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AUTHOR Newton, Jan N.; And Others
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ABSTRACT

Two separate NIE research projects in higher education, closely related in substance and complementary, were undertaken in Oregon in 1973-75. During the first year, the objectives were to: (1) compute and analyze various configurations of student schooling costs and financial resources according to institutional type and to student sex and parental income; (2) develop measures of educational demand elasticity; and (3) explore the effect of introducing new variables to the estimation model. During the second year, the project objectives were to (1) extend the first year's work by additional analysis of demographic factors; (2) examine the impact of federal financial aid programs and policies on Oregon students; (3) predict changes in demand that might result from a change in the state's community college tax base; and (4) use time series data in analyzing changing patterns of demand. The third objective of the second year was not accomplished, since a fifth objective was established and substituted during the year: to explore the factors (primarily qualitative) that might influence the high school graduate's after-graduation plans, particularly his choice of an institution of higher education. The results of the research are presented primarily in narration, with some tables, and are intended for practitioners and researchers alike. (Author/MSE)

FINAL PROJECT REPORT

"Developing an Empirical Test of the Impact of Vouchers on Elasticity of Demand for Post-Secondary Education and on the Financing of Higher Education"

National Institute of Education Project No. 3-3007

and

"Economic Efficiency in Post-Secondary Education: Issues in Alternative Financing and Consumer Choice"

National Institute of Education Project No. 4-0809

Jan N. Newton
Project Director

Dona Lehr, Richard Rankin, Jim Scherzinger
Project Assistants and Final Report Co-authors

University of Oregon
Eugene, Oregon 97403

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A C K N O W L E D G E M E N T S

In the carrying out of this research, we have had unstinting help and advice from many people in Oregon. The State has good data on its educational system, yet the most of it is not collected nor compiled in any one place. We were given free access to files, archives, various confidential data banks, "in-house" reports, and whatever else we needed to conduct our analysis. Because our task would have been impossible without them, we would like to acknowledge our great debt and our gratitude to these individuals:

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I. INTRODUCTION

This report presents the findings of two years research on higher education in Oregon, 1973-1975, funded separately as N.I.E. Projects #3-3007 and #4-0809. While the objectives of each year's work were distinct, they were also highly related and the results are complementary. They are presented and analyzed together here, although care is taken to identify which parts of the work are attributable to each of the two projects.

A. The Research Problem

We chose to focus on one state in our analysis because we hoped to extend existing empirical work through examination of more detailed and disaggregate data than has been available to other researchers to date. Oregon is considered unique in the quality and extent of its educational data, making it a good site for an in-depth analysis of higher education.

Moreover, major policy decisions concerning the cost and provision of higher education are made at the state level. Thus, although national or regional studies are instructive, local analysis can be of more direct assistance to state decision makers. Our findings should be of interest beyond Oregon, however, because the excellent data available to us here has allowed inclusion in our work of several previously neglected variables, e.g. state and Federal financial aid to education.

Like many other states, Oregon is experiencing the effects of changing higher education enrollments. Since 1970, the institutions of higher education (IHE'S) in Oregon have had an overall growth in enrollments of 16%, or

an average increase of 4% per year over the period.[1] This represents a marked slowdown from the prior 1965-69 period when overall enrollments rose by 45% or 11.4% per year on average. In itself the slowed rate of growth in total enrollments has caused budgetary problems. To cite only one, institutions of higher education have required annually increasing budgets just to keep pace with rising costs of operation due to inflation. But requests for more state funding have met with legislative and public resistance, since taxpayers feel that the falling growth rates should translate into proportionately small budget increases. Educators in Oregon's public institutions have not presented their case for more public monies very effectively and one result of legislative budgetary stringency has been a decline in real faculty salaries in each year since 1970.[2]

However, these aggregate enrollment figures for the State obscure even

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[1]The enrollment figures used here are for "full time equivalent" students, or FTE enrollments.

[2]The following percentages demonstrate the extent of the decline for those faculty in the 4-year public institutions:

A Comparison Between the CPI and Faculty Salaries in Oregon's State System Schools

Year	Percentage change in consumer price index from previous year	Percentage change in average faculty salary from previous year
1969	5.4	6.0
1970	5.9	6.0
1971	4.3	3.0
1972	3.3	2.9
1973	8.8	5.0
1974	12.0	5.8

more dramatic differences in segmental enrollment changes.[3] For example, during the 1970-74 period just considered, FTE enrollments in the four year public colleges and universities increased 1.5% overall--a meager .4% per year. Private colleges and universities fared somewhat better, with a 16% increase over the period.[4] But the state's community colleges experienced an increase of 42% in FTE enrollments, or over 10% per year. This is many times the growth rate of the state system schools. The decade of the 1960's witnessed the introduction and development of Oregon's community college system. In fact, from 1961 (the first year in which complete community college enrollment data was kept) to 1974, this segment experienced a staggering increase in FTE enrollments--from 2,586 to 40,918.

What these numbers represent is a rapidly and dramatically changing enrollment mix in Oregon's institutions of higher education. But this is just another way of saying that the demand for higher education has been and is changing.

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[3]The term "segment" refers to the four distinct types of post-secondary institutions: two year public schools (community colleges), four year public schools (state system colleges and universities), four year private schools (independent colleges and universities, including sectarian schools), private vocational/technical schools (proprietary or trade schools). The term "post-secondary education" is commonly used to mean all four types of educational institutions while "higher education" refers to three types, exclusive of proprietary schools.

[4]This particular figure overstates the general pattern of growth in Oregon's private schools--an anomaly of the time period used in calculating it. A more accurate picture of this segment's enrollments is found by looking at the 1971-74 period during which they increased by a modest 5.9% or roughly 2% a year. Taking a longer view we can go back to the mid-1960's which were a period of relatively high enrollments in the private segment. In the nine years from 1965 to 1974, absolute levels of enrollment actually fell during four years and overall the average annual rate of growth was only 1.3%.

What we hoped to do, in our research, was examine the factors which might be influencing demand. The following list of questions reflects our major concerns in this analysis of demand:

i) What are the annual out-of-pocket costs of schooling, averaged by a collection of various student sub-populations (e.g. male vs. female)?

ii) By what combination of means are students financing their schooling and how do their choices of schools reflect the combination of resources which they are utilizing?

iii) How do changes in family income, or in the availability of other financial resources, in tuitions, or in the availability of alternatives to schooling affect enrollment choices in any or all of the available school segments?

iv) What is the nature of the relationship between demand for higher education and family income, personal (student) income, sex, student achievement, high school attended, high school curriculum, and costs of schooling?

v) What is the impact of state and Federal aid on the schooling choices of recipients (e.g. in what ways, if any, do students indicate their choices have been modified)?

vi) How do financial aid applicants differ from non-applicants and in what ways do their schooling choices differ?

vii) How have changing economic circumstances (both prices, resources, and alternatives) from 1960 to date affected the demand for higher education in Oregon?

viii) In what ways do present school attendees differ, by segment, and what are the implications of these differences for demand sensitivity to

changes in economic variables such as prices and financial resources?

ix) What can we say about the equity and efficiency implications of present and proposed alternative tuition and aid policies?

We have given these research questions a more specific context by dividing the demand for higher education into two separate choice institutions: 1) the decision whether to continue schooling beyond high school, and 2) the choice among institutions once the decision has been made to continue. These decisions can be formally described in a model which specifies a series of functional relationships. This model should identify the factors which we feel are affecting demand. Such a theoretical framework then guides the selection of variables for our empirical analysis. Such a model, representing the two part decision situation described above is developed next.

