Research Report

Gender Bias and Salaries in Education Abroad

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THE FORUM ON EDUCATION ABROAD

Executive Summary

This report provides an analysis of the data collected by the Forum's Institutional and Program Resources Survey that was conducted in 2012. The Preliminary Report of that Survey is available on the Forum's web site at http://www.forumea.org/documents/ForumEA-PreliminaryReport2013Inst-Org-Res-Survey-pdf.pdf. The Preliminary Report presents data on job descriptions, tasks, profiles and experiences of individuals employed in education abroad. This report expands on that data by examining gender-based discrepancies in salaries for education abroad professionals.

The analysis suggests that there is a potential gender bias in education abroad salaries. When males and females are in these positions, and when most other variables are controlled (education, years of experience, etc.), males appear to have a salary that is approximately $9,962 higher than females.

The Forum intends to conduct further research on this important topic in order to serve its member institutions and organizations. Eventually this data will provide benchmarks for the field so that institutions and organizations can make informed judgments about salaries.

Methodology and Model

In the fall of 2012, the survey was sent to 2,613 individuals. 434 usable responses were collected, representing a response rate of 16.6%. Roughly two-thirds of the usable observations were from females (68.4%), and about one-third were from males (31.6%).

Although the survey was not originally designed to collect data for an analysis of gender bias in annual salaries, the survey did contain enough information to conduct the preliminary analysis. Ordinary least squares (OLS) regression using Rapid Insight Analytics (RIA) software was the primary technique used to conduct the analysis. In general terms, the data elements from the survey were used in an attempt to predict the annual salary of the individual. Salary is then the "output" or the "dependent" variable. Other "input" or "independent" variables within the data set such as age, education level, position title and gender are formulated into a mathematical equation that predicts the salary of an individual. In other words, salary is a *function* of the input variables.

Other techniques to compare salaries by gender (for example, simply comparing average salaries for males to average salaries for females) can result in erroneous conclusions if gender correlates with other attributes that may affect salary. For example, if the female respondents in the sample tended to have lower educational attainment or fewer years of experience in the field than the male respondents, one might incorrectly attribute lower salaries for women to gender bias rather than to these other contributing factors. The OLS regression process minimizes this risk by including and controlling for these other factors. As a result, if the final OLS regression equation includes gender as a significant predictor of salary, then we are inclined to say there is a gender bias.

OLS regression requires a single dependent variable. Respondents were asked to provide salary information by selecting a salary range; these responses were converted to an estimated salary by using the median value for the salary range selected. If a respondent reported a salary falling outside the two cutoff points provided in the survey (below $20,000 or above $200,000), they were assigned a salary of one step size below or above their respective thresholds. Those reporting earnings below $20,000 were assigned a salary of $17,500 because the interval step size in the nearest bracket is $2,500. Similarly, those reporting earnings above $200,000 were assigned a salary of $225,000 because the nearest interval step size was $25,000.

Creating the regression model in RIA is a two-step process. The first step is to use an automated data mining technique that analyzes each independent variable to determine whether or not it has any predictive potential with respect to the dependent variable (in this case, salary). Independent variables with predictive potential are then allowed to enter the second and final step: creating the OLS regression equation.

There are several metrics used to assess the overall quality of the regression equation. One is the R-squared value, a number between 0 and 1 that represents the proportion of the variance in the dependent variable that is explained by the model. In other words, it represents how much of the variance is accounted for by the regression equation. Typically for models of this type, an R-squared value greater than or equal to 0.50 could be considered quite adequate. Another measure is the individual p-values associated with each of the significant factors that are present in the regression equation, where smaller p-values indicate a stronger association between that factor (independent variable) and the dependent variable. It is common to set a p-value threshold in the modeling process; the resulting regression equation will only contain factors with p-values at or below that value. We used a threshold of 0.05, which is common. Quite often, most of the factors present in the final model will have p-values much lower than the established threshold. Additionally, an analysis of the residual values can be very helpful. This analysis is discussed in more detail below.

