Investigating the Public-Private Wage Differential:
Post-Great Recession United States and Greece

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Abstract

The level of public sector wages in relation to their private sector counterpart is a heavily debated topic, due to budgetary constraints and public opinion implications. This study analyzes the public-private wage differential in the United States and Greece, using the Integrated Public Use Microdata Series from the Current Population Survey (IPUMS-CPS) and the Luxembourg Income Study (LIS) datasets for the respective countries. A linear regression wage model is estimated in order to employ the Blinder-Oaxaca decomposition method to analyze wage differences between groups. This provides a calculation of the total wage differential in terms of two portions, "explained" and "unexplained." This describes the amount of the wage differential that is attributable to differences in worker characteristics between the two groups as well as the different pay structures present. Based on various economic theories, a larger public-sector premium is expected to exist in Greece, which is supported in part by the findings. The study's analysis of wage differentials on the basis of both age and education provides a precise analysis of the presence of wage discrepancies in vastly different economic environments. The results of the study support the hypothesized public sector premium in specific age and educational groups, but not as a whole.

I. Introduction

The wages of the public and private sectors respond to factors much differently from one another, resulting in consistent disparities. In this study, I will discuss the political and economic influences on public-private wage differentials. Following, I will use the Blinder-Oaxaca decomposition method in order to examine the wage differentials between sectors in groups broken down by age and education level, in order to gain a precise understanding of the implications of these factors. This method will be employed for both the United States and Greece, in the post-Great Recession environment. In addition to an overall public-private differential,

the discrepancy will be examined in-depth in terms of different age and educational groups to gain a more comprehensive understanding of the existence of wage differentials. This will allow for a comparison of wage differentials between two vastly different economic situations. From these results, I will be able to analyze effectively how public-private wage differentials come to being in various political and economic settings.

II. Review of Literature

Public-private wage differentials have culminated a large bank of empirical studies, especially as of late. The large majority of this literature employs similar methods of investigating differentials, as I will in this study. For example, Depalo, Giordano and Papapetrou (2013), Gunderson (1979) and Bender (2003) all utilize the Blinder-Oaxaca decomposition method to break apart the wage differential. However, these studies focus on the public-private differential as a whole, or tend to focus on gender-based wage gaps between the sectors as in Bender (2003) and Gunderson (1979). While these models exhibit a slightly different focus, each of them possesses a very similar regression model including common worker characteristics such as, age, education, experience and industry. This trend is largely due to the work of Mincer (1958). The human capital model developed by Mincer links the income distribution to the age, schooling and occupation of individuals.

Beyond modeling the decomposition of wage differentials, the focus of much research has been on the causes that leave a gap between public and private wages.

Disney (2007) outlines a number of factors including the existence of "public sector jobs," which he argues are intrinsically linked to the public sector. He also goes on to discuss the incentive-based pay present in the public sector as well as their existence as a "unitary employer," arguing for their centralized bargaining and high levels of unionization. Bender (2003) discusses the public-private wage discrepancy amongst education levels, citing that government is willing to pay low-skilled workers more than they would otherwise receive in the private sector, but is unable to pay high-skilled workers more proportionally due to negative public perception of highly paid public sector workers. From this, I would expect to see a large public premium among lower education levels, and public sector penalties amongst the highest education levels. This is supported by the empirical findings of Depalo, Giordano and Papapetrou (2013) in Greece and other European countries.

Lastly, the different role that budgetary constraints play on the public and private sector is key in understanding the wage differential, especially in times of economic distress. Gunderson (1979) refers to the "profit constraint" of the private sector versus the "political constraint" of the public sector. He finds that these constraints weigh in favor of the public sector. Due to their need to compete for employees with the private sector, competitive wages must be offered. In turn, this creates a floor for the price level of labor, as falling below the given wage level would leave them unable to find workers. Maczulskij (2013) supports this, stating that in times of economic recession public sector jobs become more appealing as their wages are "insulated from market forces."

III. Theory

First and foremost, the most applicable theory when studying wages is Jacob Mincer's classic human capital model. Simply put, this explains that higher earnings are linked intrinsically to age, education and occupation. This theory is crucial in constructing a comprehensive wage model, and ultimately decomposing wage differentials.

