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Cebula, Richard and Lopes, Jerry

Jacksonville University, Illinois State University

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RICHARD J. CEBULA
Emory University
and
JERRY LOPES
Illinois State University

This paper investigates the determinants of student choice of undergraduate major field. It argues that this choice depends on a variety of pecuniary and nonpecuniary factors. After allowing for the recent trends toward Accounting and Business Administration, the empirical results indicate that earnings differentials among fields and differences in the rate of change in earnings among fields are the most important factors in the student's decision.

Several studies undertaken in the United States in the early 1960s indicated that the economic returns to investment in schooling were relatively high and that the change in the educational stock of the United States labor force had contributed significantly to American economic growth during the twentieth century. (See, e.g., Becker, 1964; Eckaus, 1973; Hanoch, 1967; Hansen, 1963; Miller, 1960.) More recent studies have found that returns to investment in higher education are in fact declining and are approaching a return that is not too different from those completing secondary education, or that which accrues to nonhuman capital (related to this, see Psacharopoulos, 1973, pp. 5–7).

Most of the published research in this area has not dealt with the question of whether different areas of concentration (major fields) yield different returns to investment in higher education. Thus, these analyses have largely ignored the question of choice of undergraduate major field of study and its specific return to investment.

Several studies in the past have sought an economic explanation for the undergraduate students' selection of a departmental major area of study.

(See e.g., Ashenfelter & Mooney, 1968; Koch, 1972; Reed & Miller, 1970; Wilkinson, 1966.) Such contributions were narrow in scope and, at best, included only a few major study areas. Perhaps the most relevant past research in this area has been the contribution by Koch (1972), who computed internal rates of return by academic fields and examined them against changes in enrollment in 17 major fields of study at Illinois State University.

This paper will analyze the determinants of the student's choice of an undergraduate major. Instead of using the internal rates of return in each of the different majors as the explanatory variable for curricular choice, starting salary differentials will be used. Other monetary and nonmonetary characteristics affecting the choice of a major also will be considered. In this paper we will introduce a theoretical model of the individual's selection of a major undergraduate field, provide an empirical analysis, and then discuss the results.

A BASIC THEORETICAL FRAMEWORK

This section constructs a simple model to help explain student choice of a major field of study. We begin by assuming that each individual has in mind a set of criteria to use in selecting a major.

In the context of this study, we expect that students are aware of prevailing conditions in the labor market respecting the monetary incentives offered, that is, current incomes and changes in income levels. This information presumably is accessible to students through a variety of formal and informal channels. Formal channels may include placement service surveys and newspaper advertisements; informal channels may include information on earnings of former students being circulated among present students.

We also recognize that there might be certain training costs involved in the selection of a major field of study. Further, these training costs differ from one major to another. Training costs can be attributable to the individual's ability to adjust to a new major. Each individual has a certain amount of innate ability such that he or she is able to adjust better to some major fields than to others. An individual might have difficulty adjusting to a major because of "difficult" subject matter. Difficult subject matter could mean that the individual would require more time or would need to make a greater effort to complete the major field of study. Moreover, the period of education might be extended because the individual might have to take additional required courses. Training costs to the individual could also involve the direct out-of-pocket monetary costs from having to extend the period of education. In addition, the individual, in deciding to change majors might incur potentially large implicit costs that partly consist of additional earnings foregone while in school.

The individual choosing a major might also consider its nonmonetary characteristics such as the perceived teaching quality in the department, the

department's reputation, and the department's course requirements for graduation. They also might include the student's perceptions of the "friendliness" of the department's teachers, of the probability of getting good grades in that department, of the competitiveness of students in that department, and of the relevance of the field's subject matter to the individual.

In the decision process, the individual also might evaluate the perceived job characteristics to which the major fields will most likely lead. These include fringe benefits, such as vacation time, insurance, sick leave; whether or not there is extensive traveling on the job; the extent of the day-to-day contact with people; and the potential for personal growth and career advancement.

Thus, we argue that the student's choice of a major depends on a variety of pecuniary and nonpecuniary factors. The analysis below empirically examines the role of certain forms of several of these factors.

DATA AND EMPIRICAL ANALYSIS

The Data

The enrollement data (Note 1) used in this research is the enrollment for each academic department in the 1973–74, 1974–75, and 1975–76 academic years at Illinois State University in Normal, Illinois. The basic data unit is the number of full-time students claiming the various disciplines as their major fields of concentration. Enrollment data were available for the following 28 undergraduate major fields: Accounting, Anthropology and Sociology, Art History, Biology, Black Studies, Business Administration, Chemistry, Classics, Communication Arts and Theatre, Economics, Elementary Education, English, Geography, Geology, History, Journalism, Library Science, Mathematics and Computer Science, Modern Languages, Music, Philosophy, Physics, Political Science, Psychology, Religion, Secondary Education, Social Work, and Special Education.