Results and Analysis

In this study, the final regression model created to predict salary included 11 significant factors (independent variables) and had an R-squared value of .5996. That means that 60% of the variability, or fluctuation, in respondents' salaries is accounted for by the regression model. This R-squared value is certainly strong enough to conclude that the model built for salary has sufficient predictive reliability. Gender appeared as a significant factor in the model, with a p-value of 0.0002 (well below the threshold of 0.05). The gender component of the modeling equation indicates that according to this model, a woman can expect to earn on average $9,962 less than a man with the same characteristics otherwise. It is important to note, however, that less than 17% of the population is represented in this survey data, and it may not be wise to assume this small proportion is representative of the entire population of study abroad administrators in the field.

It is good practice to conduct an analysis of the residual values when assessing an OLS regression model. A residual value is the difference between an individual's actual salary and the predicted salary provided by the regression equation. Optimally, the residual values are unbiased, i.e. they are randomly scattered around zero across the entire range of salaries. Such a result would indicate that the model has no tendency to either "overpredict" or "underpredict" for any given salary level. The residual analysis for this model, however, did show signs of bias. There was a tendency to overpredict the salaries on the low end of the scale and underpredict the high end. This strongly suggests there is one or more factors that influence salary that are not currently contained the data and is another reason further study is necessary.

Limitations

It is important to note that the survey sample was not representative enough to draw conclusions about salaries for positions outside of those at the director level, nor does it contain all of the data elements necessary to state conclusively whether or not a gender bias exists.

Next Steps

While the results of this analysis show that there is a potential gender bias in education abroad salaries at the director level, more data collection and analysis is needed. The sample size will need to be increased in order to provide more authoritative data for the different types of positions in the education abroad field. In addition, information about where a person is located will provide the opportunity to use the cost of living index as an additional input variable, in order to control for any potential correlation between gender and cost of living among respondents. The data also suggested that the degree of potential gender bias varied according to the position held and the salary level of the respondent. This variation warrants further investigation as well.

The Forum intends to conduct further surveys on salaries in the education abroad field in order to serve its member institutions and organizations. Eventually this data will provide benchmarks for the field so that institutions and organizations can make informed judgments about salaries.

Appendix

The analysis below examines the differences between male and female according to a number of different variables.

- **[YEARS OF EXPERIENCE]** A t-test was conducted to determine if there was a significant difference between years of experience between males and females:
  - Hypotheses: Males and females have equal years of experience in higher education (overall) and in the field of education abroad.
  - Conclusions: There is very strong evidence in the sample to indicate that males and females do not have the same average number of years of experience. (p-value = 0.0006 for Higher Education and p-value = 0.0021 for Education abroad.

- **[HIGHEST EDUCATION LEVEL, 1]** Having a Ph.D. turned out to be a very strong predictor in our salary model with a coefficient of $17,388. Below is the breakdown of highest education level achieved by gender.

Degree	%Female	%Male
Ph.D.	16%	43%
Ed.D.	3%	1%
Professional Degree (JD, MBA)	5%	10%
Master's	60%	42%
Bachelor's	15%	4%
Associate's	0%	0%
High School Diploma	0%	0%
Other	0%	1%
Total	297	136

Table 1

- **[SAL_WOB]** Salaried employees without benefits was a category with a negative coefficient of about $23,000:
  - The numbers are very small, so this variable in general is suspect.
  - There are just over double the amount of females than there are males, and yet the males have double the percentage of salaries without benefits. The reasonable conclusion here is that this variable is relatively free of gender bias.

Sal_WOB	%Female	%Male
1	2%	4%
0	98%	96%
Total	297	137

Table 2

- **[TEN_FAC]**
  - Tenured Faculty was a category with a positive coefficient of about $14,500:
    - In this case, there were six times the percentage of male respondents in tenured faculty positions, while males were less than half of the total number of respondents. Therefore, this lends support to the hypothesis that the tenured faculty effect in the model is a surrogate for being male. Or, in another light, that perhaps being female is capturing some of the negative predicted effects of not having a tenured faculty position.
    - Pairing this with the statistics of highest level of education above, females could arguably be capturing the negative impacts of a number factors, and the female coefficient may have little to do directly with being female.