Public and private wages are impacted by factors differently due to their systematic disparities. The influence of budgets on the wage differentials between the public and private sectors is likely to be the most pronounced. As previously discussed, the "profit constraint" of private sector employers weighs in favor of the public sector (Gunderson). While private sector wages are bound by the profits of the employer, the public sector experiences what is referred to as "soft budget constraints." This allows for public sector wages to remain high even when revenue may decrease. Unlike private companies, government is able to run a consistent deficit. This discrepancy would become much more evident during economic recession, as the private sector will experience decreased profits and likely be forced to lower wages or lay off employees, while the public sector is able to sustain their wage level. From this concept, public sector wage premium is expected, particularly following the Great Recession.

In the case of Greece specifically, their decision to run a high level of debt leaves their budget constraint even looser, thus I would expect to see a larger public sector premium in relation to that of the United States, whose debt was under much

more control. This occurred due to their acceptance of a larger budgetary deficit, and thus, would be willing to pay higher wages relative to the private sector. In comparison, the United States, who was much more concerned with the level of their budget deficit following the recession, would be forced to pay lower premium sector wages.

Again, the public and private sectors experience different external factors that influence their ability to set their wages. In this case, there is an expected public wage premium among lower education levels, and a private sector premium among higher education levels. As discussed previously, the public sector is willing to pay wages to low-skilled workers that are higher than they would receive in the market system (Bender). However, this does not translate to highly educated or skilled workers, as there is a political constraint that disallows for a public wage premium. It is public opinion that weighs in the favor of the private sector in that excessive wages are heavily frowned upon by the people, putting a ceiling on public wages and leaving government unable to compete with private wages at the top end of the education ladder.

IV. Data

In studying the wage differential of the United States, I utilized the Integrated Public Use Microdata Series from the Current Population Survey (IPUMS-CPS). This allowed for large scale, individual level data with comprehensive characteristics to build a proper wage regression model. Wage information was only included in the March survey, therefore, to get the most recent post-Great Recession wages, the

March 2013 data was used. Similarly, in examining the wage structure in Greece, I used the micro-economic income data from the Luxembourg Income Study (LIS). Again, this provided ample data to construct a comparable wage regression model to that of the United States, allowing for a proper comparison, as seen below. Personal level data was used from 2010, the most recent post-Great Recession data available.

United States Wage Model:

$$\text{Ln(wage)} = \beta_0 + \beta_1\text{Age} + \beta_2\text{Age}^2 + \beta_3\text{Female} + \beta_4\text{Nonwhite} + \beta_5\text{Married} + \beta_6\text{Hispanic} + \beta_7\text{Union Membership} + \beta_8\text{Other Family Income} + \beta_9\text{Nonwage Income} + \beta_{10}\text{High School} + \beta_{11}\text{Some College} + \beta_{12}\text{Bachelors} + \beta_{13}\text{Post Bachelors} + \beta_{14}\text{Management} + \beta_{15}\text{Professional} + \beta_{16}\text{Service} + \beta_{17}\text{Office} + \beta_{18}\text{Agriculture} + \beta_{19}\text{Construction} + \beta_{20}\text{Installation} + \beta_{21}\text{Transportation} + \beta_{22}\text{Sales} + \varepsilon_i$$

Greece Wage Model:

$$\text{Ln(wage)} = \beta_0 + \beta_1\text{Age} + \beta_2\text{Age}^2 + \beta_3\text{Female} + \beta_4\text{Married} + \beta_5\text{Noncitizen} + \beta_6\text{Nonwage Income} + \beta_7\text{High School} + \beta_8\text{Some College} + \beta_9\text{Bachelors} + \beta_{10}\text{Post Bachelors} + \beta_{11}\text{Management} + \beta_{12}\text{Professional} + \beta_{13}\text{Service} + \beta_{14}\text{Office} + \beta_{15}\text{Agriculture} + \beta_{16}\text{Construction} + \beta_{17}\text{Installation} + \beta_{18}\text{Transportation} + \beta_{19}\text{Sales} + \nu_i$$

From Mincer's research, the explanatory variables of age and education were included in the wage model. Dummy variables for education, gender, race, marital

status, union status, and industry were included as characteristics of the worker for a more comprehensive model. In addition, as featured in many labor market studies an age^2 variable was calculated in order to more effectively model the non-linear relationship between increases in age level and wages. Variables were also computed to account for other income reported in the family as well as non-wage income reported. Finally, a log of gross hourly wages was used as the dependent variable in the model. The log of wages was used versus a normal wage variable, in that the logged data would possess a normal distribution compared to other wage variables. With a logged dependent variable, the coefficients of the independent variables in the model represent a percentage change in wages rather than an absolute change. Some discrepancies between data sources caused for slight variations in the models, however. In the Greek wage regression, citizenship replaced race, while union membership and other family income were excluded.

