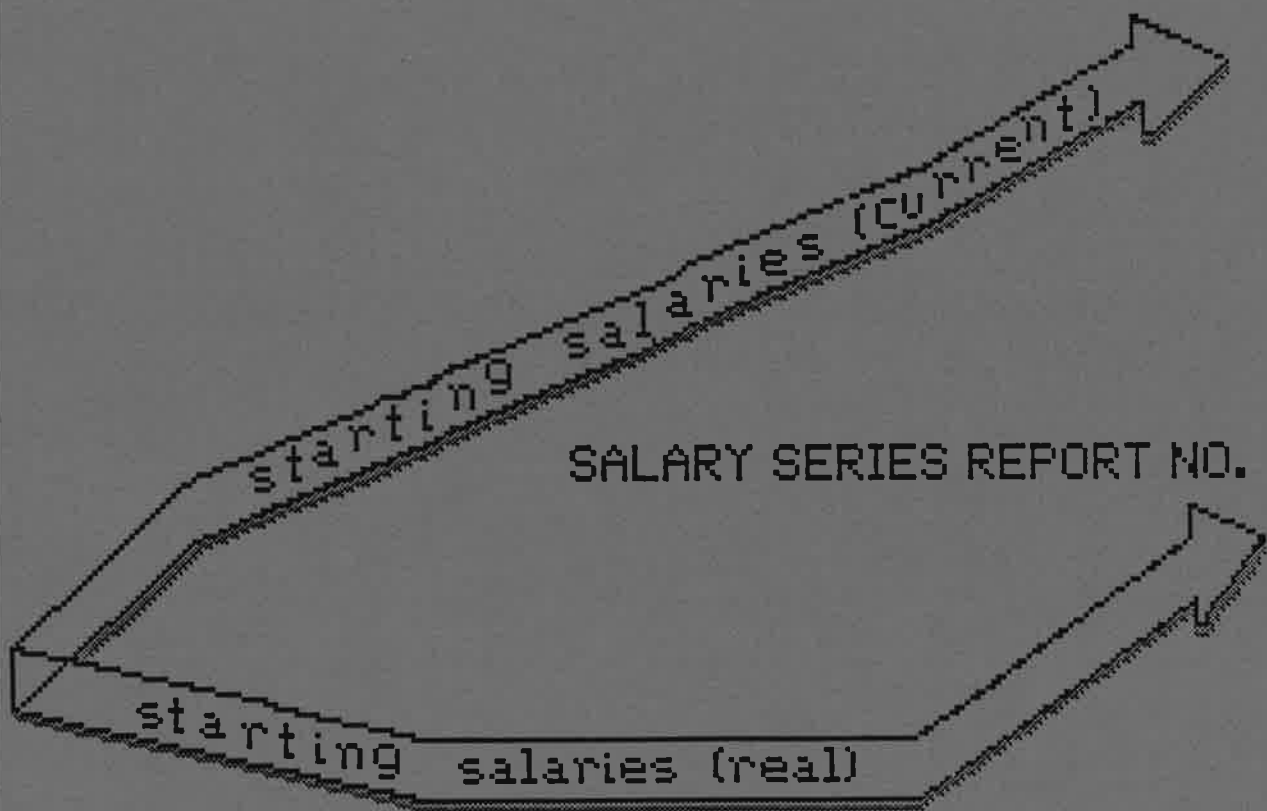


Starting Salary Trends and Analysis:
College of Natural Science, 1978-1985.

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Over the past decade both the national and Michigan economies have performed poorly, at times, which has affected the starting salaries of college graduates. Inflation has also eroded the earning power of new labor force participants, especially during the early 1980's. In an investigation of starting salaries of recent graduates from Michigan State University, inflation and economic conditions were shown to have affected salary performance (see Report No. 2). However, the magnitude of the impact varied by college and sometimes even between academic programs within a college. This report reviews recent starting salary trends for bachelor degree recipients of the College of Natural Science from August, 1978, to June, 1985. The analysis examines differences in salaries among academic programs within Natural Science. Also, starting salary comparisons are made by gender, race, and job location.

OVERVIEW

The results presented in this study are based on starting salary information reported by 625 graduates of the College of Natural Science (1978-1985). The major findings in the analysis of starting salaries include:

1. Starting salaries have increased at an average of 7% annually between 1978 and 1984, before experiencing a decline of 5% in 1985. The average starting salary in 1984-85 was \$18,319 as compared to \$13,917 in 1978-79 (current dollars that have not been adjusted for inflation).

2. The high inflation experienced from 1980 to 1983, corresponding to economic problems in Michigan, eroded the salary position of graduates during this period. After accounting for inflation, the 1984-85 average was \$11,973 (real), approximately 14% below the 1978 average.

3. Real starting salary averages for geology (\$16,185) and physics (\$14,902) were higher than averages for all other departments. Chemistry (\$13,171) and mathematics (\$13,840) were in the middle with microbiology, zoology and "other"¹ at the bottom (salary averages ranging from \$10,628 to \$11,594). Academic major displayed variations in response to inflation and economic conditions: some experienced cyclical conditions while others went through several years of decreases before showing modest improvement.

4. Manufacturing offered the highest starting salaries, averaging \$15,607 (real); education was the lowest at \$10,593.

5. Location played an important role in starting salary offers with out-of-state positions paying \$2,458 (real) more than in-state positions. The largest differences were found in geology, physics, and chemistry. Only mathematics graduates reported salaries that were similar, irrespective of location.

6. The average starting salary for men was \$13,288 (real) as compared to the \$12,035 (real) average for women. Women from chemistry held a small edge in salary, but in all other disciplines women's salaries fell noticeably behind men's.

¹Other is comprised of physiology, medical technology, botany, and general science. Physics includes physics, astrophysics, chemical physics, and physical science; and chemistry includes chemistry, chemistry education and biochemistry.

GENERAL DESCRIPTION OF THE POPULATION

During the seven year period from August, 1978, to June, 1985, 3,475 students graduated from the College of Natural Science at Michigan State University with bachelor's degrees. Approximately, 64% (2,237) of these graduates responded to a questionnaire sent to them by Placement Services. Of these graduates 28% (625) indicated that they were working and reported their starting salaries. An additional 22% (502) were working but failed to report their starting salaries. Approximately 39% of the natural science graduates indicated they were continuing their education at the graduate school level, primarily in medical school. The remaining 10% (231) were still unemployed six months after graduation. These categories represented 18%, 14%, 25% and 7% of the total population of graduates, respectively.