B. A Model of Enrollment Demand

The theory underlying the demand for higher education rests on an analysis of individaul choice behavior. We assume that the potential enrollee rationally evaluates the perceived costs and benefits of alternative courses of action and chooses the activity with the highest expected rate of return.[5] Total benefits from the purchase of higher education include future pecuniary and psychic

[5] This approach encompasses both current and future costs and benefits, whether they are of a consumption or investment nature. When costs and benefits are appropriately specified and measured (no small task, this) then it is possible to compute a rate of return obtaining for each possible course of action. For example, given some discount rate we could sum the present value of all the benefits which would accrue to the holder of a Bachelor's degree in chemistry. The costs (inc uding foregone income) could also be summed. The ratio of benefits to costs, divided by years of expected labor force participation, would give us a rate of return for the activity of obtaining a B.S. in chemistry.

returns as well as current consumption aspects. Although the precise mechanism by which education contributes to earning power is now a matter of some debate among economists, it is clear that there does exist a positive correlation between educational levels and lifetime incomes. (The correlation is much stronger for white males than for women or racial minorities, however.) Expected non-monetary benefits may include such elements as broadened occupational opportunities, ability to adjust to changing economic circumstances, and prestige. Current benefits are also relevant to the decision maker. The purchase of higher education includes the option of attending school sponsored activities, as well as partaking of the atmosphere and experience of the educational process itself.

The relevant costs of higher education likewise appear in several forms. Direct instructional outlays (tuition, fees, books, supplies and course materials) are the most obvious component of private cost. These direct costs are influenced by the method in which they are financed. Financial aid in the form of tuition remission, grants, low or zero interest loans, or government benefits serves to reduce educational expenses of individuals thus increasing the expected returns of pursuing further education. In addition to these direct costs there are indirect costs which are incurred in attending school--transportation to and from the campus for example and other additional living expenses.

The largest component of total schooling costs, however, is foregone earnings. Assuming positive time preference, increased future income, to be worthwhile, must more than cover the income lost while attending college. Finally, since certain aspects of college attendance may be viewed as work (or the consumption of a "bad"), such activities can also be considered costs of obtaining

an education. The magnitude of these costs depends upon the type and quality of the particular institution of higher education (IHE) in question and also upon the individual's taste for higher education.

In summary, we expect the enrollment choice to be influenced by monetary and psychic costs, alternative opportunities, and current and future benefits. The individual's perception and evaluation of these costs and benefits is in turn influenced by taste, ability to pay, and the availability of information on both higher education and alternative activities.

C. The Choice Among Institutions of Higher Education

Higher education is not a homogeneous good and, as a result, the selection of the type of institution and the particular school to be attended are a crucial part of the college going decision. Many of the factors mentioned above as determinants of the attendance choice are also relevant to institutional choice. That is, expected costs and benefits (both current and future) may vary greatly among institutional types and also between schools in a given segment. These differences result in rate of return calculations which influence the specific institutional choice. For example, the out-of-pocket costs differ cnsiderably among schools. Not only do tuition and fees vary widely, but also other elements such as "distance costs."

An important element of this type of cost depends on school location. If the enrollee intends to live at home, commuting costs are relevant.[6] Otherwise, on- (or near-) campus room and board charges must be assessed. Further, institutionally tied financial aid can affect relative prices facing students.

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[6]Most community colleges in Oregon actually tie their tuition charge (inversely) to the student's in-district commuting distance.

The quality of education and availability of specific programs or fields of study may also influence student choice. Additionally, there are many college attributes such as atmosphere, reputation, alumni contacts, religious philosophy, and sports teams, which although difficult to quantify may be important to the enrollee. The relative significance of these variables depends upon the consumption versus investment emphasis of the chooser.

To formalize this relationship, we assume that the enrollee ranks potential schools according to these monetary and non-monetary considerations. The individual then chooses to attend the highest ranked school to which he gains admittance.

This model can be functionally represented as follows:

$$(1.1) \qquad R_{ik} = f\,(P_{ik}, P_{jk}, S_i, Env_i, Off_i, J_i, Y_k, Ed_k, I_k).$$

The subscript i identifies the particular institution being evaluated, while the subscript k represents the individual making the rankings. In this model

P_{ik} -- the price of institution i to individual k

P_{jk} -- the price of other institutions to individual k; j = 1, 2, ..., n where n + 1 is the total number of institutions under consideration

S_i -- the selectivity of instituion i

Env_i -- the environment of institution i

Off_i -- the breadth of course offerings at i

J_i -- the expected contribution of institution i to employment prospects (i.e. above or below that expected from the purely educational benefit; for example, reputation of the school or alumni contacts)

Y_k -- family income of k

Ed_k -- educational level of k's parents

I_k -- ability level of individual k

Thus the choice ranking of institution i by individual k, (R_{ik}), is a function of the price of i to k; the price of other institutions; the school's characteristics (environment, selectivity, and course offerings); the socio-economic class of individual k--represented by family income and parental educational levels; the expected contribution of college i to future earnings; and finally the academic ability of individual k.

The price of a particular school is not, however, the same for each potential student. It is related to several additional factors.

(1.2) $$P_{ik} = g(L_{ik}, T_i, A_{ik})$$

L_{ik} -- location of institution i relative to individual k

T_i -- tuition and fees of institution i

A_{ik} -- financial aid offered to individual k by institution i

In words, the price facing the student depends not only on the published rates, but also on the amount of financial assistance offered and upon the distance the student must travel in order to attend the school.

Looking again at equation (1.1) note that we have included a socio-economic class variable in order to account for the taste for college as well as the ability to pay. The academic ability variable also seeks to capture individual taste for type of schooling.

In summary, the questions facing those analyzing demand for higher education are complex and multifaceted. Our organizational approach to these difficult concerns involves separating the schooling choices of individuals into distinct decisions: 1) the decision whether to continue schooling beyond high school, and 2) the choice among institutions of higher education. In sections B and C above we have briefly presented the theoretical bases for individual

choice in this area. Throughout this report we shall attempt to relate our empirical results to this simplified theoretical backdrop.

The next section enumerates project objectives for the first and second year's research.

II. OBJECTIVES

It is possible to examine demand for higher education with many different questions in mind. We have listed some of our primary ones above. Now we can bring both of the research projects reported here more sharply in focus by stating the specific objectives of each year's work.

A. "Developing an Empirical Test of the Impact of Vouchers on Elasticity of Demand for Post-Secondary Education and on the Financing of a State System of Higher Education," September 15, 1973 to September 15, 1974.

In this first year we proposed to employ data from the Oregon Student Resource Survey (SRS) together with simple cross-tabulations and a conditional logit technique in order to accomplish the following objectives:

1) compute and analyze various configurations of student schooling costs and financial resources, by institutional segment, by sex and by parental income (among other characteristics);

2) develop various measures of demand elasticities, with particular interest in contrasting our results with those of Miller and Radner (1970, 1975) who also use a conditional logit approach in their study of higher education;

3) explore the effect on the estimation model of introducing new variables. In particular, we wished to develop some institution-specific characteristics, such as projected alternative financial aid packages to individuals.

Two important accomplishments of the first year were not anticipated in our project proposal. In a sense they represent additional, post-proposal objectives. We cite them below.

i) We were able to convince Oregon officials to conduct a second

Student Resource Survey which elicited continuous rather than range data for all numeric variables.[1] This substantially improved the potential accuracy of our intended estimates, and this new data was used in the carrying out of the above-listed project objectives.

ii) We participated in the development of the annual survey of Oregon high school seniors and added new questions which enabled us to determine socio-economic status of students' parents as well as ranked reasons for various post-graduation plans.[2] Because of these survey modifications, our projected demand analysis for the second year's work was significantly enhanced. (See section B below.)

