choice interpretation suggests the difference in gender earnings can be explained by the job preferences of men versus women (Dubner & Rosalsky, 2016). It suggests that women choose lower paying fields like teaching and social work, while men choose higher paying jobs in the business field as well as dangerous public service jobs. Studies that account for industry of work find a gender gap within each industry.

Salary negotiation theory is a recent addition to the explanations of the gender income gap. This argument suggests that men are better at negotiating wage (Dubner & Rosalsky, 2016). Survey research does indicate that women are less comfortable in initiating salary negotiations and therefore often do not engage in them (Babcock & Laschever, 2003). This theory certainly provides a plausible explanation of the gender income gap.

The gender income gap can be explained by various factors. To the extent possible, this estimation controls for variables associated with these theories.

Model and Methods:

To examine the effect of government pay schemes on reducing gender income gaps, this capstone uses an individual level regression model that utilizes interaction terms. My data will be extrapolated from the Census Current Population Survey (CPS) going back 13 years. Of course, I will be redefining some variables in order to account for changes in the way different variables were measured over the years. Such actions are necessary to compile a uniform dataset; the specifics will be revealed in the discussion of variables below.

I will be using weekly income as my dependent variable. I will be controlling for typical income determinant variables (Ehrenberg and Smith 2012), which include the following variables:

- Gender

  The variable includes an indicator for female and male.

- Hours worked

  This variable is necessary in any examination of income. Of course, this is one of

  the more problematic variables as it contains the high likelihood for reverse

causality. After all, a person that earns $10 per hour has a different incentive to work or not work a shift compared to a worker earning $20 per hour. Including it on the dependent variable side of the equation and regressing on a calculation of hourly wage is problematic for salary based employees whose hours may vary from week to week or project to project. The estimation separately analyzes fulltime and part-time workers. Employees working less than 35 hours per week will be classified as part-time; those working 35 or more will be classified as fulltime.

- Race:

    This variable will be transformed because of changes in how race has been measured over time. Race categories will include: white, black, native American, Asian, other homogeneous race, biracial white-black, biracial white-other, biracial black-other, biracial other, and multi-racial (three or more represented racial categories). While race should not be a factor that determines income and may be highly correlated with educational attainment, race may have some effect on the likelihood of being a government employee and therefore will be included in this model.

- Ethnicity:

    Variable includes observations for Hispanic and Non-Hispanic. Like race, ethnicity has been included because it may have an effect of the likelihood of being a government employee.

- Geographic Region:

    This variable will be transformed because of changes in how geographic region has been measured. Currently the survey divides the United States into four regions:

Northeast, Midwest, South, and West. These are the categories that I will be using in my data. Previously Midwest observations were labeled North Central, and before the CPS began using regions geography was broken down by state. For the years that North Central was used, the label will be changed to Midwest. For the years that states were used, region will be generated in accordance will current CPS region classifications.

- Educational Attainment

    This variable will be condensed to represent the following categories: no high school diploma, high school diploma, some college – no degree, associate degree, bachelor degree, master degree, professional degree, and doctorate degree. The distinction between a professional degree and a doctorate degree is that a professional degree is designed for a particular field such as medicine (M.D.), pharmacology (Pharm.D.), veterinary medicine (D.V.M.), dentistry (D.M.D.), etc. while a doctorate is more generalized and includes degrees such as Ph.D. and Ed.D.

- Marital Status

    This variable includes the following categories: never married, married, married with spouse absent, separated, divorced, and widowed. This variable has been included because literature has shown a differential effect on income for males and females according to marital status.

- Number of Children under the age of 18

    This variable will be condensed to represent the following categories: 1 child, 2 children, 3 children, 4 or more children. This variable has been included because

literature has shown a differential effect on income for males and females with families.

- Age

    While age is not a precise measure of experience since individuals do change careers and experience lapses of employment, it is the only available variable in the CPS that could speak to experience. Of course, it is also possible that it may be a better measure of experience for one gender than the other. Despite these drawbacks, it is better to include an imperfect variable than no proxy since experience is a key determinant for income.

- Classification of Worker

    This is a general classification of field of work and variables include federal government, state government, local government, private for-profit industries, and private not-for-profit industries.

- Industry

    This is a classification of industry and includes 273 variables within the following categories:

    - Agricultural, forestry, fishing, and hunting
    - Mining
    - Construction
    - Durable goods manufacturing
    - Nondurable goods manufacturing
    - Wholesale trade
    - Retail trade
    - Transportation and warehousing
    - Utilities
    - Information
    - Finance and insurance
    - Real Estate and rental and leasing

- Professional and technical services
- Management, administrative, and waste management services
- Educational services
- Health care and social assistance
- Arts, entertainment, and recreation
- Accommodation and food services
- Private households
- Other services, except private households
- Public administration
- Armed forces

A full list of the industry variables is available on request.