The number of students graduating each year fluctuated from a low of 382 in 1979-80 to a high of 657 in 1983-84. Declines occurred in three periods, 1979-80, 1981-82, and 1984-85 with a 11%, 4%, 6% decrease in graduates respectively. Conversely, each of these years were followed by increases in the number of graduates, which suggests a cyclical pattern of movement through the College of Natural Science.

Over the study period, response rates averaged 64%, with the lowest in 1981 being 59%. The highest rate of unemployment occurred in 1982 at 9%, somewhat higher than the overall average rate of 6.7%.

While women comprised 39% of the total population, the actual number of women graduating in natural science disciplines has increased from 147, 34% of the class in 1978-79, to 269, or 43% in 1984-85 (Figure 1). The number of women graduates sharply increased between 1981-82 and 1983-84. Men also graduated in larger numbers in 1982-83 and 1983-84 after experiencing an unusual decline of 16% between 1980-81 and 1981-82.

The distribution of respondents reporting salaries found slightly fewer men (55%) responding than a priori expectations based on the total gender distribution of graduates. Women were more likely to be unemployed (8% for women versus 6% for men) and also failed to report salaries (20% to 11%). The failure to report salaries suggests that these graduates are likely to be in non-career or unsatisfying positions. On the other hand, a larger portion of men elected to continue their education than women (29% to 20%).

To facilitate discussion, several programs have been grouped together as follows: geology, physics (physics, astrophysics, chemical physics and physical science), chemistry (chemistry, chemistry education and biochemistry), mathematics, microbiology, zoology, and others (physiology, medical technology, botany and general science). The majority of graduates were in the other category (26%) and microbiology (16%), with the remainder distributed between chemistry (15%), zoology (15%), geology (12%), mathematics (10%) and physics (5%) (Table 1). Mathematics and chemistry graduates reported their salaries at a rate higher than a priori expectations, while "other" and microbiology graduates were below these expectations. The highest average unemployment rate was encountered by both geology and zoology (9%), followed by mathematics (8%). The "other" group enjoyed the lowest employment rate of 4%. Graduates from chemistry and the "other" group were more likely to

continue their education, though graduates from every department displayed a strong commitment to additional education. Over the seven year period, 60% of the scientists found employment, continued to seek employment, or continued their education in Michigan. This average masks an actual recovery in scientists remaining in Michigan. In 1978-79, 67% of the scientific graduates remained in the state. For the next five years this figure declined. By 1981, the lowest year, the number had dropped to 47%. The numbers have noticeably improved over the last few years to an all time high of 71% in 1984-85.

Michigan State science graduates were working in all regions of the country with the most popular areas being the southcentral (11%), northeast (9%), and northcentral (9%) states. These regions were particularly popular with geology, chemistry, mathematics and microbiology graduates. Other, zoology, and physics graduates were more likely to look to the southwest and southeast regions of the United States for employment opportunities.

For those graduates reporting salaries, 60% were employed in Michigan. However, this average is inflated by very high in-state service in 1978-79 (67%) and 1984-85 (71%). Actually in-state employment dropped sharply, as much as 48% in 1980-81. The number of natural science graduates reporting salaries and remaining in the state has been improving over the last three years of the study. Popular employment areas outside the state for these graduates included the southcentral (11%), northeast and northcentral (both 9%) regions.

When considering only those reporting salaries, a higher number of chemistry (68%), mathematics (59%), microbiology (66%), zoology (64%), and "other" (76%) graduates were employed inside the state. Geology (65%) and physics (65%) graduates continued to locate out-of-state. The salary subsample used in subsequent comparisons was representative of the total natural science graduates based on locational patterns of the different programs.

Men were heavily concentrated in all programs except the "other" category where there was a 50-50 split. When it came to reporting salaries, women in mathematics, microbiology, zoology and "other" reported more often than a priori expectations, 50%, 56%, 53% and 59% respectively. However, women reported their salaries less often for geology, physics and chemistry, 20%, 11%, and 40%, respectively. Men were also more likely to work outside the state (42%) as compared to women (37%).

Graduates from the College of Natural Science pursued careers in many different sectors of the economy. Nearly 33% of the graduates found employment in the service sector, 24% in manufacturing, and 22% in education. The majority of graduates employed in the service sector came from the "other" category (61%) and 27% of the chemistry graduates found employment in the manufacturing sector, whereas mathematics majors were primarily employed in the education sector (27%). Medical services; chemical and electrical industries; and community college, secondary and elementary education provided the majority of the employment opportunities for natural science graduates.

Ninety-three percent (93%) of the graduates were white. Blacks and Asian Americans largely comprised the balance of the remaining graduates with 2% in each group. Blacks tended to follow programs in both the "other" category and microbiology, while Asian Americans

were concentrated in chemistry and "other". Except for a slightly higher non-response rate from blacks (46%) than expected, the minority groups were represented in proportion to their total graduation numbers. However, the numbers of Hispanic, Native American, and even Asian-Americans were small, which makes statistical comparisons tenuous. For this reason, the minority groups have been collapsed into one (non-white) in the following analyses.

Within the subsample reporting salary, 94% of the respondents were white. Non-whites were slightly underrepresented in zoology and "other" plus seriously underrepresented in geology and microbiology. Nearly 53% of the minority responses were from women as compared to 44% for white women.

In summary, the sample representation for analysis of starting salaries is fairly representative of the general natural science population graduated from Michigan State University between August, 1978 and June, 1985. Potential biases may exist with respect to overrepresentation by chemistry and mathematics graduates, and inadequate number of minorities, especially minority males.

SALARY TRENDS AND COMPARISONS

The average starting salary (current dollars not adjusted for inflation) reported for 1978-79 was \$13,917 (Table 2). Salaries have increased at rates ranging from 2% to 14% per year, except for 1984-85 when salaries decreased by 5% from the previous year. The largest incremental change in salaries occurred in 1983-84 when salaries increased 14% over the previous year. Even with the decrease experienced in 1984-85, the average salary at the end of the study period was \$18,319.