B. "Economic Efficiency in Post-Secondary Education--Issues in Alternative Financing and Consumer Choice," September 15, 1974 to September 30, 1975.

In the second year we endeavored to use three distinct sets of data in combination with several statistical and econometric procedures in order to address four issues in the financing of and demand for higher education. Our analysis emphasized the economic concepts of efficiency, equity and productivity.

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[1] A copy of the 1974 Student Resource Survey is displayed in Appendix B. It was conducted jointly by the Oregon State Scholarship Commission and the Educational Coordinating Council, in cooperation with registrars at all of Oregon's forty institutions of higher education. Because of our interest in extensive SRS data analysis, we were invited to formulate survey questions as needed, define and draw the student sample, and oversee data collection and coding.

[2] A copy of this survey, "Class of 1975 Post-High School Plans, " is included in Appendix B. The survey has been conducted annually since 1956 by the Office of High School Relations, Oregon State System of Higher Education.

1) The first and major objective was to extend our initial year's work on alternative cost and resource configurations in the financing of higher education through discriminant analysis of school attendees, by institutional segment.

2) A second more specific objective was to examine the impact on Oregon students of Federal financial aid programs and policies, with emphasis on Basic Educational Opportunity Grants and Supplemental Educational Opportunity Grants.

3) Additionally, we sought to predict the changes in demand which might result from a change in the state's community college tax base--from a local to a centralized structure.

4) Finally, time series data was to be utilized in a regression analysis of changing patterns of demand. Herein were the proposed demand elasticities to be developed and interpreted in policy terms.

We did not accomplish objective #3. Work on it was delayed until the last part of the project and we ran out of time. In part, this is because two project personnel invested considerable time in using and extending a new non-parametric technique. Through the use of this "nonmetric discriminant analysis" a substantial amount of previously unuseable data on the plans of high school students was now made available to analysis. This, in turn, defined a significant new research objective.

5) We decided to explore the primarily qualitative factors which might influence the after graduation plans of high school seniors, in particular the decision whether or not to enroll in an IHE. Further we hoped to examine the qualitative bases for the choice between institutions for the school-goers.

The project findings now include a large section of these non-parametric-

results. They extend and enhance the regression and standard discriminant results, and they suggest some new and interesting insights into differences between student choosers. Thus the investment of project time in this previously unanticipated area seems warranted. However the tradeoff was against the proposed community college tax base investigation.

C. Some Roadmaps for the Reader

Because the two research projects pursued many objectives, using multiple data sets and diverse analytic procedures, the following tables may aid the reader in linking research questions to objectives to procedures and data. Table 1 displays the project objectives for each of the two grant periods and then lists the procedures and data employed for each objective along with the principal research questions examined within each. Chart 1 provides an association between project procedures and data and the specific choice situation which we explore in our research. Since we use this choice framework in the presentation of project results, Chart 1 provides the reader with an overview to the later section on our findings.

Having specified the objectives of our research, we turn to a brief review of the work of others in analyzing higher education demand..

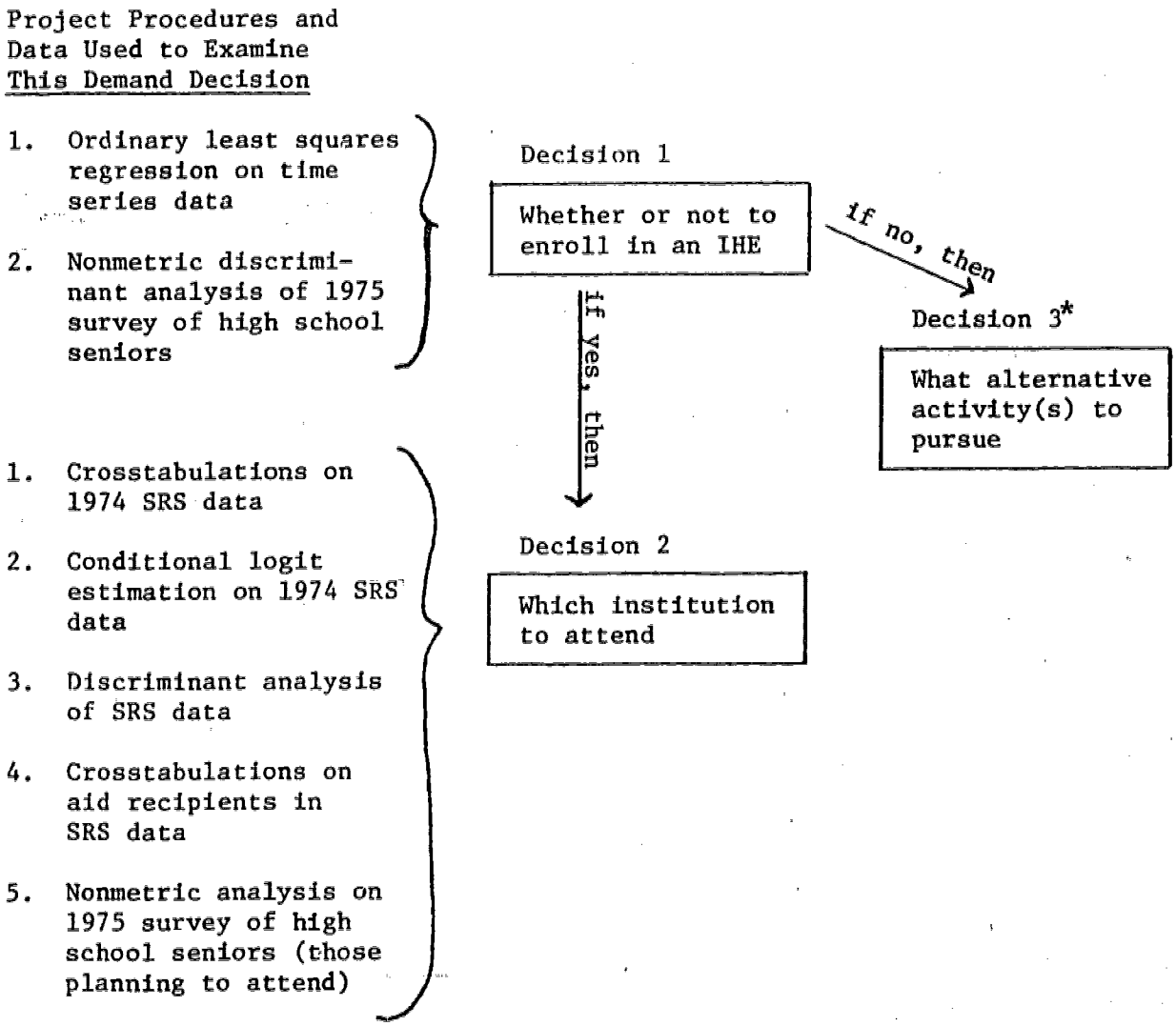
TABLE 1

OVERVIEW OF PROJECT OBJECTIVES, PROCEDURES, DATA AND RESEARCH QUESTIONS

	Project Objectives	Principal Procedures and Data Utilized	What is the Choice Context or Research Question Being Examined?
1973-74 Project No. 3-3007	A. 1 Segmental cost and resource configurations	Crosstabulations on 1974 SRS data	How do costs, resources, and other student characteristics differ by segment, parental income and sex?
	A. 2 Demand elasticities	Least squares regression on time series data	What are the elasticities of demand for higher education and do they differ by segment?
	A. 3 Effect of new variables on logit estimates	Conditional logit estimation on 1974 SRS data	How do various financial resources (and other new variables) influence the choice among institutions?
1974-75 Project No. 4-0809	B. 1 Extension of A. 1 through segmental profile analyses	Discriminant analysis on SRS data	In what ways do students attending each of the institutional segments differ? What does this tell us about the choice between IHE's?
	B. 2 Analysis of Federal financial aid programs	Crosstabulations on aid recipients in SRS data Time series regressions with aid included as a variable	How do Fed. aid recipients differ from non-recipients? What has been the impact of aid on their decision to go to school and on their choice of school?
	B. 3 (Not accomplished)		
	B. 4 Analysis of changes in demand over time	Least squares regression on time series data	What economic variables have influenced enrollment demand over time?
	B. 5 Analysis of high school seniors' post-graduation plans	Nonmetric discriminant analysis on 1975 survey of high school seniors	How do students who plan to go to an IHE differ from students who do not? How do students planning to attend school in one segment differ from those electing another segment?

