AHEAD AT THE START: STARTING SALARY OUTCOMES OF COOPERATIVE EDUCATION GRADUATES

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During this period when many institutions of higher education are evaluating their educational goals and curriculum offerings, the need arises to understand and articulate the outcomes of experiential learning programs, such as cooperative education. Michigan State University serves as an example of an institution faced with budgetary problems, curriculum revisions, changing enrollment patterns, and a lethargic state economic environment that requires answers to questions on program viability. Siedenberg (1989) addressed these same issues in a more general sense, challenging participants in the education process to examine their programs using a more rigorous methodological approach. The results add a certain degree of explanatory power to the discussion of salary outcomes that can be used in evaluation of similar programs.

The purpose of this paper is to present results of a study that compares the early career outcomes of cooperative and noncooperative students in terms of starting salary. In addition to comparative statistical tests, regression analysis was used in order to isolate the impact cooperative learning may have on starting salaries.

QUANTIFYING SALARY OUTCOMES

Siedenberg's recent extensive review of the cooperative education literature (1989) identified the efforts to substantiate the non-monetary and monetary benefits of co-op programs. While research supports the benefits of cooperative education, the methodological issues Sidenberg raised cast doubt as to the validity of these results. In response to these concerns, an economic wage model was proposed that through the use of regression analysis controlled for the effects of multiple independent variables; thus isolating the impact of cooperative experience on wages. The model can be expressed as:

$$W_{it} = f(H_{it}, P_{it}, L_{it})$$

Where W refers to the wage rate the graduate receives (in this case, starting salary) and is a function of H, human capital, P, personal characteristics, and L, labor market conditions. H, P, and L can be comprised of several variables. For this study, H is defined by the type of educational program (co-op or nonco-op), academic major, and grade point average. Per-

sonal characteristics, P, are traits such as age, gender and race. The labor market measure for this study was job location, as adjusted for the cost of living.

Siedenberg used his model with a population of non-traditional students (1990), finding that cooperative experiences allowed students with little formal work experiences to catch up in salary with students who had previous work experiences. The model effectively demonstrated the role of cooperative education in establishing salaries among this population. In this study, the model is applied to a group of traditional students: students who graduated from college between the ages of 22 and 24 and had little previous work experience other than that which was obtained while going to college. These characteristics define a very homogeneous sample, removing the necessity of accounting for a variety of different work experiences.

SAMPLE AND DATA ACQUISITION

The subjects for this study were drawn from 1979-1989 graduates of the College of Engineering at Michigan State University. Michigan State University offers a traditional engineering curricula to students ranging in age from approximately 18 to 24. The average-age student at the college is approximately twenty three and the composition of the graduating class is approximately 70% males.

Michigan State University only offers one cooperative education experience. The investigation focused on this group because of familiarity with the program and the availability of two data bases that could be used in the wage model. The first data base contained information on the cooperative education experiences and the second held data on early career outcomes and personal characteristics. Conclusions drawn from this study are applicable to traditional, engineering students; but should not be considered universally representative of all co-op students.

Complete information was available for 370 cooperative graduates from a potential pool of approximately 800 cooperative education participants. A stratified random sample, weighted for graduation year, gender and engineering major, was drawn from noncooperative engineer

ing students with complete information. A total of 1037 nonco-op students were selected. Both samples adequately represented engineering students at Michigan State University.

Information on number of co-op experiences and co-op employer were available. From the cooperative education file, a co-op experience has been based on a quarter (term) or ten week work experience. The information in the follow-up early career data file included academic major, grade point average, gender, year of graduation, starting salary, first employer and entry position title. Race was also available; but because of the low number of minorities in the sample, this variable was not used. An attempt was made to code the type of employer but the majority of graduates fell within a very narrow range of group types so that this variable was not very useful.

Several adjustments were made in the starting salary figures. Salaries were first adjusted for inflation, using the 1979 academic year as the index. Salaries were further adjusted to account for interstate differences in the cost of living. Using the state index developed by Nelson (1991), salaries were standardized. This procedure lowered salaries in high cost of living states such as Connecticut, Massachusetts, New York, California and the District of Columbia and raised the salaries in the Midwest, Southeast and Rocky Mountain states. These modifications add perspective to the following comparisons.

COMPARISONS

All engineering programs available at the university were represented in both groups. The distribution across majors, presented in Table 1, reflects the enrollment pattern within the college. Women comprised 31% of the total sample with 24% in the cooperative education program and 34% in the noncooperative group. The latter figure is consistent with the percentage of women graduating from engineering over the past decade.