When salary figures were adjusted for inflation (1978-79 = 100), the impact of inflation on current salary levels could be determined. Between 1978 and 1983, real salary (adjusted for inflation) increases failed to keep up with inflation as indicated by the negative percentage change figures in the real column of Table 2. The failure of current salary increases to keep pace with inflation also suggest a possibly weak labor market for science graduates during this time period. Inflation and poor economic conditions have eroded the salary position of graduates over the five years of the study which have not been negated by the one increase experienced between 1982-83 and 1983-84.

Even when salaries showed improvement in 1983-84, this increase could not be sustained, as salaries declined the following year. In general, salaries for natural scientists have not followed the overall improvement of the economy, as captured in trends from other colleges. Increased participation in graduate school may reflect both the need for advanced degrees and a weak job market.

Year of graduation did not have a significant impact on salary averages (real). Using a criterion of $p \leq .05$ as the significance level, no one year was statistically different from any other year when comparing yearly averages.

Academic Programs

Graduates from different academic areas within natural science have experienced slightly different labor markets which are reflected in starting salary offers. The average starting salaries (real) are

listed in Table 3 for each program. The highest salary average was reported by geology graduates at \$16,185. Salaries for physics, chemistry, and mathematics graduates ranged from \$13,171 to \$14,902. At the lower end of the salary range were microbiology, zoology and "other" graduates. Several significant comparisons, involving geology, physics, chemistry and mathematics, were identified when means were compared and are listed at the bottom of Table 3.

Annual salary increases for the different academic programs showed negative trends after adjustments for inflation. The small sample sizes did not permit a comprehensive interpretation; salaries by year have been included for completeness. For example, geology graduates in 1984-85 faced a serious decline in starting salaries, a decrease of 30%. (These changes probably influenced the negative change illustrated in Table 2.) The sharp decline reflects the economic difficulties in the petroleum and mining sectors of the economy. With the exception of chemistry graduates, who did not experience an initial drop in salaries between 1978-79 and 1979-80, the declining salary trends for other programs were similar. While these figures represent the best estimates of average starting salary, the small sample size should caution against drawing generalizations except possibly in chemistry and mathematics.

Employer

The average starting salary (real), as reported in Table 4, offered by manufacturing firms was significantly higher than the other sectors, at \$15,607. The average starting salary paid by "other" which includes consulting firms, volunteer organizations, and self employment was \$12,099 (real). The average starting salaries for service, education, and other varied ranging from \$10,593 to \$11,780.

When sorted by year of graduation, the sample sizes in some cases became too small, restricting the interpretation of the trends in starting salaries. For completeness, all values have been included in Table 4. The general trend in starting salaries after accounting for inflation (Report No. 2) showed a decline between 1978 and 1982 for the different employment sectors, followed by a gradual increase through 1985. The salary pattern for service and education sectors was very similar to this general trend. Manufacturing, government, and "other" followed a more cyclical pattern with both manufacturing and "other" experiencing a sharp drop in salaries between 1983-84 and 1984-85.

Job Location

The decision to accept a position in Michigan versus one outside the state may be based on the salary offer. The difference in starting salary averages between those working in- and out-of-state was \$2,458 (real), with the advantage to out of state positions. This difference was statistically significant ($p \leq .001$).

Each departmental group within the College of Natural Science showed a consistent pattern of higher salaries outside the state. Salary differences due to job location by department are presented in Table 5. The real salary differentials between salaries offered in state compared to those out-of-state ranged from a high of \$5,562 for geology to a low of \$67 for mathematics. Not surprisingly, the differential in geology salaries resulted from the fact that the majority of employment opportunities are likely to be outside the

state. The difference for microbiology and zoology were approximately \$800 and for the others greater than \$1,000. Only mathematics graduates received comparable pay irrespective of location. These differences may be large enough to influence a decision to select a position out-of-state over one in Michigan. However, for geology and physics graduates, salary difference appeared to have a strong influence in job selection, as the number remaining in Michigan was low.

To further clarify starting salaries by location, salary trends for different locations were examined. In 1978-79, Michigan's new scientists were starting at an average salary of \$14,040 (real), which was \$139 less than the average out-of-state salary (Table 6). The state's economic condition, combined with high inflation, negated most of the increases in salaries, thus causing salaries to drop over the next three years. Between 1978-79 and 1979-80, there was an initial drop of 18% followed by 6% and 1% decreases. At the same time, graduates accepting jobs outside the state received a salary increase of 3% above inflation in 1979-80 before annual increases failed to keep pace with inflation. It was during this period that out-of-state salaries began to exceed Michigan salaries.

Over the last three years, both in and out-of-state salaries have fluctuated with increases followed by a decrease. In-state salaries have fared better, resulting in a reduction of the salary gap from a high of \$3,270 to \$1,715. Because of the cyclical pattern of recent salary increases, a short-run prediction regarding closing this gap cannot be made.

Sorting for the different economic sectors that employ natural science graduates, the differences between in- and out-of-state salaries in manufacturing and "other" organizations were close to the average difference (Table 7). The salary differences for service and government sector employment was smaller, approximately \$400, in favor of out-of-state positions. Only the education sector favored Michigan by about \$224.

Grade point average relationships will be discussed below, but an interesting in- and out-of-state comparison is worthy of mention. Grade point averages were collapsed into four major groups. The highest GPA group, above 3.5 had the highest salaries when employed out-of-state, averaging \$16,543 (real) (Table 8), nearly \$6,000 more than in-state positions for the same level of academic achievement. For grades below 3.5, out-of-state positions also paid more with differences ranging from \$931 to \$1,683. Graduates with strong academic records, GPAs of 3.5 or better, received the lowest salaries of all groups in Michigan. This relationship is different from the one found in several other colleges (e.g. education) where graduates with the highest grades received higher salaries in Michigan.

In summary, the comparison of average salaries between in- and out-of-state placement found a large advantage for out-of-state positions. This gap has not been appreciably reduced over the years. While Michigan does retain the majority of graduates with higher grades (60%), strong out-of-state competition for scientists suggests that Michigan industries may have to sharply increase salary levels, to retain a well-trained scientifically based labor pool.