CHART 1

DEMAND DECISIONS ABOUT HIGHER EDUCATION



*Note: We now have the data with which to examine this choice situation, but have not done so for the present research project(s).

III. REVIEW OF RELATED RESEARCH

The traditional approach to estimating educational demand has been based on highly aggregated data. Investigation has thus focused on variables such as per capita income and average tuition costs. Although this process is useful for predicting overall levels of demand (and for supporting one's theoretical expectations), it is not particularly helpful to policy makers who are attempting to affect the schooling choices of certain socioeconomic groups or who are seeking to analyze the enrollment impact or distributional consequences of various financing schemes. Some of these difficulties have been partially alleviated by stratifying the data and making separate demand calculations for various income, area, and ability groupings.

The data and estimation techniques for disaggregated demand studies of higher education have only been available recently. Two such studies, using the conditional logit method, seek to relate individuals and institutional characteristics to the conditional probability of choosing a given institution (or institutional type). These conditional probabilities then can be translated into relative frequencies which allow for estimation and prediction of segmental and overall enrollment demand.

The disaggregative studies are not without their own particular difficulties. The data requirements are extensive--so extensive that the results of the studies thus far accomplished are hampered by the necessity of having to estimate or exclude variables which are believed to be important. Further, the conditional logit model involves a crucial assumption which may not be met in educational demand analysis and which may therefore lead to biased results. This assumption, "independence of irrelevant alternatives," is discussed in that part of the results section where we present our conditional logit

estimates. In this section, we first summarize and compare several aggregate studies and then discuss the two works using the disaggregate conditional logit approach.

A. Aggregate Demand Studies

An early empirical estimation of a demand function for higher education in the United States was undertaken by Campbell and Siegel (1967). After providing a theoretical summary of the ways in which investment and consumption elements are expected to affect the demand for education, they estimated this demand in terms of U.S. resident undergraduate degree enrollments in four-year institutions from 1919 to 1964. The ratio of enrollments to "eligible" population aged 18-24 is utilized as the dependent variable in their final specification, thereby relating demand to a measure of those who are technically qualified to exercise such a preference.[1]

Three important assumptions underlie their procedure: (1) no supply constraint exists, (2) no change in taste occurs over the period, and (3) enrollment demand is homogeneous to degree one. The theoretically most prominent variables--income and price--were hypothesized to explain the fluctuations in the ratio of enrollment to eligibles over the study period. The regression equation took the form,

$$(3.1) \qquad \log R_t = \log b + \alpha \log Y_{Ht} + \beta \log P_t.$$

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[1] Eligibles are estimated using 7-year cumulative totals for high school graduates, adjusted for death rates and for participation in the armed services. They were not able to adjust for those in the 18-24 range who had already received college degrees or who were institutionalized.

The results were as follows:

(3.2) $$\log R_t = \underset{(2.0056)}{.7425} + \underset{(6.19977)}{1.2036} \log Y_{Ht} - \underset{(2.9243)}{.4404} \log P_t$$

R_t -- $\frac{N_t}{E_t}$

N_t -- undergraduate degree enrollment in 4-year institutions in year t

E_t -- the number of 18-24 year old eligibles in year t

Y_{Ht} -- real disposable income per household in year t

P_t -- average real tuition in year t

The coefficients of income and price are of the expected sign and significant at an alpha level of .025. Since the form of the equation is log linear, the coefficients represent demand elasticities of income and price, respectively.[2]

Probably the most serious shortcomings of this investigation result from the paucity of available time series data. Only 9 points were used in estimating demand over a 45 year period. An increased number of observations with equivalently high results (R^2) would lend more credence to their procedure and estimates. Criticism has also been directed at their assumption of perfectly elastic supply in the relevant range. If this assumption is incorrect, then an identification problem clouds interpretation of the results. This assumption would appear to be more supportable in recent years of accelerated growth

[2]Campbell and Siegel express little confidence in these estimates because of the small number of observations.

of two-year public schools which exhibit low entrance requirements.[3]

Although they mention the theoretical importance of the rate of interest in determining the quantity of investment in human capital which is reflected in enrollment demand, this variable is not included in their formulation due to the imperfections in the market for such loans. The changing availability of student loans (private loans, state and federal loans, guarantees, as well as NDSL, etc.), benefit programs (G.I. Bill and Social Security survivorship payments), grants and scholarships should, if possible, be included in demand analysis, either as increased resources (in the income variable) or lower private cost for education (in the price variable).[4]

Utilizing the data gathered by Campbell and Siegel as a base, Galper and Dunn (1969) investigated the effects of particular nonmarket forces on educational demand. They focused on changes in the size of the armed forces, as well as the impact of the G.I. Bill educational benefits. These elements, along with income, are viewed as short run factors which influence the proportion of high school graduates who ultimately enroll in college. They hypothesized that enrollments are a positive function of real income and military discharges and a negative function of the change in the size of the armed forces.

Citing T. W. Schultz (1960) as a reference on the relatively constraint cost trends in college education over the 1920-1965 period, they considered price a long run influence not appropriate for inclusion in their investigation

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[3]Recall that they were dealing with 4-year schools only.

[4]We should point out that this is a difficulty which is noted but not satisfactorily resolved in any of the educational demand studies which we examined.

of short run factors. By including a separate variable for discharges, they hoped to capture the effect of subsidized education for veterans. Employing a five-year distributed lag structure, they estimated the first-difference form of their equation and obtained the results given below:

(3.3)
$$\Delta N_t = .76363 \sum_{i=1}^{5} a_i \Delta HSG_{t-i} + .88858 \sum_{i=1}^{5} b_i \Delta (HSG_{t-i} \cdot Y_{t-i})$$
$$-.35186 \sum_{i=1}^{5} c_i \Delta (HSG_{t-1} \cdot \dot{A}_{t+1-i}) + .18036 \sum_{i=1}^{5} d_i \Delta D_{t-i}$$

$\bar{R}^2 = .8344$ D.W. = 1.7395

S.E.E. = 55.543 (in thousands)

where,

N_t -- enrollments for the academic year ending in t.

HSG_{t-1} -- high school graduates of June, year t-i.

Y_{t-i} -- index of real family income of calendar year t-i.

$\dot{A}_t$ -- $\frac{A_t}{A_{t-1}}$, where A_t is the size of the armed forces in the fiscal year ending in June, t.

D_{t-i} -- discharges from the armed services in fiscal year t-i.