<Table 1 Here>

Between 1979-1989, current salaries for all subjects showed a steady increase from an average of $18,625 to $30,344, or 6.3% per year. Annual increases failed to keep pace with inflation during this period; the 1989 adjusted salary was $17,448 or 6% lower than 1979. Figure 1 illustrates the starting salary trends for cooperative and noncooperative responses (salaries have not been adjusted for cost of living). For nine years during this period, cooperative education graduates received higher starting salaries. In 1989 noncooperative salaries averaged slightly higher than co-op salaries. Nonco-op students have experienced several years of strong starting salary increases during the late 1980's to close the gap. Overall, co-op subjects had an average starting salary of $18,201 as compared to $17,593 (real dollars) which was statistically different at the $p < .001$ level ($F = 1.64$).

<Figure 1 Here>

The cumulative grade point averge for the sample was 3.12. Co-op students had significantly higher GPAs ($F = 1.37$, $p < .001$) with an average of 3.19, compared to 3.10 for nonco-op graduates. While women earned higher grades (average 3.16) than men (3.10), the difference was not significantly different. Grade point average did vary by academic major with mechanical, electrical, chemical, and computer science students earning a cumulative average of 3.14 compared to 3.08 for engineering arts, civil and agricultural engineering ($p < .05$).

The cost of living index is based on the demand for goods and housing in a state and is constructed using population change, individual income, population density and two housing measures, median value of owner-occupied house and mean value of new housing. After adjusting for the cost of living, the Northeast (Region 1) and the Pacific Coast (Region 6) experienced a loss in starting salary while the other regions enhanced their salaries. An ANOVA found the regions to be statistically different ($F = 23.79$, $p < .001$). The oneway, using Duncan procedure at .05 level of significance, revealed statistical differences between Region 1 (Northeast) and all other regions and Region 6 (West Coast) and all other regions. Region 4 was also found to be different from Regions 2, 3 and 7 (see Table 1).

STARTING SALARY MODEL

Several other variables were found to influence starting salaries. Grade point average was positively related to salary ($r = .113$, $p = .01$) as was academic major ($r = .349$, $p = .01$). To test whether co-op participation was a significant predictor of starting salaries, regression analyses was employed to specify the wage model. Starting salary was dependent on several independent or explanatory variables. These variables were grouped into human capital (co-op participation, academic major, grade point average), labor market (job location, year of graduation), and personal characteristics (sex). To facilitate the use of academic major, programs were grouped by comparable average starting salaries and then contrasted coded. In one group were electrical, mechanical and chemical engineers, in another computer science and operations research, and in the third agriculture, civil and general (engineering arts) engineering.

Multiple regression analysis provides the unique contribution of variable while the other independent variables are held constant. A variation of the step-wise procedure was used that specified that co-op enter the equation last. This allows the other variables which may mutually share variance of starting salary with co-op to account for variance. Co-op, if it turns out significant, will indicate a stronger relationship to salary than if entered first.

The regression results are presented in Table 2. Academic major, Grad 79, Region 1, GPA and Co-op were the significant variables that accounted for variance in starting salary. Graduates in mechanical, electrical and chemical engineering commanded higher starting salaries than other majors; lowest salaries were received by civil, agricultural, and engineering arts graduates. This factor accounted for much of the variance in starting salaries.

<Table 2 Here>

Annual increases in starting salaries from 1980 to 1989 failed to keep pace with inflation. Graduating in 1979 significantly added to salary in comparison to all subsequent years. Cost of living in the northeastern states of New York, Connecticut, Massachusetts, and New

Hampshire (Region 1) dropped real starting salaries significantly below salaries in all other regions of the country.

Grade point average was positively related to salary; for every .01 increase in GPA, starting salary increased by approximately $5.00. Co-op also had a positive impact on salary, being significant at the .03 level. Having a co-op contributed slightly more than $300 to starting salary, all other things being equal. In other words, the salary differential was about 15% (two years of salary increases) in favor of co-op graduates.

SALARY MODEL WITHIN CO-OP GROUP

Two questions about cooperative programs were examined in a modified salary model that included only co-op participants. A threshold in starting salary was found in regards to the relationship between number of co-op experiences and starting salary. Figure 2 traces the path of starting salary with increasing number of experiences. A comparison of the means found the starting salary for co-op participants with one or two experiences (terms) was not significantly different from nonco-op graduates. Only when a co-op participant had been involved in three quarters of co-op or more, were higher salaries realized. Starting salaries continued to increase up to five experiences. At this point a threshold or optimum point was reached where after the marginal change in salary was negative. Graduates with more than five experiences still made significantly higher salaries than those with three or fewer experiences.