Gender

The average starting salary for men was \$13,288 (real) compared to \$12,035 (real) average for women; a difference of \$1253. Not accounting for any other variables, this difference proved to be statistically significant ($F=9.89$, $p<.002$).

Women's salaries dropped approximately 24% between June, 1979, and June, 1982 (Table 9), while men's salaries only decreased by 5% over the same period. Over the next three years, men's continued to decrease by 3% while women's salaries began to increase 5% against inflation. With recent increases experienced by women, the salary gap between genders has been reduced from a high of \$2376 to \$860. Women, however, still do not enjoy the salary advantage of \$836 that they had in 1978-79.

Across programs, the salary position of men and women varied. In chemistry, women commanded a slightly higher starting salary (\$126) (Table 10) than men. Men had higher salaries in all other fields, ranging from \$493 in "other" majors to \$3,900 in physics. Statistically, the program-gender interaction terms were only weakly important.

The salaries for men and women differed depending on location. Men received nearly \$2,700 more for jobs in Michigan than women did (Table 11). Salaries for out-of-state employment, however, were nearly the same. Comparing only women's salaries by location a small difference was found, \$593, that favored out-of-state positions. Men, on-the-other hand, had a larger differential, approximately \$3,150, when taking a job outside the state. In general, women received similar salaries irrespective of location while men enjoyed a much higher salary outside Michigan.

Women received higher salaries in education, \$834 more than men (Table 12). This was the only economic sector for which this relationship was true. Men were receiving higher salaries in all other sectors though the differences for service and government employment were relatively small.

Grade Point Average

Grade point average, as pointed out earlier, introduced some interesting comparisons. The highest grade point group, greater than 3.5, had the highest average starting salary because of the salaries paid to geology and physics graduates (Table 13). In chemistry, mathematics, zoology and "other" groups, however, graduates with GPA's below 3.5 reported higher salaries. For example, mathematics graduates with a GPA less than 2.5 received the highest starting salaries for their department. For chemistry, zoology and the "other" categories, the highest salaries were reported by those with a GPA in the 2.5-3.0 range.

The salary position of the various GPA groups could have been influenced by the year of graduation, although the interaction term was not statistically significant. The group with GPAs below 2.5 saw their income actually increase between 1980-81 and 1981-82 then again in the period between 1982-83 and 1983-84 after accounting for inflation (Table 14). These increases were followed by two periods of dramatic declines, 16% between 1981-82 and 1982-83 and 14% between 1983-84 and 1984-85. Real salaries have moved from negative to positive percentage changes in sporadic movements.

Similarly, other GPA groups faced dramatic swings in salaries. The general trend experienced by groups above a GPA of 2.5 was

several years of declines followed by an increase leading to another decline. This roller-coaster trend moved through periods of steady ups to periods of steep downs. Salaries did not keep pace with inflation as the 1984-85 salary levels were considerably below 1978-79 levels.

The manufacturing sector paid the highest salary for all GPA categories (Table 15). Salaries for manufacturing employees ranged from \$14,764 (real) for those under a 2.5 GPA to \$18,408 for those with a GPA greater than 3.5. The education sector paid the lowest for those graduates with a GPA above 3.0. The service sector was the lowest paying industry for those graduates with GPAs below 3.0.

A final comparison of grade point by gender found that men had higher salaries across all GPA groups (Table 16), even though women have higher overall grade point averages. The biggest gender difference was \$2,649 for graduates with grades above 3.5. The remaining groups differed by \$1,470, \$666 and \$1,581, for those <2.5, 2.5-3.0, and 3.0-3.5, respectively.

Race

Because of the very small number of minority graduates in the College of Natural Science, all racial groups have been aggregated into one group. The average non-white salary was \$12,748 (real), slightly higher than the white average of \$12,710 (real). No further comparisons could be made using this variable.

STARTING SALARY DETERMINANTS

The salary comparisons made above indicate that several factors are important when determining starting salary levels: academic major, year of graduation, gender, and job location. Because of confounding effects caused by the relationship between independent variables, the unique contribution of a single factor cannot be specifically determined. A final analytical exercise, using hierarchical regression analysis, was performed to identify the key determinants of starting salaries for natural science graduates (real salaries were employed in the analysis).

In order to measure a particular effect, class variables were created for area of concentration, year of graduation, grade point average, industry of employment, and race. The dummy variables for gender and job location (in or out of Michigan) were also treated as class variables.

Each independent class variable was then regressed separately (alone) onto the dependent variable, starting salary. The R^2 was obtained for each variable, as well as the regression coefficient for each member of the class. These measures reflect the causal relationship between the independent and dependent variables with all other effects uncontrolled. The next step was to regress the entire set of explanatory variables whose causal priority (order of entry) had been prespecified onto starting salary. For example, to test the hypothesis that year of graduation did not have an effect on starting salary, the explanatory variables were entered in the following order: area of concentration, industry, gender, grade point average, job location, race and finally year of graduation. The incremental R^2 for the last variable entered (in example, year) was calculated by subtracting the final R^2 from the R^2 for the model obtained prior to the entry of the last variable. Similar tests were made for

the other independent variables:

The statistical inference assumed the null hypothesis that in the population, there was no increment in starting salary variance accounted for when year, for example, was added to the model. The null hypothesis or incremental R^2 's significance was tested by using the F-test as described by Cohen and Cohen (1983).

RESULTS

Approximately 58% of the College of Natural Science starting salary variance was accounted for when the complete model was specified. Thus, the model offers a rather robust explanation of starting salaries. Upon examining the regression coefficients (Table 18), year of graduation, department, and job location stand out as the important explanatory factors after holding all other possible effects constant.

Using a significance level of $p \leq .01$, only academic major had a significant incremental R^2 (Table 17). By factoring out the incremental contribution, a suppression effort (when the unique R^2 is larger than the R^2 alone) was identified. Suppression suggests that academic major was correlated to other independent variables, hiding its true relationship with starting salary. After all the variance is accounted for by controlling the other variables, academic major contributed 28%, a robust contribution.