Ten_Fac	**%Female**	**%Male**
1	2%	12%
0	98%	88%
Total	297	137

Table 3

- Some of the "Estimated Percent of time spent…" parameters were found to be predictive:

MODEL STEPS

FINAL OLS REGRESSION MODEL

Variable	Coef	p-value
Intercept	128,158.2[illegible]	0.0000
Female	-9,962.48	0.0002
JC_Sal_WOB	-23,769.38	0.0004
JC_Ten_Fac_US	14,509.06	0.0065
Est_percentTm_StrtgicPlanning	1,038.76	0.0000
PcentTime_TravelOverseas	-896.52	0.0000
CubeRoot(Est_percentTm_Orientation)	-6,401.36	0.0000
SquareRoot(Est_percentTm_PersonnelManagement)	2,575.02	0.0004
Binary(Highest_Ed_Lvl,1)	17,388.46	0.0000
Binary(Inst_Org_Type,7)	8,988.68	0.0006
Cube(PcentTime_Work_at_HomeInst)	-0.08139	0.0000
Cube(Yrs_Exp_in_HigherEd)	45.18	0.0000

Figure 1: The regression using Salary as the y-variable

  - **[EST_PERCENTTM_STRTGICPLANNING]**
    - Strategic Planning had a positive coefficient
    - These are estimated percentages, so one should not read too much into minor differences.

    - Men spend about 2.26% more time in strategic planning than women on average, amounting to a predicted salary difference of about $2,354 in men's favor.
- **[PCENTTIME_WORK_AT_HOMEINST]**
    - Percent of time spent working at the home institution had a negative coefficient.
- **[PCENTTIME_TRAVELOVERSEAS]**
    - Percent of time spent traveling overseas also had a negative coefficient.
        - Both overseas and home institution assessments had negative coefficients, but the survey requested these reported as a pair, requiring that the two figures sum to 100 pairwise (note that this occurs in the averages in the table).
        - While women spend more time working at their home institution on average, and predicted salaries are decreased as a result, men travel overseas more often on average. One assumes the only way to assess the net difference is through effect size.
            - If you consider the effects of both of these variables simultaneously, based on the pairs of percentages reported for men and women, these two variables account for a difference of $8,312.
- **[EST_PERCENTTM_ORIENTATION]**
    - Estimated time spent working in Orientation had a negative coefficient.
        - At a difference of roughly .2 between the cube roots of the male and female averages, this variable accounts for a difference in predicted salary of $1,280, in favor of males.
- **[ESTPERCENTTM_PERSONNELMANAGEMENT]**
    - Time spent managing personnel had a positive coefficient, and its contribution ranges from $0 - $25,000.
    - Males tended to commit a slightly larger portion of their professional energy to this category than females, but not by much.
        - Due to the coefficient and the percentages reported by respondents, the difference in predicted salary by this variable alone is less than $300.

Averages (in %)	**Orientation**	**Strategic Planning**	**Work Home Inst**	**Travel Overseas**	**Personnel Management**
Female	4.017794	5.354093	91.34749	8.65251	5.917266
Male	2.675781	7.620155	82.62832	17.37168	6.53125
Totals					
Female	282	282	260	260	280
Male	129	130	114	114	129

Table 4

- **[JOB_PREFIX]**
  - Since most of the variables mentioned are distributed in favor of males in the sample, it became necessary to take a shallower look at the data.
  - This serves as evidence to support a hypothesis that females will have a lower average salary in the sample.
    - The proportion of females in executive positions is half as much as the proportion of males in executive positions.
    - While only 16% of males fall into the assistant category, the category with lowest expected salary, half of all females are “assistants” in their field.