Before proceeding, a brief discussion of the institution's supply behavior is appropriate. For one thing, for the period considered, there were only minor changes in the faculty size of most individual departments (programs). With the exception of Business Administration and Accounting, no single department (program) experienced a net change (plus or minus) in its total faculty of more than one person or any consequential increase in average class size. In the case of Business Administration and Accounting, the unusually large growth in enrollments during the observation years, which has reflected a national trend, resulted in a 20 percent increase in faculty size over the observation period, as well as a 15 percent increase in average class size. Other dimensions of the supply behavior at the institution, such as financial aid, average faculty teaching loads, and admissions standards, remained essentially unchanged at both the university level and across fields. Hence, except for Business Administration and Accounting, there were only

negligible changes in institutional supply conditions that could reasonably have influenced student enrollments.

Income or salary data were derived from the College Placement Council's Salary Survey reports (Note 2). These reports consisted of monthly salary offers (not acceptances) made to both male and female graduating students at all degree levels in selected curricula and positions during the normal recruiting period, September to June. The salary data were submitted by a representative group of 158 colleges throughout the United States and include actual offers made by business and industrial firms. Thus, 1974 salary data would be all such information extracted from the September 1973 to June 1974 period. Further, all salary data used in the study, except for education, were derived from the College Placement Council's Salary Survey reports. Several disciplines necessitated sharing salary data due to the College Placement Council's classification system. For example, salaries were identical for the fields of Psychology, Political Science, Geography, and Anthropology-Sociology because only "social sciences" salary data were available for these fields. Economics-major salary data were available separately and were therefore excluded from the other social sciences data. This action was adopted because students in those disciplines that shared identical salary data probably would view salaries under Social Sciences as being the relevant statistic on graduation.

Salary data for the education fields (elementary, secondary, and special) were derived from the Illinois Teachers' Salary Schedule and Policy Study 1974/75 (Note 3). Due to the unavailability of copies prior to the 1974/75 issue, the data were adjusted according to the annual percentage increase in salaries as outlined in the report for the median salaries for all the education fields. The data used in this research are average salaries of full-time classroom teachers, over a 10-month period, employed by the different school districts at the beginning of the school year. This salary information was derived from mailed questionnaires to the superintendents of all Illinois public school districts in August of 1974, and the response rate was 100 percent.

Salary or earnings differentials to be used in the empirical analysis were calculated by taking the difference between the earnings in a particular major field and the mean earnings of the 28 major fields in the analysis. This mean earnings is the simple (unweighted) average of all the disciplines' average earnings. See Table I for the dependent and independent variables used in the analysis.

Specific Hypotheses

It is hypothesized here that a student's choice of an undergraduate major is a function of several factors, including earnings differentials (YDIF), the change in earnings differentials over time (YDIFCH), job outlook conditions (OUTLOOK), and Graduate Record Examination scores (GRE). In addi-

TABLE I

Variables in the Empirical Model

Variable	Definition
Dependent	
ENRL	Percentage change in enrollments from Fall 1973 to Fall 1975 = $\left(\frac{\text{Enrollments 1975} - \text{Enrollments 1973}}{\text{Enrollments 1973}} \times 100\right)$
Independent	
YDIF	Monthly earnings differential calculated from monthly salary offers, September 1972 to June 1973, measured in dollars
YDIFCH	Change in the monthly earnings differential calculated from the difference in monthly salary offers between September 1973 to June 1974 and September 1972 to June 1973, measured in dollars
D	Intercept dummy variable to account for the large increase in enrollments in Accounting and Business Administration
OUTLOOK	Job outlook variable, providing projections of future occupational needs, as measured by the forecast percentage change in occupational needs (by field) for the period 1974 through 1985
GRE	Graduate Record Examination Quantitative Aptitude test scores, by field, 1975

tion, the student choice is treated as a function of a dummy variable (D), which allows for the enrollment trend in recent years (including the time period studied) toward Accounting and Business Administration. The variables YDIF, YDIFCH, OUTLOOK, GRE, and D are specifically defined in Table I.