The regression coefficients (Table 18) for major showed the magnitude of the differences. Coefficients for geology's, physics', and mathematics's were significant (at $p \leq .01$) and positive, meaning that they were higher than the "other" group which had been omitted to avoid colinearity. When the significance criterion is relaxed to $p \leq .05$, chemistry has a significant and positive coefficient while zoology has a negative coefficient (salary level below other).

A slight suppression effect was also found for year. After controlling other variables, year made a unique contribution of 2.5% to starting salary. This incremental contribution was significant upon relaxing the criterion to .05. The years 1978-79 and 1979-80 had large, positive and significant regression coefficients. All other years were not statistically different from 1984-85.

The regression coefficient which is positive and significant indicates that a job outside Michigan paid \$1,209 more than a job in Michigan, all other factors held constant. While the incremental F for location was large, it was not significant. Nevertheless, location appears to play an important role in salary considerations.

Other important factors included the class variable industry: manufacturing that accounts for differences in salary within the manufacturing sector. This variable made a significant ($p \leq .05$) incremental contribution; yet none of the regression coefficients was significant. Finally, one GPA group, < 2.5 , had a significant regression coefficient, indicating a difference in salary (lower) from all other groups.

Interestingly, the gender variable did not appear significant in the final model. When considered alone, the regression coefficient is large (1,253) and significant with the sign indicating that women have lower salaries. After all other variables are controlled, the gender effect disappears. Much of the difference in men's and women's salaries is accounted for by academic major, location, and employer. Additional attention should be given to encouraging women

to enter higher paying majors and to having women consider out-of-state employment. An assessment of career planning by women, particularly in their sophomore and junior years, in natural science may be appropriate and timely.

CONCLUSIONS

After comparing starting salary means by selected characteristics for natural science graduates and employing regression analysis, several variables were found to be important in determining starting salary levels: year of graduation, academic major, location and selected employers. Gender, after controlling for all other factors, was not a significantly important variable; even though the sign of the regression coefficient and mean comparisons indicate lower salaries for women.

Year of graduation captures the economic conditions prevailing at the time of graduation. From 1978 to 1982, salary increases did not keep pace with inflation. For most departments, except geology, salaries have improved against inflation for the past several years. Nevertheless, graduates have lost ground in terms of their salaries' purchasing power between 1978-79 and 1984-85.

Graduates from certain departments regularly were offered higher salaries. Geology, physics, chemistry, and mathematics fell in this group, while microbiology and zoology received the lowest salaries.

A significant finding was the large gap in initial earnings between graduates staying in Michigan and those finding jobs outside the state. To retain a larger number of natural scientists over the next several years, Michigan firms will likely have to improve salaries in larger increments than experienced in recent years.

References

Cohen, Jacob and Patricia Cohen. 1983. Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences. Hillsdale, New Jersey: Laurence Erlbaum Associates.

FIGURE 1: Women in Natural Science

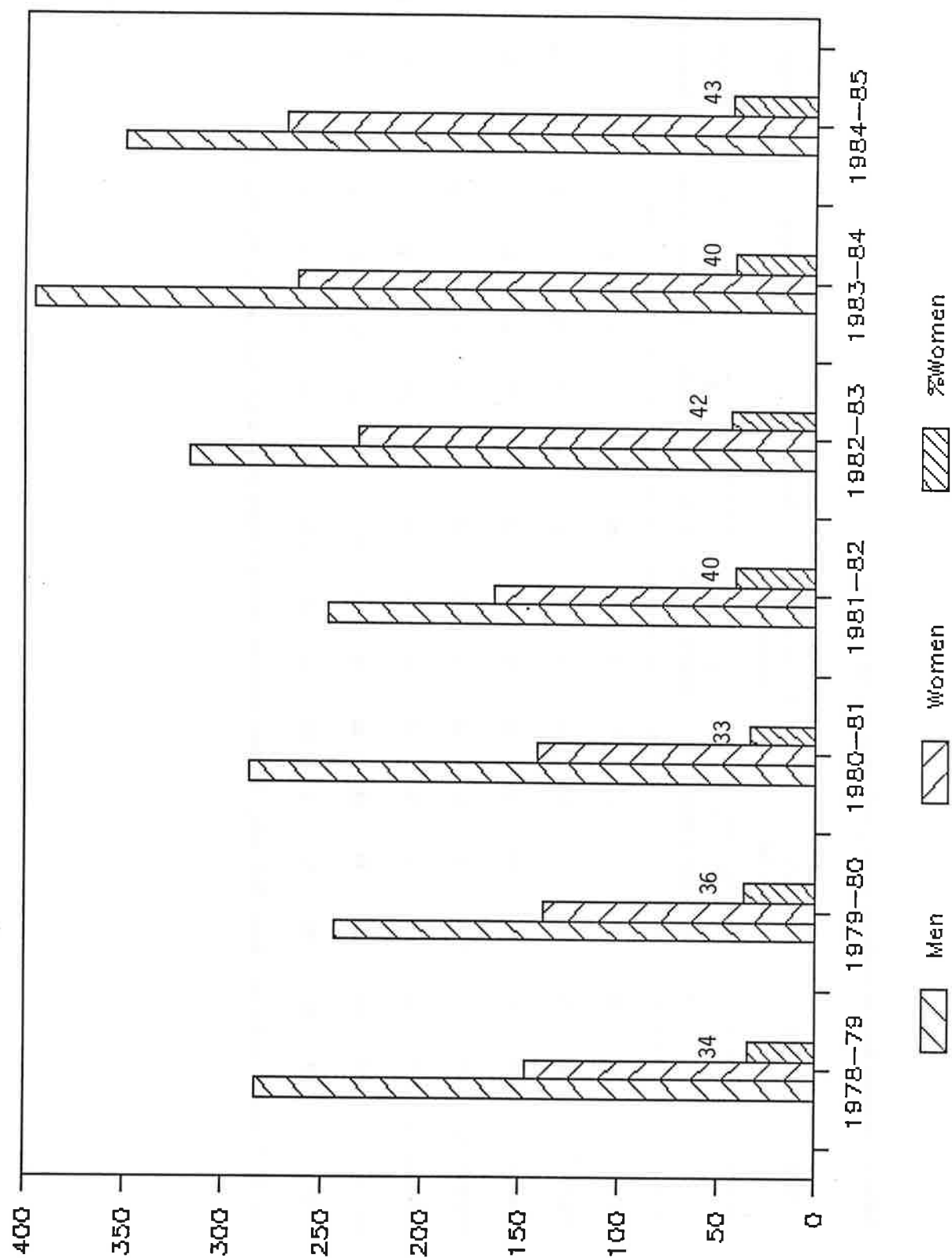


Table 1. Response Rate by Different Majors, College of Natural Science.