Occurrences	**Assistant**	**Associate**	**Executive**
Female	57	35	21
Male	10	29	25
Totals			
Female	113		
Male	64		
Percentages	**Assistant**	**Associate**	**Executive**
Female	50%	31%	19%
Male	16%	45%	39%

Table 5

- In an attempt to validate the “female” flag variable entering the model, “female” was taken out of the model in two fashions:
  - In the first, the same variables remained in the model, so that the only change was that female was no longer available as a catchall for any differences in salary.
    - The guiding thought was that if the variables correlated to female in the sample were the only reason that female was entering the model, then “male variables” would receive coefficients of greater magnitude in the new regression.

MODEL STEPS

FINAL OLS REGRESSION MODEL

Variable	Coef	S.E.	t-value	p-value
Intercept	37,614.95	3,460.35	10.87	0.0000
JC_Sal_WOB	-22,691.74	6,958.98	-3.26	0.0011
JC_Ten_Fac_US	20,080.76	5,459.93	3.68	0.0002
Est_percentTm_StrtgicPlannir	1,052.76	175.86	5.99	0.0000
CubeRoot(Est_percentTm_Or	-7,397.73	1,354.40	-5.46	0.0000
SquareRoot(Est_percentTm_I	2,962.54	756.15	3.92	0.0001
Binary(Highest_Ed_Lvl,1)	19,293.96	3,048.98	6.33	0.0000
Binary(Inst_Org_Type,7)	8,373.02	2,705.73	3.09	0.0020
CubeRoot(PcentTime_Travel(	5,578.56	1,354.21	4.12	0.0000
Cube(Yrs_Exp_in_HigherEd)	51.26	7.062	7.26	0.0000

Diagnostics

R_SQUAF	SSE	CTSS	MSE
0.5641	222,692,80	510,882,71	549,858,768.8

RMSE	DFE	F	N
23,449.068	405	58.24	415

- An analysis was conducted that looked at the difference between the model with "female" and the model without "female."
  - **[JC_Sal_WOB]**
    - In salary without benefits, the coefficient drops by roughly $1,000
      - Males were more densely represented in this category, so ultimately the average male predicted salary suffers less by being a "salary without benefits."
  - **[JC_Ten_Fac_US]**
    - For tenured faculty, the coefficient is increased by $5,500
      - There were 6 times more males than females, so this could indirectly be capturing a gender difference.
  - **[Est_percentTm_StrtgicPlanning]**
    - This coefficient was changed by only $20.
  - **[PcentTime_Travel_Overseas]**
    - No simple comparison can be drawn regarding the percent of time spent traveling overseas; this variable was transformed in the model without females, but was not in the model with females.
  - **[CubeRoot(Est_percentTm_Orientation)]**
    - This coefficient decreased by roughly $400.
      - While there was a gap in the gendered predicted salary, the increase in magnitude increases the gap by $200.
  - **[SquareRoot(Est_percentTm_PersonnelManagement)]**
    - This coefficient increased by $400, but the reported time spent in this category was similar for males and females.

- **[Binary(Highest_Ed_Lvl,1)]**
    - This coefficient increased by $2,000.
        - This variable was among the most disparate between the two genders in our sample, so this increase relates back to males at a much higher frequency than females.
- **[Binary(Inst_Org_Type,7)]**
    - This coefficient decreased by $600.
        - Females made up 70% of this partition, but while the decrease applies more to females than males, the decrease is subtle.