- Occupation

    This is a classification of occupation and includes 569 variables within the

    following categories:

    - Management, business, and financial operations
    - Professional and related occupations
    - Service occupations
    - Office and administrative support occupations
    - Farming, fishing, and forestry occupations
    - Construction and extraction occupations
    - Installation, maintenance, and repair occupations
    - Production Occupations
    - Transportation and material moving occupations
    - Armed forces

    A full list of the occupation variables is available on request.

I will also generate interaction terms for gender and worker classifications. This coefficient

will speak to the effectiveness of government pay scales compared to other worker

classifications holding all other control variables constant. Obviously this assumes that

government worker compensation is always decided using a systemic pay scale such as the

general schedule used by the federal government. I am confident this assumption holds true for

most government workers and would expect more deviation from systematic pay schemes in lower branches of government.

Findings

The full regression results are available on request for full time workers. Not only were most of the included variables statistically significant, but the interactions between females and class of workers showed very interesting findings. When holding all traditional wage determinant variables constant including industry and occupation, the federal government is much more effective at reducing the gender income gap than any other employer. While females earned 4.33 percent less than their male counterparts for the same full time work, that was a significant difference compared to all other employers who paid females between 15 and 20 percent less as displayed in Table 2.

Table 2: Interaction Results for Full Time Workers

Variable	Coefficient / Difference in Mean Weekly Income	Income Gap Percentage
Females in Federal Government	-50.10	-4.33
Females in Local Government	-142.96	-15.53
Females in Private Not for Profit Industries	-171.98	-18.07
Females in Private for Profit Industries	-164.53	-18.52
Females in State Government	-184.85	-19.62

n=1.5m; All Coefficients Significant at $p<0.001$

While all levels of government were more effective at reducing the gender income gap for part-time workers, the federal government actually reversed it and paid females 3.33 percent

more than their male counterparts for the same part-time work as measured using the control variables in this model. However, it is worth noting that state and local government still reduced the gap by about 6 percent compared to private industry for part-time workers. These results can be seen in Table 3.

Table 3: Interaction Results for Part-time Workers

Variable	Coefficient / Difference in Mean Weekly Income	Income Gap Percentage
Females in Federal Government	31.24	3.33
Females in State Government	-79.42	-13.93
Females in Local Government	-75.73	-14.05
Females in Private Not for Profit Industries	-95.59	-19.63
Females in Private for Profit Industries	-91.97	-22.33

n=0.5m; All Coefficients Significant at $p < 0.001$

Limitations:

Income is determined by a large number of factors, only some of which can be measured even using the Current Population Survey. Measurement error in the CPS is a problem, particularly with respondents who do not provide their own data, but for all respondents. Classification into type of employer is probably not intentionally misreported, but people with more than one job could be making a choice about which one to report.

Most importantly, a regression cannot attribute the gender gap to any particular cause, nor can the regression explain the reasons for residual differences between types of employers. However, those differences can be estimated.

Conclusions:

While the trend analysis calculated from raw data that inspired this project is a beginning point, a fuller picture is obtained by completing a comparison across more detailed categories with a regression. Though this analysis did provide some answers, it also left a couple of questions. First and foremost, what is it about the federal general schedule that results in the dramatic reduction of the gender income gap compared to other employers, especially ones that also likely use a systematic pay schedule? Is such a reduction even a goal, or are their fundamental differences in the pay scales? An in-depth study into government pay systems would need to be undertaken to address these questions.

Another striking question is why are state and local governments capable of reducing the gender income gap for part time workers, but not full time workers compared to private industry? Explanations regarding the age and education level of typical part-time workers come to mind, but those are controlled in the regression, and studies show that the gap increases with both age and educational attainment. However, the gap for part time workers in the private sector is larger rather than smaller. Also, not all states and localities are created equal and an analysis that compares across states or localities may in fact reveal that some states/localities are quite effective at reducing the gap while others are not. That would also add another 100 explanatory variables to the 900 including industries and occupations.

While this analysis does suggest that the gender income gap is smaller in Federal Government jobs than in other public or private jobs, it cannot prove that the Federal pay-scale is the difference maker. There is a smaller gap in Federal government jobs, but that difference in itself could be created by omitted factors. However, a systematic pay schedule such as a pay

scale with detailed pay grades, which the Federal Government uses, is a possible explanation of a smaller gender income gap.

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Appendix A lists all industry categories, Appendix B lists all occupation categories, and Appendix C lists the regression results with all categories controlled individually, i.e. 273 industries and 569 occupations in addition to the other explanatory variables. All Appendices are available on request.