Major	Total		Working Salary Reported		Working No Salary Reported		Graduate School		Unemployed		No Response						
	n	%	n	%	n	%	n	%	n	%	n	%					
Geology	369	12	79	14	21	40	9	11	61	8	17	34	16	9	155	14	42
Physics	158	5	37	7	23	19	4	12	49	6	31	10	5	6	43	4	27
Chemistry	469	15	110	20	23	42	10	9	128	17	27	34	16	7	155	14	33
Mathematics	311	10	107	19	34	41	9	13	58	8	19	25	12	8	80	7	26
Microbiology	477	16	91	16	19	43	10	9	110	14	23	31	15	7	202	19	42
Zoology	467	15	55	10	12	51	12	11	127	16	27	42	20	9	192	18	41
Other	802	26	76	14	9	198	46	25	238	31	30	31	15	4	259	24	32

Source: Follow-up report data base, 1978-1985, Placement Services, Michigan State University, East Lansing, Michigan 48824.

Table 2. Average Starting Salary, Current and Real, for All College of Natural Science Graduates from August, 1978, Through June, 1985.

Year	n	Average (\$ Current)	% Change	Average * (\$ Real)	% Change
1978-79	97	13,917		13,917	
1979-80	92	14,270	6	13,027	-6
1980-81	88	15,866	8	12,592	-3
1981-82	72	16,639	5	12,145	-4
1982-83	84	16,992	2	11,966	-1
1983-84	99	19,292	14	13,035	9
1984-85	94	18,319	-5	11,973	-8

* Salaries have been deflated using 1978-79 as the index year (=100).

Source: Follow-up report data base, 1978-1985, Placement Services,
Michigan State University, East Lansing, Michigan 48824.

Table 3. Average Starting Salary (Real) for Academic Programs in the College of Natural Science from 1978-79 to 1984-85.

Year	Geology			Physics			Chemistry			Mathematics			Microbiology			Zoology			Other		
	Average Salary (\$)	% Change	n	Average Salary (\$)	% Change	n	Average Salary (\$)	% Change	n	Average Salary (\$)	% Change	n	Average Salary (\$)	% Change	n	Average Salary (\$)	% Change	n	Average Salary (\$)	% Change	n
1978-79	7 17,585		4	18,110		14	12,890		20	14,383		19	13,156		10	12,474		5	10,590		5
1979-80	9 17,068	-3	6	16,339	-10	13	13,651	6	16	13,258	-8	18	12,556	-5	11	10,783	-14	9	10,496	-1	9
1980-81	19 17,020	-3	4	15,755	-4	15	13,354	-2	10	10,961	-17	15	10,830	-14	9	10,230	-5	7	10,942	4	7
1981-82	10 17,596	3	5	12,905	-18	17	13,580	2	9	11,444	4	13	10,592	-2	8	9,194	-10	4	9,194	-16	4
1982-83	9 16,780	-5	5	10,387	-20	14	12,413	-9	17	11,783	3	11	10,247	-3	9	12,559	37	15	10,986	19	15
1983-84	12 16,582	-1	10	15,523	49	15	12,833	3	21	13,685	16	8	10,834	6	5	9,484	-24	17	10,366	-6	17
1984-85	13 11,733	-30	3	15,399	-1	22	13,339	4	14	13,135	-4	7	11,369	5	3	7,407	-22	20	10,829	4	20
Average	79 16,185		37	14,902		110	13,171		100	13,840		91	11,594		55	10,757		77	10,628		77

Comparisons of average salary which were significant at the .05 level.

- Geology: Chemistry, Mathematics, Microbiology, Zoology, and Other.
- Physics: Mathematics, Microbiology, Zoology, and Other.
- Chemistry: Microbiology, Zoology, and Other.
- Mathematics: Zoology, and Other.

Source: Follow-up report data base, 1978-1985, Placement Service, Michigan State University, East Lansing, Michigan 48824.

Table 4. Average Starting Salary (Real) by Economic Sector from 1978 to 1985 for College of Natural Science.

Year	Manufacturing			Service			Government			Education			Other		
	n	Average Salary	% Change	n	Average Salary	% Change	n	Average Salary	% Change	n	Average Salary	% Change	n	Average Salary	% Change
1978-79	31	16,399	-3	14	12,479	-8	15	12,305	-15	27	13,914	-27	10	12,297	13
1979-80	27	15,836	7	18	11,497	-4	10	10,518	16	18	10,193	-6	19	13,893	-20
1980-81	29	16,933	-8	12	11,048	-15	6	12,228	-17	28	9,580	-2	13	11,125	-12
1981-82	31	15,638	-6	11	9,345	2	4	10,153	18	20	9,386	3	6	9,759	37
1982-83	30	14,722	8	11	9,494	4	7	12,016	-5	29	9,692	4	7	13,410	-8
1983-84	45	15,841	-12	14	9,894	14	6	11,403	23	22	10,100	6	12	12,376	-13
1984-85	32	13,917		19	11,295		4	14,069		22	10,689		17	10,810	
Overall															
Average	225	15,607		99	10,854		52	11,780		166	10,593		84	12,099	

Source: Follow-up report data base, 1978-1985, Placement Services, Michigan State University, East Lansing, Michigan 48824.

Table 5. Average Starting Salary (Real) Differences Between Michigan and Outside the State for Natural Science Majors, 1978-1985.

Majors	Michigan		Other	
	n	Average Salary (\$)	n	Average Salary (\$)
Geology	28	12,594	51	18,156
Physics	13	12,853	24	16,012
Chemistry	75	12,735	35	14,107
Mathematics	63	12,907	44	12,974
Microbiology	60	11,305	31	12,154
Zoology	35	10,492	20	11,221
Other Majors	59	10,294	18	11,725
Total	333	11,834	223	14,292

Source: Follow-up report data base, 1978-1985, Placement Services, Michigan State University, East Lansing, Michigan 48824.