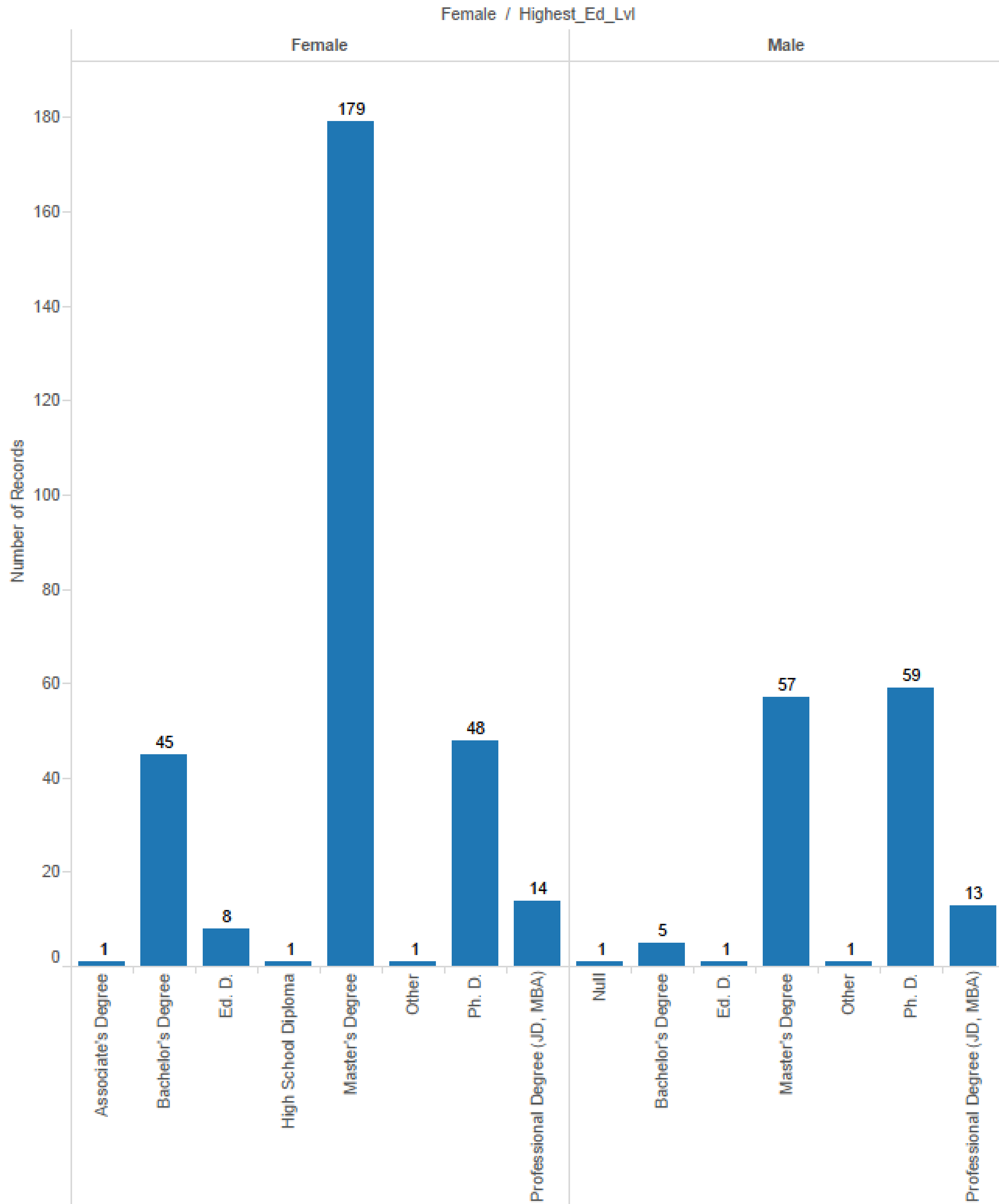
Female / Highest_Ed_Lvl
Female
Male
Number of Records
0
20
40
60
80
100
120
140
160
180
1
45
8
1
179
1
48
14
1
5
1
57
1
59
13
Associate's Degree
Bachelor's Degree
Ed. D.
High School Diploma
Master's Degree
Other
Ph. D.
Professional Degree (JD, MBA)
Null
Bachelor's Degree
Ed. D.
Master's Degree
Other
Ph. D.
Professional Degree (JD, MBA)