Estimating enrollment elasticities at mean values of the respective predictors, they found income elasticity of .6917, which is much smaller than Campbell and Siegel's result of 1.2. Although it is noted that the absence of a price variable may have resulted in an understatement of income elasticity, their main justification for this low number is that as all recent high school graduates of an income class who wish to enroll have enrolled, the eligible population approaches a saturation point. Thus, they would expect that since

income has risen over time this elasticity would be low and declining as more income levels become saturated. We do not find this a particularly compelling explanation. The elasticity of enrollments with respect to the change in the size of the armed forces was estimated as -.2568, while elasticity with respect to discharges was .13.

Although their main concern was with the impact of the nonmarket influences of the military, a major factor--the student deferment--is ignored. This omission may have resulted in biased coefficients and elasticity estimates. Further, benefits and eligibility requirements have changed over time and adjustments should be made to insure consistency.

A cross-sectional analysis of United States post-secondary demand by Corazzini, Dugan, and Grabowski (1972) emphasized demand differences among four socioeconomic classes.[5] Their theoretical demand model contained the usual components--expected increased earnings, expected value of direct consumption benefits, direct and opportunity costs, and a representative discount rate. Further, they proposed a theoretical supply function which takes account of rationing by means of admissions standards. When estimating enrollment demand, however, this rationing factor is included (along with taste and expected return) in their measure of ability. Additional coefficients are estimated to measure the impact of direct and indirect costs, and income or home environment.

Using data from Project Talent, a national sample of high school students in the 1960's, they estimated demand by the following equation:

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[5]This study is also reported by the Massachusetts Metropolitan Area Planning Council (1969). Somewhat similar studies were carried out by Feldman and Hoenack (1969) and Hopkins (1974).

(3.4) $$E_i = A_o + a_1T_{ji} + a_3T_{ci} + a_4T_{pi} + a_5W_i + a_6U_i + a_7F_i + a_8A_i + e_i$$

where,

E_i -- the percent of 10th grade (1960) high school students in state i who enrolled in college in 1963.

T_{ji}, T_{ui}, T_{ci}, T_{pi} -- state average tuition rates at junior colleges, public four year universities, teacher colleges, and private four year universities, respectively.

W_i -- average earnings of production workers in state i.

U_i -- the unemployment rate of state i.

F_i -- average level of father's education in state i.

A_i -- average ability as measured by performance on achievement tests.

e_i -- statistical error term.

The results for the total enrollment equation (i.e. not stratified by socioeconomic class) were as follows:

(3.5) $$E_t = 14.43 - .011T_j - .027T_u - .005T_c - .009T_p - .362W + .834U$$
$$(3.14)^{**} \quad (2.32)^{*} \quad (1.26) \quad (2.06)^{*} \quad (1.03) \quad (2.04)^{*}$$
$$+ 2.84F + .176A$$
$$(4.21)^{**} \quad (5.72)^{**}$$

$\bar{R}^2 = .769$ t statistics in parentheses

* statistically significant at the 5 percent level,
** at the 1 percent level.

Measures of cost (various tuitions and unemployment rates) were of the expected sign and significant. Likewise, fathers' education (an income or environment proxy) and student ability had the anticipated effect. Average

hourly wages had the hypothesized negative sign, but the coefficient was not significant.[6]

Thus, their results are consistent with their hypotheses that cost factors will have a negative influence on enrollments, while income (or environment) and ability will have a positive impact. Perhaps more interesting are their findings that the coefficients of these predictors vary substantially when the data is stratified into socioeconomic quartiles. For instance, although the coefficient on public university tuition was significant for all groups, junior college tuition was significant for the lowest quartile only, while tuition at private universities was significant (alpha level of .05) for only the higher quartiles. Likewise, the opportunity cost proxies appear to be more important to the lower socioeconomic groups. These results indicate that important differences among the determinants of demand by various groups may be disguised in analysis of a single total enrollment function.

B. Disaggregated Demand Studies

Kohn, Manski, and Mundel (1973) postulate a formal model of college choice involving three successive decisions by individuals--(1) whether to commute or reside on a campus, (2) which college alternative is preferred given the residency decision, and (3) given the best college alternative, whether to enroll or choose a non-college option. In order to specify this model, the authors impute a feasible set of college alternatives for each

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[6]Perhaps the reason for the insignificance of the coefficient results from the relation of wages and income. If wages influence parental support then the expected sign would be positive. The variable may therefore involve offsetting cost and income elements rendering interpretation difficult. We also experienced this difficulty in our time series formulations.

individual. This was done by applying a priori exclusion rules, then estimating the probability of admission to non-excluded schools, and then simulating the residency decision. A random subsample of this choice set was then selected and augmented by the school actually chosen by the individual.[7] The conditional logit estimation procedure, which seeks to determine choice probabilities based on individual and school characteristics, was applied to a subsample of SCOPE (School to College: Opportunities for Post Secondary Education) data on 3,000 1966 Illinois high school graduates who attended some college.[8] The observations were stratified by three income levels and estimated using variables representing cost, academic quality, quality of life, and college type. Measures of cost and academic quality (in terms of average SAT scores and breadth of offerings) appear to be most significant in influencing the probabilities of attending the schools included in the feasible set of each student.

The next step involved estimation of their college-going model--that is, the choice of whether to attend the most likely college option or not to go to college at all. This "go" versus "no-go" choice was specified as a function of the "best" predicted college alternative (as determined given the college choice parameters estimated above) and parental education levels. Again, a stratified SCOPE subsample was used, this time with 7,000 observations on Illinois high school graduates including both continuing and noncontinuing students.

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[7] This procedure involved taking a sample of ten from an imputed choice set of between 50 and 150 schools. The authors report that alternative randomizations did not significantly alter the results.

[8] This procedure is based on a maximum likelihood estimation technique developed by D. McFadden (1973).

In estimating the income effect, the authors found that (ceteris paribus) the probability of attending college increases moving from the low to middle income stratum, and falls from the mid to high income group. The seeming contradiction of this result with the fact that a larger proportion of high income students attend college is explained by noting that high income students may generally face a more attractive set of college alternatives than do poorer students. In other words, "all other things" are seldom "equal" for these different groups. Further, if given the same level of utility from the best alternative available, the higher income individual probably faces a more attractive set of noncollege alternatives and thus would be less likely to attend school.

Two of the shortcomings mentioned by the authors were their inability to include financial aid as a variable affecting choice and their use of non-current data (a 1973 study using 1966 data).

An extensive investigation of both supply and demand for higher education was undertaken for the Carnegie Commission on Higher Education by Miller and Radner (1975). Our concern here will be limited to the method and results of their analysis of demand for places in higher education. Using 1966 data, Miller and Radner attempted to predict the demand for freshman places as a function of family income, cost, academic ability, other student traits and school selectivity. Like Kohn, Manski, and Mundel, they employed a conditional logit estimation technique. The purpose of this technique is to relate the relative frequencies of choices to the characteristics of the student and his or her particular set of options.

Their final demand formulation concentrated on two composite variables--a cost-to-income ratio (R_{ij}) and an index of academic interation (Z_{ij}).

These variables are defined as follows:

$$R_{ij} = \frac{C_{ij}}{Y_i} \qquad \text{and} \qquad Z_{ij} = \frac{A_i S_j}{1000}$$

where,

C_{ij} -- the out-of-pocket dollar cost to student i of option j (set equal to zero for the option "no school")

Y_i -- a measure of family income for student i

A_i -- an academic ability score for student i

S_j -- a measure of the "selectivity" or "quality" of option j

J_i -- set of options available to student i

The conditional logit technique is applied to estimate the conditional probability (P_{ik}) that student i chooses option k from the set J_i of feasible alternatives, given the particular values of R_{ij} and Z_{ij}.