Table 6. Average Starting Salary (real) Trends for Natural Science Graduates Working in Michigan and in Other States, 1978-85.

Year	Michigan			Outside Michigan		
	n	Average Salary (\$)	% Change	n	Average Salary (\$)	% Change
1978-79	65	14,040		32	14,179	
1979-80	51	11,566	-8	41	14,568	3
1980-81	42	10,903	-6	46	14,173	-3
1981-82	38	10,755	-1	34	13,699	-3
1982-83	53	11,492	7	31	12,776	-7
1983-84	61	11,977	4	38	14,735	15
1984-85	67	11,584	-3	27	13,299	-10

Source: Follow-up report data base, 1978-1985, Placement Services, Michigan State University, East Lansing, Michigan 48824.

Table 7. Average Starting Salaries (real) for Natural Science Graduates by Major Employment Sectors as Compared to In and Out-of-State Job Location, 1978-1985.

Industry	Michigan		Outside Michigan		Difference (\$) (M-O)
	n	Average Starting Salary \$	n	Average Starting Salary \$	
Manufacturing	109	14,385	116	16,756	2,371
Service	76	10,763	23	11,156	393
Government	29	11,576	23	12,037	461
Education	109	10,640	57	10,416	-224
Other	54	11,174	30	13,764	2,590

Source: Follow-up report data base, 1978-1985, Placement Services, Michigan State University, East Lansing, Michigan 48824.

Table 8. Average Starting Salaries (real) for Natural Science Graduates by Various Grade Point Average Groups as Compared to In and Out-of-State Job Locations, 1978-1985.

Grade Point Average	Michigan		Outside Michigan		Difference (\$) (M-O)	Staying in Michigan (%)
	n	Average Starting Salary \$	n	Average Starting Salary \$		
< 2.50	90	11,760	42	12,691	-931	68
2.50-3.00	123	12,349	92	13,984	-1,635	57
3.01-3.50	119	11,919	81	13,602	-1,683	60
3.51-4.00	45	10,868	34	16,543	-5,675	60

Source: Follow-up report data base, 1978-1985, Placement Services, Michigan State University, East Lansing, Michigan 48824.

Table 9. Average Starting Salary (real) Trends for Male and Female Natural Science Graduates and Yearly Salary Differences, 1978-1985.

Year	Male			Female		
	n	Average Starting Salary \$	% Change	n	Average Starting Salary \$	% Change
1978-79	52	13,698		45	14,534	
1979-80	53	13,578	-1	39	11,987	-17
1980-81	48	13,692	1	40	11,316	-5
1981-82	40	13,013	-5	32	11,060	-2
1982-83	46	12,584	-3	38	11,218	1
1983-84	59	13,736	9	40	12,001	7
1984-85	49	12,488	-9	45	11,628	-3
Overall		13,288			12,035	
						1,253

Source: Follow-up report data base, 1978-1985, Placement Services, Michigan State University, East Lansing, Michigan 48824.

Table 10. Differences in Average Starting Salaries (real) for Male and Female by Academic Major, College of Natural Science, 1978-1985.

Major	Male			Female		
	n	Average Starting Salary \$		n	Average Starting Salary \$	Difference (M-F)
Geology	63	16,369		16	15,459	910
Physics	33	15,324		4	11,424	3,900
Chemistry	66	13,121		44	13,247	-126
Mathematics	54	13,278		53	12,585	693
Microbiology	40	11,958		51	11,309	649
Zoology	26	11,360		29	10,217	1,143
Other Majors	31	10,923		46	10,430	493

Source: Follow-up report data base, 1978-1985, Placement Services, Michigan State University, East Lansing, Michigan 48824.

Table 11. Differences in Average Starting Salaries for Male and Female Graduates of the College of Natural Science by Job Location, 1978-1985.

Gender	Michigan		Outside Michigan		(\$) Difference (M-O)
	n	Average Starting Salary \$	n	Average Starting Salary \$	
Female	103	12,409	176	11,816	593
Male	146	15,108	201	11,966	3,142
Overall Difference		2,699		150	

Source: Follow-up report data base, 1978-1985, Placement Services, Michigan State University, East Lansing, Michigan 48824.

Table 12. Differences in Average Starting Salaries (real) for Male and Female by Economic Sector, College of Natural Science, 1978-1985.

Employment Sector	Male		Female		(\$) Difference (M-F)
	n	Average Starting Salary \$	n	Average Starting Salary \$	
Manufacturing	154	15,843	71	15,097	746
Service	48	10,917	51	10,795	122
Government	25	11,902	27	11,666	236
Education	73	10,096	93	10,930	(834)
Other	47	13,031	37	10,914	2,117

Source: Follow-up report data base, 1978-1985, Placement Services, Michigan State University, East Lansing, Michigan 48824.

Table 13. Average Starting Salaries (real) for Natural Science Academic Majors According to Grade Point Average Levels, 1978-1985.

GPA Group	Total		Geology		Physics		Chemistry		Mathematics		Microbiology		Zoology		Other	
	n	Average Salary(\$)	n	Average Salary(\$)	n	Average Salary(\$)	n	Average Salary(\$)	n	Average Salary(\$)	n	Average Salary(\$)	n	Average Salary(\$)	n	Average Salary(\$)
<2.50	118	12,295	14	14,230	10	13,911	24	12,833	20	13,814	19	11,499	13	10,310	18	9,758
2.51-3.00	194	12,892	32	15,329	16	15,989	35	13,809	34	12,021	36	10,969	20	11,549	21	11,271
3.01-3.50	173	12,717	20	16,675	9	12,914	35	12,795	38	13,234	27	12,135	17	10,271	27	11,015
3.51-4.00	71	13,748	13	19,640	2	20,108	16	13,107	15	13,074	9	12,678	5	10,404	11	9,878

Source: Follow-up report data base, 1978-1985, Placement Services, Michigan State University, East Lansing, Michigan 48824.

Table 14. Average Starting Salary Trends (real) for Natural Science Graduates According to Selected Grade Point Average Levels, 1978-1985.