In order to get an accurate measure of wage rates, some individuals were omitted from the sample. Individuals whom reported wages less than $3.60 (or half of the federal minimum wage rate) or greater than $200 were excluded to prevent outliers from biasing the model. Also, in order to keep only full time workers, the individual had to have worked at least 40 weeks out of the year and at least 35 hours per week. Lastly, I left out the "armed forces" industry, as there are such varying positions in the industry that comparison would not be accurate. After these deductions, the sample size of the United States and Greece were 54,168 and 15,076 respectively. The data was then weighted to represent the population more accurately. Overall, this would provide the necessary data to compile an

explanatory linear-regression wage model. This combined with the descriptive statistics of each variable, allowed for me to employ the Blinder-Oaxaca decomposition procedure.

V. Proposed Model

Consistent with nearly all wage differential studies, I will employ the Blinder-Oaxaca decomposition method in order to generate a comprehensive illustration of wage differentials in both the United States and Greece. First, a linear regression model explaining wages in each sector must be created. With this, common worker characteristics are included as independent variables, in order to explain changes in individuals' wages. With the descriptive statistics of each variable and their respective regression coefficient, the decomposition can be used. This was prepared using the SPSS Statistics software package.

The Blinder-Oaxaca decomposition method[1], as illustrated below, is useful not only in that it calculates the total wage differential, but also because it breaks down the differential into an "explained" and "unexplained" portion. Applied to this study, the explained portion represents the extent of the differential that is attributable to different characteristics among the individuals, i.e. age, gender, education, etc. On the other hand, the remaining "unexplained" portion, accounts for the differential that is strictly due to a difference in the pay structure between the public and private sectors. For example, if higher educated employees shifted to the public sector, I would expect to see an increase in public sector wages, specifically noted in the "explained" portion of the wage differential This allows for

more in-depth analysis of the wage differentials present by allowing for a strict focus on structural differences between groups.

$$W_{private} - W_{public} = [\beta W(W_{private} - W_{public})] + [(\alpha_{private} - \alpha_{public}) + (\beta_{private} - \beta_{public})S_{public}$$

This study departs from those previously discussed in that it includes public-private wage decompositions for different levels of the public sector, age groups and education levels. Specifically, I decompose the Federal sector, state and local sectors, three age groups and four education categories separately against their respective private sector wages. In doing this, a more clear insight will be available into the way that different population groups experience wage differentials. From this, we can see how the political and economic factors mentioned affect various groups in two very different environments.

VI. Results and Interpretation

By running the descriptive statistics and a linear-regression model for each respective data set, I was able to collect the mean values and coefficients of each variable and in turn calculate the total wage differential as well as the portion attributable to worker characteristics as well as wage structure through the Blinder-Oaxaca decomposition. First, I present the total wage premiums of each breakdown, including level of the public sector, education level and age group.

Pubilc Sector Premiums		
	United States	Greece
Federal	44.50%	29.07%
State and Local	12.27%	4.19%
Less Than High School	4.50%	14.56%

High School	8.41%	20.08%
Some College	10.07%	17.14%
Bachelors	-7.70%	-3.74%
Post Bachelors	-17.81%	-27.80%
Less Than 30	16.68%	15.26%
30-45	7.45%	23.10%
Over 45	9.97%	6.53%

From this, we can see where a public and private premiums exist for each labor market. This table shows the public sector premium existing among low educated individuals, while a private sector premium exists among the highly educated. Also, in analyzing the wage premiums of each age group, we can see that the only real disparity between the Greek and American differentials comes in the middle age group. Therefore, this is where the factors for a larger public sector premium in Greece are showing through. The table gives no insight into the details of each decomposition, which will be discussed for each decomposition.

In my analysis I noticed a large difference between wages within the public sector, specifically when comparing federal workers to state and local workers. Thus, I analyzed the wage differentials between the Federal workers separately from State and local workers in comparison to the private sector, with the following results:

Federal vs. Private Differentials			**State and Local vs. Private Differentials**		
	United States	Greece		United States	Greece
Due to Means:	0.224	0.193	Due to Means	0.149	0.094
Due to Parameters:	0.22	0.1	Due to Parameters:	-0.03	-0.05
Total:	0.445005	0.290655	Total:	0.122657	0.0419169

From this, the Blinder-Oaxaca decomposition calculates a 44.5% wage premium for federal workers relative to the private sector in the United States with 22.4% of the differential attributable to "means" or worker characteristics and 22% to "parameters" or pay structure. In contrast, Greece presented a more equitable differential, with a federal premium of 29.07%. The composition of this discrepancy differs from that of the United States, in that the differential weighs much heavier towards worker characteristics, whereas in the United States the differential is evenly split between both factors.