The variables were measured using a SCOPE sample of over 4,400 (1966) high school seniors from California, Illinois, Massachusetts, and North Carolina; and a 1967 parental followup questionnaire. The authors encountered difficulty with student reported parental income, both in terms of accuracy of reporting and non-reporting students and parents. As a result, relationships were tested on two samples--one which used income data reported by the parents themselves, and another using parental income predicted from student reported income and other socioeconomic data.[9] These samples were stratified into four ability groups based on expected SAT scores (stratum divisions at scores of 400, 475, and 550). Distance and eligibility for each student entered into

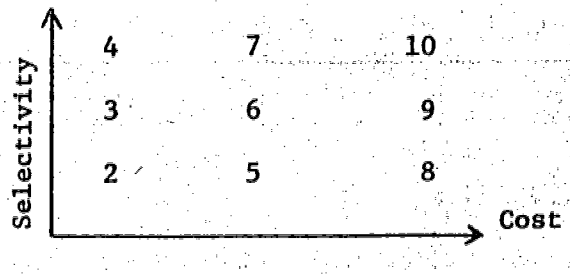
[9] Results discussed below are from the sample of parent reporters.

calculations of cost and feasible choice sets. As a result of the laboriousness of these calculations, the number of students in the stratified subsamples were limited to around 96, in each sample, in each state.

The institutions were categorized by average cost and selectivity as follows:

TABLE 2

INSTITUTIONAL CATEGORIES



Choice 1 is the "no institution" option. Alternatives 2, 3, and 4 represent public schools (community colleges, state colleges, and state universities) within commuting distance of the student's high school; type 5, trade schools and private junior colleges; type 6, public state colleges not within commuting distance, and lower tuition private schools; type 7, state universities away from home; types 8, 9, and 10, three selectivity levels of private colleges and universities. The set of these options available to each student is based upon his or her SAT score and home location.

The estimated coefficients of the cost-to-income ratio were negative and significant for all ability groupings. The size of this coefficient declines as ability increases. This can perhaps be explained by noting that cost has less influence on high ability students since they face a lower risk of failure and expect higher rates of return from their education than do lower ability students.

The coefficient of the academic interaction variable is negative and significant for the lowest ability group while positive and significant for the highest ability group.[10] Miller and Radner believe the positive coefficient is due to the attractiveness that high selectivity schools have to high ability students. On the other hand, low ability students have a quite restricted choice set, and " . . . among these students, the more able evidently find it more attractive to work rather than attend these (junior colleges or unselective private) IHE's."[11] It further appears that the middle ability groups are not much affected by the academic interaction variable, neither being attracted by high quality schools nor repelled by limited choice sets offered them.

The predicted relative frequencies as estimated by this model appear close to the observed frequencies thus indicating that the two composite variables have explanatory power.[12] Using a technique similar to analysis of residuals, Miller and Radner tested the impact on the accuracy of their predictions of several index variables which attempted to capture important elements of student personalities. They found that indices representing student academic aspirations, high school curricula, and academic expectations added to prediction accuracy. Other measures such as the respondent's sex, fate control, time preference or ability to sacrifice, and a measure of broad academic interests did not prove useful as additional explanatory variables.

Miller and Radner also estimated "elasticities of demand." It should be

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[10]The coefficient is negative and insignificantly different from zero for the two middle ability groupings.

[11]Miller and Radner (1975), p. 74.

[12]At this time, no generally accepted measure of "goodness of fit" has been developed for conditional logit estimates.

kept in mind that these are not traditional elasticities but are rather percentage changes in conditional choice probabilities associated with percentage changes in components of the (independent) index variables. Elasticities of ability, income, own cost, and own selectivity are presented for each of four ability scores for three income levels ($6,000, $12,000, $18,000). Changes in enrollment probabilities resulting from changes in ability are quite small and vary in sign among ability and income levels. At the lower two ability levels (in all three income ranges) an increase in ability results in a slight increase in the probability of not attending an IHE. At the two higher ability levels (575 and 650) an increase in ability leads to a decrease in the probability of no school and low selectivity schools and an increase in the probabilities of the more selective schools.

Income elasticities generally are negative for the no school and low cost choices and positive for the higher cost institutions. This reflects the impact of changes in the ability to pay for higher education.

The own cost elasticities all have the expected negative sign and, as would be suggested by theory, are generally stronger for low ability students than high, and for low income groups than for high.

Own selectivity elasticities are negative for the two lower ability groups (at all three income levels) and positive for the higher ability groupings. These again provide evidence for the attraction that selectivity has for higher ability students and the repulsion it has for lower ability students.

Although Kohn, et al. and Miller and Radner use the same estimation procedure, there are some important differences in their approaches. Perhaps the most obvious difference is in the treatment of the "no-go" alternative. As previously noted, Kohn, et al. have a two step decision process (first

choose best school alernative, and then compare this choice with the no-go option), while Miller and Radner include no IHE as a school with zero cost. The distinction is important due to a primary assumption of the conditional logit model referred to as the "independence of irrelevant alternatives." This assumption implies that if an alternative is removed from a choice set, the probabilities of the remaining alternatives will all increase but will stay in the same relationship to each other (i.e. the increased probability will be distributed proportionately). It seems that this assumption is more likely to approach reality in the case of a 2-stage decision model. For instance, in the 2 step model, if one institution (or institutional type) is removed, the probability is spread among the other types of schools and not allocated to the "no-go" decision. This is reasonable in that other institutional types should be closer substitutes to the removed school than is the alternative of attending no IHE.

Kohn, et al. include a larger set of explanatory variables in their demand function, have more detailed institutional descriptions, and a larger sample size.[13] Both studies sought to reduce the feasible choice set to a manageable size. Kohn, et al. accomplished this by random selection of 10 schools from a set previously calculated for each student, while Miller and Radner defined 9 types of institutions based upon their relative cost and selectivity. The Miller and Radner procedure here appears somewhat less arbitrary and more useful for prediction purposes.[14]

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[13]Miller and Radner speculate that the significance of Kohn, et al.'s additional variables may result from their large sample rather than from the importance of the variables themselves.

[14]Kohn, et al. include a dummy for type to correct for bias of their method of feasible set selection. This is not necessary for Miller and Radner.

Kohn, et al.'s results indicate that as ability increases, the probability of attending some IHE also increases. Miller and Radner, on the other hand, contend that as ability increases for those in the lowest ability grouping, the probability of no IHE increases. Miller and Radner postulate that Kohn, et al. might get similar results if they were to specify separate demand functions for various ability groups. Alternatively, Miller and Radner's results may be related to their arbitrary ability groupings per se. That is, classifying a person as near the top of the low ability group as opposed to near the bottom of the mid-ability group is an arbitrary decision. There is no indication in Miller and Radner's work as to where the switch over in coefficient sign actually occurs or if different groupings yielded different results. In any case, the question of the impact of ability on individual choice deserves further investigation.

Both studies have problems traceable to the data requirements of their estimating technique. Kohn, et al. were unable to include income specifically as a variable (although they did stratify by income group), while Miller and Radner were forced to concentrate on a somewhat unrepresentative sample of parent reporters. The variables utilized to describe differences among schools (quality and selectivity) were likewise limited. Part of the difficulty here is that the variable actually needed is the difference among schools (or school types) as perceived by the chooser, rather than as estimated or described by the researcher. The very way in which the alternatives are defined influences the interpretation of the results.