	< 2.50				2.50 - 3.0				3.0 - 3.5				> 3.5			
Year	Average Starting Salary (\$)	n	% Change	Average Starting Salary (\$)	n	% Change	Average Starting Salary (\$)	n	% Change	Average Starting Salary (\$)	n	% Change	Average Starting Salary (\$)	n	% Change	
1978-79	13,115	17		16,453	27		12,982	34		13,564	19					
1979-80	11,855	16	-10	11,790	23	-28	14,038	44	8	12,069	9	-11				
1980-81	11,466	15	-4	13,007	33	10	11,577	22	-18	14,108	18	17				
1981-82	12,950	20	13	12,347	21	-5	11,339	21	-2	11,801	10	-16				
1982-83	10,870	20	-16	12,094	34	-2	11,764	18	4	13,733	12	16				
1983-84	12,763	26	17	13,070	36	8	12,915	29	10	14,206	8	3				
1984-85	11,031	18	-14	12,679	41	-3	11,937	32	-8	11,595	3	-18				

Source: Follow-up report data base, 1978-1985, Placement Services, Michigan State University, East Lansing, Michigan 48824.

Table 15. Natural Science Graduates' Average Starting Salaries (real) for Major Employment Sector According to Grade Point Average Levels, 1978-1985.

Employment Sector	< 2.5			2.5 - 3.0			3.0 - 3.5			> 3.5		
	n	Average Starting Salary (\$)	n	Average Starting Salary (\$)	n	Average Starting Salary (\$)	n	Average Starting Salary (\$)	n	Average Starting Salary (\$)	n	Average Starting Salary (\$)
Manufacturing	43	14,764	92	14,832	64	16,151	26	18,408				
Service	31	10,390	17	10,856	40	11,100	11	11,267				
Government	11	11,628	24	11,680	12	11,725	5	12,723				
Education	20	10,504	57	11,790	58	9,766	31	9,839				
Other	27	10,982	25	12,165	26	12,896	6	13,392				

Source: Follow-up report data base, 1978-1980, Placement Services, Michigan State University, East Lansing, Michigan 48824.

Table 16. Average Starting Salaries (real) for Men and Women from the College of Natural Science According to Grade Point Average, 1978-1985.

GPA	Men			Women		
	n	Average Starting Salary (\$)	Average Starting Salary (\$)	n	Average Starting Salary (\$)	Difference \$ (M - W)
< 2.5	86	12,568	46	11,098	1,470	
2.5 - 3.0	124	13,331	91	12,665	666	
3.0 - 3.5	106	13,344	94	11,763	1,581	
> 3.5	31	14,920	48	12,271	2,649	

Source: Follow-up report data base, 1978-1980, Placement Services, Michigan State University, East Lansing, Michigan 48824.

Table 17. R^2 (alone) and R^2 (unique) for Variables in Regression Model with Corresponding F-test, 1978-1985.

	$R^2(a)$	$R^2(u)$	F(u)
Year	0.020	0.026	5.28*
Academic Major	0.216	0.284	57.66*
Gender	0.016	0.001	1.22
GPA	0.007	0.004	1.62
Race	0.004	0.018	4.39
Job Location	0.042	0.017	20.71
Industry	0.197	0	---
Ind: Manufacturing	0.232	0.022	5.36**
Ind: Service	0.031	0	---
Ind: Government	0.005	0.006	2.44
Ind: Education	0.018	0.002	2.45
Ind: Other	0.000	0.006	3.65

* Significant at $p < .01$.

** Significant at $p < .05$.

Source: Follow-up report data base, 1978-1985, Placement Services, Michigan State University, East Lansing, Michigan 48824.

Table 18. Regression Coefficients for the Full Model of Starting Salary in which the Variable Entered Last.

	B (alone)	B (unique)		B (alone)	B (unique)
Intercept		9,097.07*			
Year			Job Location		
1978-79	2,009.46*	1,888.93*	Outside Michigan	2,095.14*	1,208.82*
1979-80	827.60*	1,001.68*	Michigan (intercept)	11,986.00	
1980-81	535.91	378.85	Industry		
1981-82	68.77	-182.24	Manufacturing	3,508.73*	876.83
1982-83	-110.32	-10.41	Service	-1,244.25	0.00
1983-84	959.21	431.57	Government	-318.25	29.44
1984-85	12,076.23		Education	-1,535.18	-598.70
Academic Major			Other (intercept)	12,098.60	
Geology	5,556.33*	2,308.48*	Industry: Manufacturing		
Physics	4,273.92*	1,802.90*	Aerospace/Petro	7,495.63*	5,404.75
Chemistry	2,543.02*	955.36*	Automotive	3,817.36*	4,018.09
Mathematics	2,306.27*	1,533.64*	Electronic/PubU	3,445.73*	2,620.10
Microbiology	966.21	-106.14	Chemical/Electr	3,583.25*	3,519.36
Zoology	128.83	-999.49**	Construction	2,971.71*	2,518.04
Other (intercept)	10,628.25		Other(intercept)	11,115.14	
Gender			Service		
Women	-1,252.82*	-352.79	Medical Services	-2,671.01*	219.37
Men (intercept)	13,287.74		Accounting	-2,272.24	1,162.97
Grade Point Average			Banking/Finance	-36.36	877.39
< 2.5	-1,254.34	-943.98**	Merchandising	-2,185.88	394.44
2.5 - 3.0	-261.54	-719.28	Hotels/Restaurant	-2,392.65	0.00
3.0 - 3.5	-709.77	583.58	Other(intercept)	13,081.60	
> 3.5 (intercept)	13,310.49		Government		
Race			State	184.51	2,478.84
White	-1,803.88	363.21	Military	-573.03	535.25
Black	-418.89	1,991.24	City/Federal	-2,174.86	-436.60
3.00	-3,336.48	-813.43	County(intercept)	12,789.58	
4.00	1,724.03	-257.40	Education		
5.00	-1,718.28	528.24	Post Secondary	-2,013.28*	836.96
Foreign (intercept)	13,794.07		Elementary/Sec	12,983.44	
			Other		
			Research/Consult	-183.98	2,186.74**
			Volunteer Org	117.63	3,402.83*
			Self-employed	12,745.31	

* Significant at the 0.01 level.

** Significant at the 0.05 level.