< Figure 2 Here >

The second question focused on whether co-op participants who accepted offers with their co-op employer received higher salaries than if they went with another employer. In this case, we have used a very narrow definition of "same employer": graduates had to be employed by the same unit or division that they contracted to do their cooperative education with. Being hired by another division within the same parent company was considered a different employer.

Only 25% of the co-op participants indicated that they accepted employment with their co-op employer. "Same Employer" respondents received higher starting salaries (averaged $19,053) than respondents who took positions with different firms. A comparison found the difference to be significant ($F = 1.65, p < .006$).

Using the wage model, the following independent variables were regressed on starting salary: academic major, year of graduation, grade point average, sex, job location, number of co-ops and same employer (1 = yes and 0 = no). The regression results are provided in Table 2.

Academic major and job location in Region 1 had the biggest influence on starting salaries among co-op graduates. Mechanical, electrical and chemical engineering did much better in terms of starting salary. For those taking jobs in the Northeast, salaries were negatively impacted by the cost of living. High cost of living in the Pacific Coast states lowered salaries while the low cost of living in the Southwest actually improved salaries.

Several other variables also had a significant impact on starting salary after the variance was controlled for academic major and job location. Graduates from 1980 earned higher salaries. These graduates may have entered the labor market before the recession and inflationary pressures of this period could offset their salaries. Grade point also was positively related to salaries with salaries increasing $6.84 for every .01 increase in GPA, all other things being constant.

To account for the non-linear relationship of number of co-ops and starting salary, a curve was fit to the data and a formula for the curve derived. The formula for number of co-ops that was inserted into the regression equation was specified as :-54.34 (number of co-ops)^2 + 654.21 (number of co-ops). Number of co-ops remained a strong and positive influence on starting salary ($t = 3.35, p = .01$).

Two variables that did not influence salary were gender and being employed by co-op employer. When other factors are taken into account, same employer salaries were not higher than salaries for those who went with other employers.

CO-OPS AND GENDER

In the overall model, gender did not impact on starting salaries, even though overall averages suggested that men had slightly higher salaries. This was partly explained through the distribution of women across engineering majors. Women tended to be under represented in the high paying fields of electrical, chemical and mechanical engineering. Instead they clustered in computer science and the general engineering major: majors that received lower salaries. In addition, women were also under represented in the cooperative education program. With proportionately more men in co-op programs, male starting salary averages were pushed higher. The only factor that may have offset this salary disadvantage for women was grade point average. Women tended to have slightly higher GPA'S that enhanced their salaries slightly.

In order to see how gender, GPA, major and co-op interact, several chi-square tests were performed and interaction terms were added to the regression model. Because of small sample sizes, consistent and useful statistics were not obtainable. However, trends were observed that provide insight into the nature of male - female salary patterns. These observations are summarized in Table 3.

For men, higher grades and co-op experience moderately increased starting salaries in the fields of electrical, mechanical and chemical engineering. More substantial starting salary increases were obtained for co-op experiences and higher grades in the field of computer science (Major 2). Grades and co-op experience did not influence starting salaries in the fields of civil and agricultural engineering and general engineering.

<Table 3 Here>

Grade point only had a slight effect of grades for women in electrical, mechanical, and chemical engineering. Co-op experiences, however, produced sizeable gains in starting salary in these three majors. In computer science, women only realized moderate gains from higher grades and co-op experiences while in the areas of civil, agricultural, and general engineering these factors had no influence on starting salaries.

In summarizing the starting salary experience among nonco-op students, women and men received comparable starting salaries in electrical, mechanical, and chemical engineering; but in all other fields women received slightly lower salaries. With co-op experiences, women did somewhat better than men in computer science and civil, agricultural and general engineering. Women from electrical, mechanical and chemical engineering showed a dramatic advantage in starting salary after completing their co-op education. The message from these inferences suggests that women can make strong salary gains by participating in cooperative programs.

CO-OP PARTICIPATION AND STARTING SALARY OUTCOMES

The cooperative education experience provides opportunities for a student to gain work related skills that are viewed as an investment toward achieving a quality job upon graduation. It has long been assumed that co-op participants gained an advantage in terms of employment outcomes. Siedenberg (1990) showed for a non-traditional population that for co-op students with little work experience actually caught up with non-participants who had obtained relevant work experience prior to graduation. The significant positive coefficient for co-op in the regressions for this study represents a gain for co-op students in terms of starting salary in a more traditional college population. It appears that co-op students can get off to a faster start in their careers than traditional students, at least in terms of salary.