The wages on the state and local levels on the other hand exhibit a much smaller differential in total. Again, the United States boasts a larger total differential than Greece at 12.27% compared to 4.19%. Interestingly, both countries exhibit a public sector premium in terms of worker characteristics, but strictly in terms of wage structure, a private sector premium exists, at nearly the same scale.

Based on Mincer's theory of human capital (1958), wages are largely a factor of age, experience and education. In order to capture how wage differentials respond to this, I broke down each dataset into three age categories, which would capture both age and relative experience. By applying the Blinder-Oaxaca decomposition across separate age groups, the results will show where wage differentials are most evident.

Public vs. Private (<30) Differentials		
	United States	Greece
Due to Means:	0.167	-0.067
Due to Parameters:	0.00	0.22
Total:	0.167	0.152593
Public vs. Private (30-45) Differentials		

	United States	Greece
Due to Means:	0.103	-0.177
Due to Parameters:	-0.03	0.41
Total:	0.07453	0.2309528
Public vs. Private (45+) Differentials		
	United States	Greece
Due to Means:	0.062	0.08
Due to Parameters:	0.04	-0.01
Total:	0.09965098	0.0652644

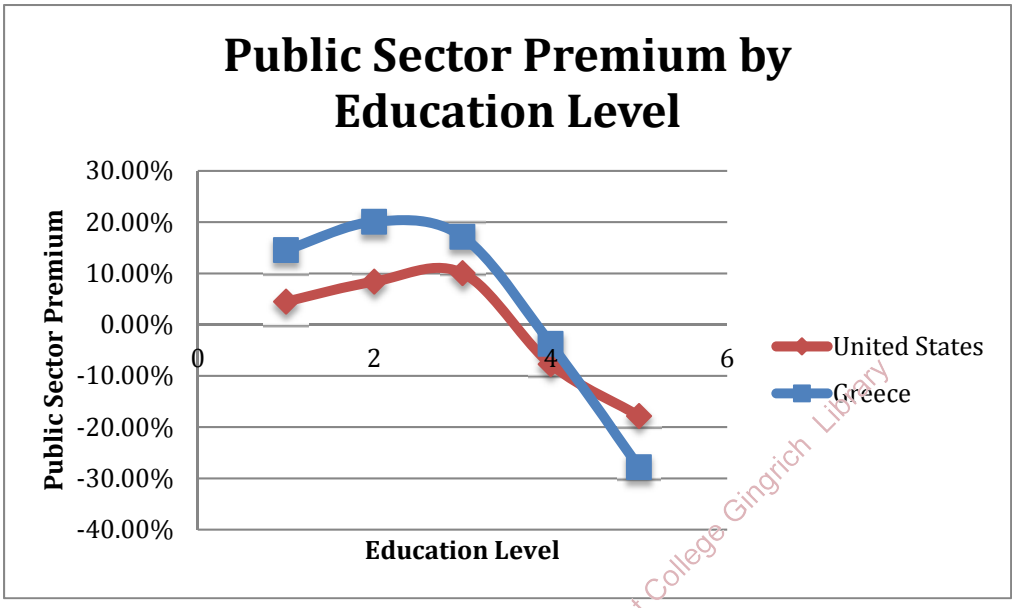
These results show that in workers less than 30 years of age, the public-private wage differential in the United States and Greece are very comparable at 16.7% and 15.26% respectively. Also a somewhat equitable distribution exists in the included working population above 45 years old, with differentials of 9.97% and 6.53% respectively. However it is in the middle age group, 30-45 years of age, which exhibits the wage differential that was theorized. While the younger and older populations experience comparable wage levels, the differential in the middle-aged population cannot be ignored, with differentials of 7.45% and 23.1%. Thus, the soft budget constraints stemming from the high levels of debt in Greece show through in the wage differential in age group. By exclusively observing the differences in pay structure, Greece shows a large public sector premium in both the youngest and middle-aged groups. In comparing the portion of the differentials due to the parameters of each sector in the youngest age group, a 22% discrepancy exists in Greece, while there is virtually no basis for differential in the United States. This gap widens in the middle age bracket as Greece experiences a massive public sector premium in pay structure of 41%, while the United States actually displays a 3%

private sector premium. In workers over 45 years of age, these differentials become more balanced however.