Although many questions still remain after consideration of the disaggregative studies accomplished to date, it seems that they have addressed the identification and joint dependency shortcomings suffered by the aggregative

(regression) studies. Careful specification of the feasible alternative set allows for investigation of demand not disguised by supply effects. The discussion of alternatives also allows for the joint dependencies which are not visible in most of the aggregate studies.

IV. DATA SETS AND PROCEDURES

Our empirical investigation of higher education in Oregon draws upon three distinct sets of data--a 1960-1974 time series on factors which may affect college enrollments; a recent (1974) survey of college attendees; and a 1975 survey of Oregon high school seniors. Here we describe these data sets and introduce the procedures used to analyze them. The standard econometric methods will be only briefly mentioned, while two less familiar techniques are described in more detail.

A. The Data

We collected time series data on higher education in Oregon for the years 1960 through 1974. The major sources for enrollment and price data were the files and reports of the Educational Coordinating Council (ECC), the State Department of Education, and the Division of Analytical Services of the Oregon State System of Higher Education (OSSHE).[1] Information on general economic conditions in Oregon was obtained from various state agencies and publications, as well as federal sources. The amount of financial aid distributed to college students was obtained from the Oregon State Scholarship Commission in Eugene and the U.S. Office of Education, Department of Health, Eduation and Welfare.[2]

Despite the fact that Oregon is reputed to have the most complete set

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[1] The ECC files include copies of Higher Education General Information Survey (HEGIS) reports for most Oregon IHE for several years. Additional information was obtained from back issues of college catalogs in the State Library stacks.

[2] Our thanks to Anna Griswold, USOE, for her help in securing the financial aid information.

of education statistics of any state, basic time series data such as enrollments and tuition charges are scattered among many agencies. For the earlier years included in this study this fundamental information could not be located in summary form. ECC enrollment reports give extensive coverage on all segments since 1967, but information on prior years (especially concerning private IHE's) had to be painstakingly collected. As a result, it was necessary to use total freshman headcount enrollments in our demand estimation rather than the more satisfactory number of "new from Oregon high schools" freshman, measured in full time equivalence. In the case of community colleges, the best obtainable figure was the headcount of individuals enrolled in lower division college transfer programs.[3]

It was a struggle to secure complete, segmental tuition and enrollment data for Oregon schools over the 1960-74 period. This certainly made plain to us a major reason for the highly aggregated analyses of educational demand to date. For example, that portion of our study which examines the differing enrollment sensitivities to economic factors, by institutional segments, would be impossible to carry out on a regional or national level. Lack of the most basic data--tuition and enrollments over time--might even thwart a replication of our work in the setting of another state. As educational data collecting and keeping seems generally to have improved from the late 1960's on, this problem will not permanently plague researchers in this area.

A major part of the cross-sectional data used to estimate the model of choice among IHEs are contained in the 1974 Oregon Student Resource Survey (SRS). The SRS is a 77-item questionnaire administered to a stratified random

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[3]Oregon community colleges do not report enrollments for the freshman and sophomore categories traditionally used by four-year schools. Rather these two years are collapsed into the category "lower division."

sample of Oregon college and proprietary school students. Since the information on proprietary schools is incomplete due to a low response rate, we have excluded them from our analysis.[4] The sample we utilize contains slightly over 2,000 individuals attending two and four year public and private schools in Oregon.[5] This general purpose SRS sample is, in turn, edited in various ways for use in particular research questions. Specific information on these alternative SRS subsamples is included in our discussion of results.

The 1974 SRS was conducted by the Oregon State Scholarship Commission and the Educational Coordinating Council in cooperation with the College Entrance Examination Board. The responses contain continuous data on economic variables such as income, aid dollars received, loans, savings and employment earnings, and college expenses. There is also substantial information on demographic characteristics of the respondents. Further, specific questions address individual academic aspirations, reasons for at-

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[4]We have not seen a demand study which includes these schools and had hoped to fill an important empirical gap here. Private vocational schools (PVS's) represent a significant sector in post-secondary education. In 1972, 152 PVS's in Oregon enrolled 25,800 students in both resident and correspondence programs. That figure equalled one-half the headcount enrollment of the state's four year, public schools. However, of this number, only 8,300 students were enrolled in resident training programs. Additionally, a growing number of these schools are eligible for institutional Federal financial aid (e.g. NDSL, CWS), as are their students eligible for various Federal grants, loans and benefits to individuals. Thus, it is increasingly unjustified to omit them from analyses of educational demand. We regret having to do so. It is encouraging that the Oregon Educational Coordinating Council has gradually assimilated PVS's into its comprehensive studies of enrollment distributions, surveys of future plans of high school seniors, and the follow-up surveys. These data will greatly facilitate analysis of Oregon's private vocational schools and their students in the future.

[5]A list of the 41 schools included in the survey is displayed in Appendix A.

TABLE 3

Percentage of SRS Respondents and Student Population Who Are Male and Female

Institutional Segment	Male		Female	
	SRS	Population	SRS	Population
Community Coll.	57.2	52.5	42.8	47.5
State System	57.2	58.3	42.8	41.7
Private	55.1	56.2	44.9	43.8
Totals	56.5	55.7	43.5	44.5

TABLE 4

Residency Status of SRS Respondents and Student Population

Institutional Segment	Percentage of Out-of-State Students	
	SRS	Student Population
Community Coll.	4.0	3.8
State System	16.0	15.6
Private	49.5	53.2
Totals	14.9	14.5

TABLE 5

Racial Characteristics of Student Population and SRS Respondents

Institutional Segment	Percentage of Students Identified as Non-Caucasian[8]	
	SRS	Student Population
Community Coll.	3.1	3.4
State System	4.3	3.3
Private	9.8	7.0
Totals	4.5	3.8

[8]The racial categories included in both sets of percentages are Native American, Black/Afro-American, Chicano/Mexican-American, Oriental/Asian-American.

population to suggest a sample that is demographically accurate. Non-white students are somewhat overrepresented in the sample, but we do not find this troubling, if surprising.

A further, important consideration is that of respondent financial resources. For example, is the SRS sample biased or unrepresentative in its distribution of respondent parental income? Are the parental income figures reported by students accurate? We are not certain of the answers to these questions. Our efforts to evaluate the student reported figures indicate that some inaccuracy exists. There does not, however, appear to be a systematic bias (either upward or downward) in the income estimates. We do know something about the general willingness to respond to questions on financial resources. In all, 32.2% of the respondents did not provide us with a parental income figure. However, 35.6% of the sample reported themselves as primarily self-supporting. This is instructive because students often wrote comments beside the parental income question indicating that they were leaving it blank because it was not relevant to their situation--i.e., they considered themselves to be financially independent. In contrast, only 11.1% of the sample did not answer the question on personal income and perhaps some of them had none to report. Considering all the possible sources of financial support for schooling (e.g. family income, personal income, savings, grants, benefits and loans) as a personal resources pool, we note that only 4.9% of the sample gave us no personal resource information. The point here is that while we cannot prove that the family and personal income information given is or is not accurate, there is no pervasive problem with non-reporting of financial data on this survey.

The survey form itself contains a mechanism for assessing the internal

tending college, high school and college grade point averages, impact of aid on enrollment decisions, and views concerning debt financing of education.

The cross-sectional data used to estimate the model describing the choice of whether or not to go to college are drawn from survey responses collected from Oregon high school seniors. Since 1956, the Office of High School Relations (OHSR) of the State System of Higher Education has surveyed seniors regarding their postgraduation plans.[6] Information from earlier years (1956-1972) is available from OHSR only in summary form. However, individual responses for more recent years have been placed in computer files, and the 1972-1975 surveys have been assessed for our research purposes. The response rate for each of these years is between 75-80% of all Oregon high school seniors, yielding between 25,000 and 28,000 observations per year.