Earnings differentials (YDIF) indicate the relative current monetary attractiveness of each of the major fields of study. Large positive income differentials for some major fields might indicate increased demand in the labor market for individuals with those specific training backgrounds. There could be incomplete adjustment from previous time periods in the labor market such that some individuals are still responding to the high salary or earnings differential for graduates in some disciplines. The change in earnings differentials (YDIFCH) identifies those major fields that have become more attractive monetarily and also those that have become less attractive. Positive changes in the earnings differentials in some major fields could be large enough to induce some individuals to enter those "more rewarding" fields.

The trend variable (D) takes into account those disciplines (namely, Accounting and Business Administration) where unusually large enrollment changes occurred during the observation years. In recent years, there have been extremely large enrollment increases in Accounting and Business Administration. In these fields this trend is of such magnitude that the other factors expressly included in this study might not account for it; in other words, the variable D could be a surrogate for other (unspecified) factors

influencing students to enter these disciplines. One can view the dummy variable as a trend variable where Business Administration and Accounting are simply popular majors and thus that D captures this qualitative (intangible?) element. In any event, given the magnitude of the trend in question, student choice is treated in most (not all) of the empirical estimations as a function of variable D.

Next, we consider the job outlook variable (OUTLOOK) (Note 4). As noted above, this variable provides projections of future occupational needs, as measured by the percentage change in occupational needs between 1974 and 1985. One would expect that an individual choosing a major field of study would include as a decision variable the prospects or probability of being able to secure a job in the future that will use his/her educational background. The outlook of the major fields or projections of future occupational needs would allow the individual to visualize what the prospects are.

The last variable in the analysis is the Graduate Record Examination Quantitative Aptitude test scores (GRE) by curriculum (see Boldt, 1976). We expect these Quantitative Aptitude test scores to reflect different levels of competitiveness that might exist in the various major fields. As noted above, the student might view this level of competitiveness as a major-field characteristic and as a possible decision criterion for choosing or changing his or her major. The presence of a high level of competitiveness in a major field might make it less attractive to many individuals because of the anticipated increased study time (a cost) needed to compete for grades and the anticipated increased probability of getting lower grades (a cost).

Before proceeding, it should be mentioned that the dependent variable used in this study is the percentage changes in enrollment in the various major fields rather than an alternative measure such as the net changes in enrollment. This is because net changes in enrollment is subject to the possible bias of some disciplines being large in absolute size and some being very small. This can render inaccurate any discipline comparisons because disciplines large in absolute size tend to have more changes in enrollment than disciplines small in size.

Furthermore, this study attempts to minimize the possibility of choosing an inappropriate time lag. It is conceivable that percentage changes in enrollment respond to changes in market incentives with lags. However, the time lag used, whether it be a 1 or 2-year lag, may not explain enrollment changes completely in the present or the next time period. For example, if the salaries offered to graduating English majors increase, we would expect, other things being equal, the percentage enrollment changes in English to increase. This increase in English majors might occur in the next time period and/or the period after that. Whether the enrollment response is greater in either time period depends on how soon information on the salary increase

is disseminated. Furthermore, we suspect that changes in enrollment take more than one time period to adjust completely. Some students have quick access to information about changing labor market conditions, whereas other students do not. At the same time, some individuals hesitate at changing their major fields of study until a more comprehensive outlook of the market is available. Thus, in this paper percentage changes in enrollment are based on 2 successive academic years.

EMPIRICAL ANALYSIS

Given the arguments above, this study estimates the five following regressions by ordinary least squares (OLS):

$$ENRL = a_0 + a_1YDIF + a_2YDIFCH + a_3D + a_4OUTLOOK + a_5GRE + \mu_1, \quad (1)$$

$$ENRL = b_0 + b_1YDIF + b_2YDIFCH + b_3D + b_4OUTLOOK + \mu_2, \quad (2)$$

$$ENRL = c_0 + c_1YDIF + c_2YDIFCH + c_3D + \mu_3, \quad (3)$$

$$ENRL = d_0 + d_1YDIF + d_2YDIFCH + d_3D + d_4GRE + \mu_4, \quad (4)$$

$$ENRL = e_0 + e_1YDIF + e_2YDIFCH + e_3OUTLOOK + e_4GRE + \mu_5, \quad (5)$$

where a_0, b_0, c_0, d_0, e_0 = constants, and μ_1, μ_2, μ_3, μ_4, μ_5 = stochastic error terms.

Equation (1) includes all five independent variables. Equations (2) through (5) are selected variations on equation (1), with one or more of the variables in (1) omitted. In equation (5), the dummy trend variable has been omitted to allow insight into this factor's influence.