Lastly, the wage differentials were decomposed on the basis of educational attainment. Based on the theory discussed, a public sector premium is expected in lower educated groups, while a private sector premium is likely to exist among the population's most educated groups.

Public vs. Private (Less Than High School) Differentials		
	United States	Greece
Due to Means:	0.007	0.113
Due to Parameters:	0.04	0.03
Total:	0.04503	0.1455776
Public vs. Private (High School) Differentials		
	United States	Greece
Due to Means:	0.062	0.123
Due to Parameters:	0.02	0.08
Total:	0.00840529	0.2008369
Public vs. Private (Some College) Differentials		
	United States	Greece
Due to Means:	0.065	-0.129
Due to Parameters:	0.04	0.3
Total:	0.1006784	0.17144
Public vs. Private (Bachelors) Differentials		
	United States	Greece
Due to Means:	0.003	-0.022
Due to Parameters:	-0.08	-0.02
Total:	-0.077025	-0.03743
Public vs. Private (Post Bachelors) Differentials		
	United States	Greece
Due to Means:	-0.057	0.048
Due to Parameters:	-0.12	-0.33
Total:	-0.178149	-0.27798

The results of the decomposition between educational groups explicitly support the hypothesized findings. In both the United States and Greece, there is a clear public sector advantage in all groups prior to attaining a bachelor's degree, i.e. less than high school, high school and some college. This accurately encompasses the lower skilled worker population that would benefit from the higher wages offered by the government. In both the bachelor's and post-bachelor's groups, there is a distinct private sector premium, which was expected to have existed due to political constraints on the level of wages offered by the public sector. This pattern of premiums based on education level is visualized below.



The visual shows that Greece possesses more extreme total differentials in both the public and private sectors, relative to the United States. This distinct pattern of wage differentials is not only supported by the level of total differential, but is exhibited in both of the portions of the differentials due to worker characteristics and pay structure. Apart from the most educated, post-bachelor's group, the wage differentials in Greece weigh in

favor of the public sector more heavily than those of the United States, consistently. Even in the bachelor's degree group, in which a private sector premium exists, the differential is smaller due to the existing public-sector advantage. The breakdown of each differential is interesting in the United States, as it is predictable by the workers' characteristics among the less educated groups. However, the highly educated, bachelor's and post-bachelor's groups, attribute their differentials to differences in pay structure. This supports the theory of higher educated individuals experiencing a private sector premium, as it represents the public sector's inability to compete with these higher wage levels. In Greece, the pattern is similar, however the pay structure differential exists only in the post-bachelor's group. Both the theories of softer budget constraints in Greece resulting in larger public sector wage premiums and of the wage premium pattern among different education groups is explicitly supported by this decomposition.

VII. Conclusion

This study successfully investigated the intricacies of the public-private wage differential in two vastly different economic environments. While both the United States and Greece were coming out of the recent economic crisis, their responses post-recession were hugely unalike. While the United States' economy certainly took a large blow, it remained the worlds largest economy unlike in Greece where the government fell into a debt crisis, which required a €45 billion rescue package from other Euro countries as well as the International Monetary Fund (IMF). Thus, the calculations in this study represent how wage differentials respond to different economic situations. Consistent with my hypothesized finding, Greece experienced

a larger public sector premium than did the United States in the middle-aged population, as well as almost all educational groups. This was a result of the looser budget constraints of Greece due to the immense levels of debt that they accumulated following the Great Recession. In addition, in both the United States and Greece, the theory of political constraints within the public sector by education level held true as highly educated individuals experience a wage advantage in the private sector due to the government's political inability to pay high enough wages to compete with the private sector. Overall, this study is a valuable contribution to the vast literature on wage differentials, as it investigates the discrepancies in terms that are not commonly acknowledged, such as the impact of different age groups and education levels, while most studies focus on the differentials between sectors as a whole or examine gender gaps in wages.

Appendix A:

I utilized the Integrated Public Use Microdata Series from the Current Population Survey (IPUMS CPS) to estimate the wage regression for the United States. Wage information was only included in the March survey, therefore to get the most recent wages; the March 2013 data was used for our study. Variables such as age, gender, education, race, union status, industry, sector were included as characteristics of the worker. In order to get an accurate measure of wage rates, some individuals were omitted from the sample. We decided to exclude any wages less than $3.60 (half of the federal minimum wage rate) or greater than $200 to leave out any outliers. Also, in order to keep only full time workers, the individual had to have worked at least 40 weeks out of the year and at least 35 hours per week. Lastly, we left out the "armed forces" industry, as there are such varying positions in the industry that comparison would not be accurate. After these deductions, we were left with a sample size of 54,168, more than big enough to get accurate, unbiased results. The same restrictions were applied to the 2010 personal level data obtained from the Luxembourg Income Study, for the wage model Greece, leaving a sample size of 15,076.