Figure 2


Prefix/Title
Female / Job_Prefix
Female
Male
60
55
50
45
40
35
30
25
20
15
10
5
0
Number of Records
Female, Job_Prefix
Female, Assistant
Female, Associate
Female, Executive
Male, Assistant
Male, Associate
Male, Executive
Assistant
Associate
Executive
Assistant
Associate
Executive
Average Yrs Exp
Female
Female
Male
Measure Names
Yrs_Exp_in_HigherEd
Yrs_Exp_in_Edu_Abroad
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Value
297
297
137
137
Yrs_Exp_in_HigherEd
Yrs_Exp_in_Edu_Abr..
Yrs_Exp_in_HigherEd
Yrs_Exp_in_Edu_Abr..

Figure 3


Tenured Faculty
Female / JC_Ten_Fac_US
Female
Male
Number of Records
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
0
1
0
1
Salaried WOB
Female / JC_Sal_WOB
Female
Male
Female
Female
Male

Figure 4

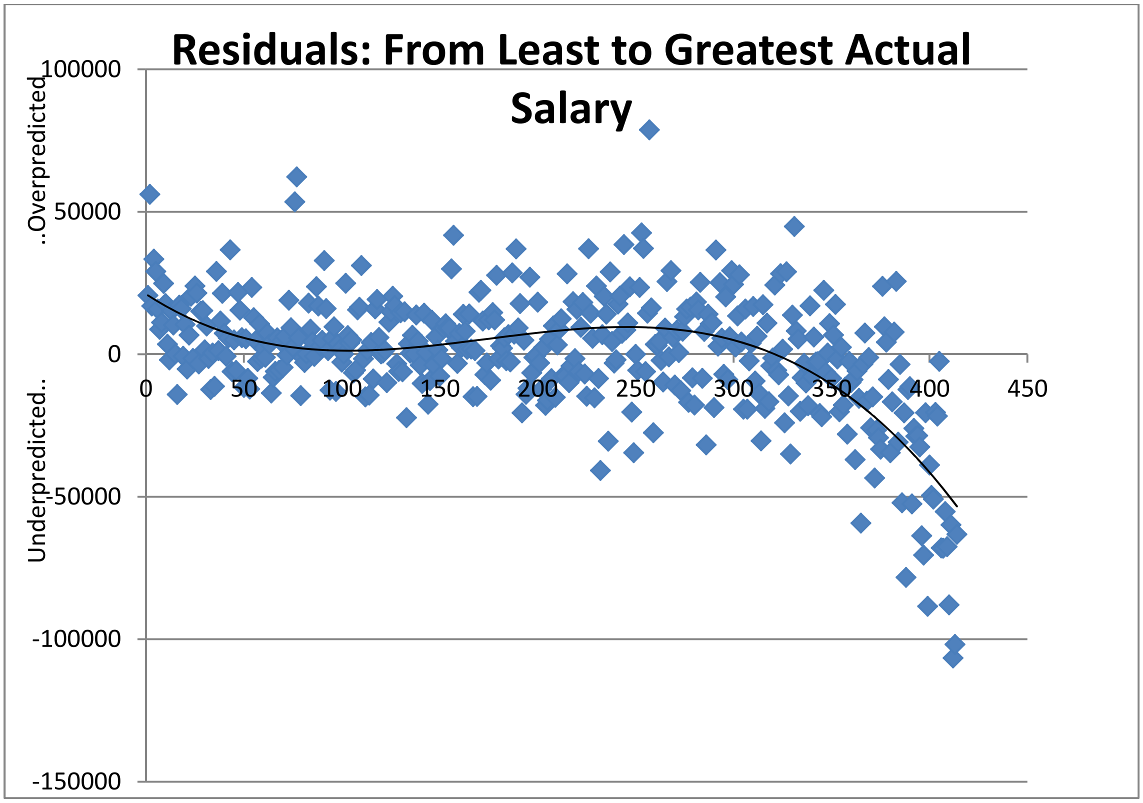

Figure 5: Residual Analysis with fitted trend line, polynomial order 3