Does this advantage persist throughout the careers of these graduates? The answer is that we really do not know. Two possible scenerios can be articulated. One scenerio would maintain that the salary advantage at graduation continues throughout one's career and may, in some cases, widen. The other scenerio suggests that a threshold effect occurs where nonco-op graduates eventually gain the experience that allows them to catch-up with co-op graduates.

This perspective implies that co-op careers may level off sooner than nonco-op careers. Further research on employment and career outcomes needs to examine these arguments.

Within the co-op experience a threshold effect was found. There appears to be an optimum number of co-ops ; after which starting salaries begin to taper off. One possible explanation was provided by several employers who evaluate co-op students. After a certain number of co-op experiences, co-op students are viewed as regular employees. In the case of Michigan State University participants, the number was five. With five or fewer terms of co-op, the employer evaluates the participant from the perspective of a student. The evaluations tend to be positive and weaknesses are not viewed as seriously. Once that fifth term is completed employers view the co-op participant a regular employee. The evaluations become more focused and weaknesses weigh against the student. These more critical evaluations apparently are reflected in starting salary.

Co-op participants who sign with their co-op employer receive higher starting salaries. However, only about 35% of co-op students accept offers from their co-op employers. The decision that leads to rejecting an offer (if one has been extended) raises interesting questions on the dynamics of the recruitment process for both parties, employer and graduate. The implications can be far reaching in terms of the organization's workforce and the graduate's long term career. This finding warrants further investigation.

An important finding was the salary benefit women received from the co-op experience, especially in the fields of mechanical, electrical, and chemical engineering. The challenge is to interest women in participating in co-op programs. Women who enter engineering hold expectations of finishing their degree in four years. They are reluctant to extend that time frame; rather they elect to switch majors (Gardner and Broadus, 1989). Making a commitment to a co-op program that extends graduation into a fifth, possibly sixth year, presents a dilemma for many women.

Co-ops experiences, on the other hand, offer the opportunity to remove a problem that many women believe they face in engineering which is "not being taken seriously" (Gardner and

Broadus, 1989). Women in the white, male dominated fields of mechanical, electrical and chemical engineering, were particularly sensitive to this problem. Through co-ops, women can develop their skills and alter the perceptions of men toward them in the work environment.

From the work done by Siedenberg with non-traditional student populations and this study which explored a traditional student population, cooperative education participation provides an advantage in terms of starting salary. The co-op experience can work in different ways for different students. Yet, upon graduation, co-op students are able to realize their potential in the labor market.

Table 1
Includes major distribution, profile of students, and adjusted starting salaries

Student Profile:

Majors:	Mechanical	29%	Men	69%
	Electrical	19%	Women	31%
	Chemical	11%		
	Computer	16%	GPA:	3.12 (Average)
	Civil	11%		
	Agricultural	2%		
	Engineering Arts	12%		

Starting Salary	n	Unadjusted	Adjusted
Region 1	148	17943	15903
Region 2	130	17892	18190
Region 3	223	17682	18428
Region 4	108	18193	19057
Region 5	62	17880	19035
Region 6	174	18174	17540
Region 7	562	17469	18311

Region 1: CT, DE, ME,NJ, NY, PA, RI, VT
Region 2: AL, DC, FL, GA, KY, LA, MD, NC, SC, TN, VA, WV
Region 3: IL, IN, OH, WI
Region 4: AZ, CO, OK, TX, UT
Region 5: IA, KS, MN, MO, NE, WY
Region 6: AK, CA, ID, OR, WA
Region 7: MI

TABLE 2
Regression Results for Models of Starting Salaries for All Participants and Co-ops

A. All Participants

Variable	Regression Coefficient	t-statistic	Significance t-statistic
Curriculum	3242.95	14.58	.00
Grad 79	1378.92	6.46	.00
Region 1	-2476.76	112.14	.00
GPA	4.79	2.79	.01
Co-op	314.82	2.20	.03
Sex	24.80	.18	.86
Constant	16216.02	29.45	.00

B. Co-op Graduates Only

Variable	Regression Coefficient	t-statistic	Significance t-statistic
Curriculum	2977.72	8.66	.00
Grad 80	797.88	2.53	.02
Region 1	-2537.51	8.88	.00
Region 4	880.55	2.17	.03
Region 6	-721.24	2.75	.01
GPA	6.84	2.38	.02
Sex	241.16	1.09	.27
Number of Co-ops[1]	.75	3.35	.01
Employer (same)	359.18	1.61	.11
Constant	14505.89	15.40	.00

[1] Because of the non-linear relationship between number of co-ops and starting salary, an equation was fited to the curve (represented in Figure 2) and then inserted in the regression equation. The equation was specified as: 654.21 (number of co-ops) - 54.34 (number of co-ops)^2.