Appendix B.

Descriptive Statistics					
United States			Greece		
	Public	Private		Public	Private
Variable	Avg (Std Dev)	Avg (Std Dev)	Variable	Avg (Std Dev)	Avg (Std Dev)
Log of Wage	3.1110	2.9647	Log of Wage	2.2055	1.9928
	(0.53871)	(0.63284)		(0.32005)	(0.39851)
Age	44.7100	41.3600	Age	42.6300	39.0600
	(11.000)	(11.78800)		(9.15900)	(9.22900)
Female	0.5344	0.4285	Female	0.3876	0.4004
	(0.49882)	(0.49486)		(0.48719)	(0.48998)
Nonwhite	0.2190	0.1989			
	(0.41354)	(0.39919)			
Married	0.6600	0.5764	Married	0.7966	0.6078
	(0.47371)	(0.49413)		(0.40255)	(0.48825)
			Noncitizen	0.0000	0.0759
				(0.00000)	(0.26480)
Hispanic	0.1033	0.1644			
	(0.30435)	(0.37064)			

Union Member	0.0784	0.0148			
	(0.26887)	(0.12080)			
Other Family Income	40.7351	33.5953			
	(53.91369)	(53.60707)			
Nonwage Income	2.8752	2.2260	Nonwage Income	871.4477	682.8617
	(12.53299)	(12.06713)		(2247.53468)	(2296.39935)
High School	0.1908	0.2784	High School	0.3501	0.4598
	(0.39294)	(0.44822)		(0.47699)	(0.49838)
Some College	0.2579	0.2888	Some College	0.0416	0.1121
	(0.43746)	(0.45320)		(0.19958)	(0.31551)
Bachelors	0.2729	0.2467	Bachelors	0.3403	0.1140
	(0.44544)	(0.43108)		(0.47381)	(0.31778)
Post Bachelors	0.2648	0.1098	Post Bachelors	0.0214	0.0039
	(0.44125)	(0.31259)		(0.14484)	(0.06215)
Management	0.1351	0.1850	Management	0.0125	0.1012
	(0.34186)	(0.38830)		(0.11107)	(0.30157)
Professional	0.4281	0.2048	Professional	0.0101	0.1224
	(0.49480)	(0.40355)		(0.10021)	(0.32772)
Service	0.1957	0.1306	Service	0.0078	0.0401
	(0.39673)	(0.33696)		(0.08819)	(0.19608)
Office	0.1504	0.1318	Office	0.9425	0.0468
	(0.35750)	(0.33826)		(0.23285)	(0.21117)
Agriculture	0.0008	0.0069	Agriculture	0.0000	0.0031
	(0.02886)	(0.08302)		(0.00000)	(0.5527)
Construction	0.0215	0.0506	Construction	0.0016	0.0507
	(0.14506)	(0.21925)		(0.04035)	(0.21933)
Installation	0.0230	0.0454	Installation	0.0240	0.2299
	(0.14991)	(0.20819)		(0.15316)	(0.42078)
Transportation	0.0268	0.0677	Transportation	0.0000	0.0589
	(0.16147)	(0.25117)		(0.00000)	(0.23536)
Sales	0.0072	0.1053	Sales	0.0014	0.3471
	(0.08426)	(0.30699)		(0.03722)	(0.47605)

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1 The Blinder-Oaxaca decomposition model is useful in calculating the differential between two groups. This "decomposes" the differential into an explained portion and unexplained portion, which when applied to wage differentials represents the portions of the differential due to discrepancies in worker characteristics and pay structure respectively. This is achieved by employing separate linear regressions for each group, and descriptive statistics to get the mean and coefficient for each variable. From here, the coefficient of the variable is multiplied by the difference between the means of each group. This is done for each variable included in the model, the summed to find to calculate the explained portion of the differential. In order to account for the unexplained portion, the mean value of the variable is multiplied by the differences between coefficients, and then added together for each variable. From here the explained and unexplained portion between two groups is understood, with the total differential being the combined value of the two calculated portions.