Table II provides the OLS results for all five estimations. In the Table, all 20 estimated coefficients exhibit the expected signs. Of these 20 coefficients, 10 are statistically significant at the .01 level or beyond, and 2 are significant at the .05 level. The variables YDIFCH and D are significant in all cases considered at the .01 level, while the variable YDIF is significant at either the .05 or .01 level in three of the five cases. The variables OUTLOOK and GRE are not significant at even the .01 level in any case.

Table III provides the zero-order correlation coefficients among the independent variables. Although there is one case of moderately high correlation, overall there are no major multicolinearity problems.

CONCLUSIONS

Several conclusions can be derived from Table II. First, the variable YDIFCH (changes in earnings differentials) is significant in all five equations, whereas the variable YDIF is significant in three of the five equations. This suggests that monetary variables (expected future earnings) are very important to individuals as they select a major field of study.

Second, it appears that changes in the earnings differentials can explain percentage changes in enrollment better than the earnings differentials in

TABLE II

Ordinary Least-Squares Estimates, Determinants of Student Choice of Undergraduate Major Field

Equation #	YDIF	YDIFCH	D	OUT-LOOK	GRE	F-ratio	R^2	R^{-2}
(1) coefficient	.127[a]	.533[b]	46.014[b]	.262	−.100	6.377	.59	.50
(t-value)	(1.84)	(3.44)	(2.52)	(1.00)	(−.99)			
(2) coefficient	.077	.484[b]	53.957[b]	.235		7.558	.57	.49
(t-value)	(1.44)	(3.23)	(3.18)	(.89)				
(3) coefficient	.074	.509[b]	55.908[b]			9.898	.55	.50
(t-value)	(1.40)	(3.47)	(3.33)					
(4) coefficient	.120[a]	.556[b]	48.798[b]		−.092	7.727	.57	.50
(t-value)	(1.75)	(3.63)	(2.70)		(−1.05)			
(5) coefficient	.135[b]	.579[b]		.274	−.112	5.301	.46	.40
(t-value)	(2.29)	(3.78)		(1.29)	(−1.18)			

[a] Statistically significant at the .05 level.
[b] Statistically significant at the .01 level or beyond.

TABLE III

Correlation Coefficients Among Independent Variables

	GRE	YDIF	YDIFCH	D	OUTLOOK
GRE	1.00000				
YDIF	.56309	1.00000			
YDIFCH	.27871	.07121	1.00000		
D	−.13082	.28793	−.01437	1.00000	
OUTLOOK	.06408	−.00933	.17747	.11244	1.00000

the various major fields can. From the regression models tested (equations 1 to 5), YDIFCH is consistently a very significant variable in explaining enrollment changes; by contrast, YDIF was a significant explanatory variable only in regressions (1), (4), and (5). Further, in each equation, YDIFCH always has a more dominant effect than YDIF in explaining enrollment changes because YDIFCH is always statistically a more significant explanatory variable than YDIF. This result might suggest that individuals are more aware and/or responsive to changing monetary incentives in the labor market for graduates.

Third, an additional monetary characteristic, represented in this study by the occupational outlook variable (OUTLOOK), did not appear to account for much of the individual's decision in the selection of a major field.

Next, for the typical student, the variable GRE appears to be an insignificant measure of the degree of competitiveness in a field. It would thus

appear to be an inappropriate measure of the costs that students might incur in one discipline as opposed to another.

Finally, the results in Table II confirm (as expected) the trend toward the Accounting and Business Administration fields. It is interesting to note, however, that in equation (5)—where D is omitted—YDIF and YDIFCH both still act to significantly explain the student decision or choice of major field.

The results of this study also support Koch's contention that, other things being equal, a marginal group of students will shift to disciplines where salaries are high. This study goes beyond Koch's (1972) study in that it attempts to account for some representative nonmonetary characteristics that might affect an individual's selection of a major. Although in this study nonmonetary characteristics do not significantly explain enrollment changes, the inclusion of nonmonetary characteristics provides a statistical means of judging the relevance of such characteristics, rather than simply relying on assumptions to suppress their relevance.

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AUTHORS

RICHARD J. CEBULA, Professor of Economics and Department Chairman, Emory University, Atlanta, GA 30322. *Specializations:* Human resources; public choice and public finance.

JERRY LOPES, Assistant Professor, Department of Economics, Illinois State University, Normal, IL 61761. *Specialization:* Economic education.