Table 3
General Salary Findings when Comparing Men and Women by GPA and Co-op

Men:	Major	Starting Salary
	1	GPA and Co-op have modest, positive effect salary
	2	GPA and Co-op have a large, positive effect salary
	3	GPA and Co-op have no influence on salary

Women:	Major	Starting Salary
	1	GPA has only a slight effect; Co-op has a very large effect
	2	GPA and Co-op have modest, positive effects on salary
	3	GPA and Co-op have no influence on salary

Women Salaries as Compared to Men

Major	NonCo-op	Co-op
1	Equal throughout	Women substantially better off
2	Women lower in all groups	Women somewhat better off
3	Women lower in all groups	Women somewhat better off

Majors1: Electrical, chemical, mechanical

2: Computer science, operations research

3: Civil, agricultural, engineering arts

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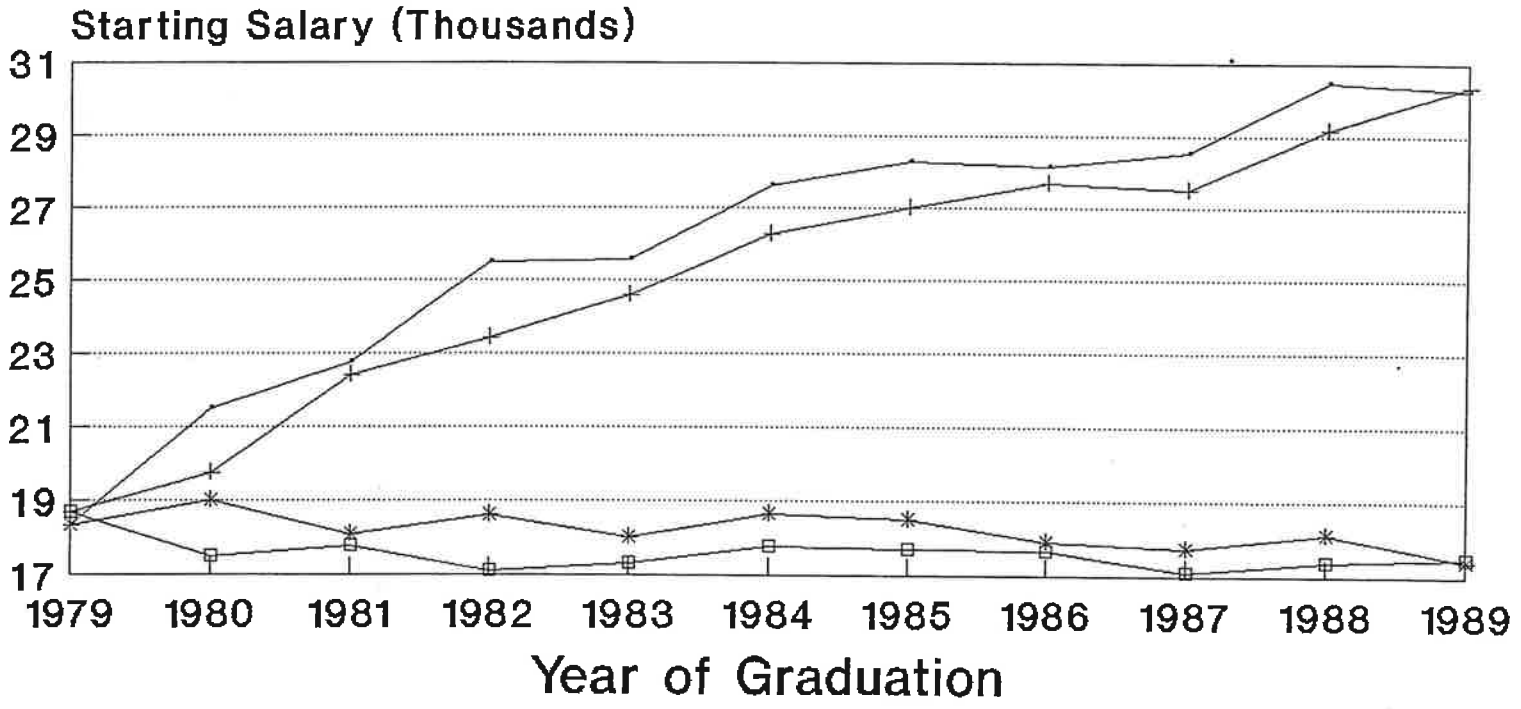
SALARY TRENDS

Coop vs. Non-Coop



SALARY TRENDS

Terms of Coop Participation