The questions contained on the survey have varied from year to year. However, each of the recent (1972-1975) questionnaires have included information regarding planned post high school activity; reasons for further schooling (if such is planned); ranking and reasons for particular school choices; planned major; high school attended and type of high school program; racial group and sex. Certain years contain high school grade point averages, parents' education and occupations, reasons for decision not to attend college, level of academic aspirations, and career expectations. The high school codes can be used to stratify the data according to geographic area, an urban/rural demarcation, or by high school size.

The data sets thus described, it is necessary to identify some shortcomings

[6]The survey has been conducted cooperatively by the Educational Coordinating Council and Office of High School Relations since 1971.

in the data as we see them. The time series data need not be discussed here as we feel it to be quite complete and well specified. Since each item in the series was specifically collected by project personnel, we know the numbers to be internally consistent and accurate. There are problems with the two cross-sectional data sets, however.

B. Insufficiencies of the Data

Total useable observations for the Student Resource Survey number 2,163. We had planned for a larger sample, but were somewhat thwarted by a low response rate from community college and proprietary students. A subsequent adjustment was made for community college underrepresentation by editing the SRS sample to achieve representative proportionality among the three institutional segments. This accurately apportioned subsample contains 1,654 observations, and we use it in the segmental cross tabulations where such proportionality facilitates the analysis.

We were interested to see just how accurately our original sample depicted the population from which it was drawn. A detailed comparison was made of the demographic characteristics of survey respondents (unadjusted sample of 2,163) and those of the total Oregon student population. There is a comforting similarity. The following tables display these comparisons for the characteristics of sex, residence status, and racial identity.[7]

In all, the proportions of female, out-of-state and non-Caucasian respondents in the SRS are sufficiently close to their numbers in the student

[7]Statistics in these three tables showing actual student population characteristics were taken from the institutional HEGIS reports.

consistency of all but the personal and parental income data. Respondents provided coded range information for 28 distinct financial resource categories. They then aggregated these categories into five larger ones and gave a continuous dollar figure for each of these five sums. We developed a computer program to assess the internal consistency of the range and continuous data reported by each respondent and to output information on the nature of inconsistencies found, if any. This analysis has satisfied us that the financial resource information given is acceptably consistent. However, we have no similar validity check for the personal and parental incomes reported. In the absence of such a reassurance, we endeavored to proceed in such a way that outcomes from the differing analyses on the three data sets are congruent at points--e.g. that SRS results which utilize parental income can be supported (or not) by results using economic and income variables from our other data sets. We feel that this procedure serves to make the SRS income analysis less vulnerable.

The high school senior survey data presents quite another problem. A major shortcoming of this cross-sectional data is that its form is qualitative rather than quantitative in most instances. In those cases when the responses do involve quantitative information, the data are in ranges rather than continuous form. For these reasons, it was necessary to use a non-parametric approach in the analysis. This technique and the others we employed are described next.

C. Estimation Techniques

Ordinary lease squares regression was applied to the time series data in order to estimate the effect of economic variables on freshman enrollment in Oregon IHEs. A typical problem of economic time series data--multicollinearity--was encountered in the application of this method. This difficulty, along with

model specification and results, are discussed in section V. (We also refer interested readers to Appendix G on multicollinearity at the end of this report.)

Secondly, discriminant analysis was applied to the cross-sectional (SRS) data on college-going students in an effort to develop profile analyses of the students attending the various types of educational institutions. The assumptions required for appropriate use of this procedure are these:

1) the data set consists of observations from two or more mutually exclusive and exhaustive groups;

2) the k variables describing the members of each group are distributed according to a multi-variate normal density function (within each group);

3) the variance-covariance matrices of these variables do not differ significantly between groups.[9]

Each individual is described by a set of (hopefully) disinguishing characteristics of discriminating variables. Based on a process which capitalizes on differences in group mean values of these discriminating variables, a set of linear equations is derived--one equation for each group.[10] These discriminant functions are then used to classify these (or other) observations based on the values of the descriptive variables of the observation involved.

When the discriminant functions are derived from normalized data, the discriminant coefficients can be interpreted as weights which indicate the similarities and differences in the characteristics among the groups. A confusion matrix summarizing the type and number of successful (and unsuccessful)

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[9]According to Chapter 2 of Reinmuth (1974), the discriminant model is rather robust with respect to deviations from this assumption, so that heteroskedasticity is a problem only when serious violations occur.

[10]Succinct presentation of the mathematical derivation of linear discriminant functions can be found in Johnston (1972) and Press (1972).

classifications and various test statistics can be used to evaluate the "fit" of this classification procedure.

An important prerequisite for use of the normal discriminant techniques described above is quantitative and continuous data. A limited number of nominal or discontinuous variables can be included by employing dummy variables. For example, if survey data is being used, the respondent's sex can be indicated by a 0,1 dummy structure. However, if a response (e.g. father's occupation) can take on one of several (p) response levels, then (p-1) dummy variables must be included in the model. In our case, the high school students' survey allows the following nine response levels for the question concerning father's occupation: skilled labor, semi-skilled labor, farm labor, small business owner, office worker, manager, commission salesman, professional, non-earner. Thus, inclusion of just this variable in the discriminant model would require the use of eight dummy variables. In fact, examination of the high school survey questionnaire (Appendix B) reveals that this is a problem with almost every question on the form. This kind of data can result in a large number of dichotomous variables. Since these variables only take on values 0 or 1, they may represent a violation of the discriminant assumption of a multivariate normal distribution of measurements within each class.

Clearly, if all or most of the data are nominal and/or of a nature that cannot be placed on a meaningful interval scale (as is the case with the high school surveys), an alternative approach is necessary. Such a method has recently been suggested by Reinmuth (1975).[11] This approach, called nonmetric discriminant analysis, has as its goal the classification of items into mutually

[11] Since this is not a widely used procedure, it is described here at some length. A more formal development of the technique is given in Appendix H.

exlusive and exhaustive groups by means of probability calculations. The technique takes information about the existing relative frequencies of group classification (prior probabilities) and "updates" these probabilities as additional information is learned about the common characteristics of the individuals within each group. Consider this situation:

1) two schools (A and B) are available to a certain student population;
2) school A has twice as many students as school B;
3) three-fourths of A's students are male, one-third of B's are male;
4) Jack attends school A or B.

We desire the probability that Jack attends school A. By (2) a given student is twice as likely to attend A as B, i.e. the probability that Jack attends A is 2/3 and the probability he attends B is 1/3. Knowing that Jack is male, however, allows us to incorporate the information in (3) into our calculations It is obvious that Jack is much more likely to attend A than (2) indicates. The exact probability that Jack attends A (given that he is male) is revealed by Bayes Law[12] to be:

$$P(X_A \mid Y) = \frac{(2/3) \cdot (3/4)}{(2/3)\ (3/4) + (1/3)\ (1/3)} = 9/11 \simeq .82$$

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[12]Bayes Law is an important result of mathematical settheory. Stated formally for a two group classification problem:

$$P(X_A \mid Y) = \frac{P(X_A) \cdot P(Y \mid X_A)}{P(X_A) \cdot P(Y \mid X_A) + P(X_B) \cdot P(Y \mid X_B)}$$

where $P(X_A \mid Y)$ = probability of occurrence of event X_A given that event Y has occurred

In the example above: X_A = event that a student attends school A
X_B = event that a student attends school B

(Footnote continued on next page)

We can also calculate the probability that Jack will attend B:

$$P(X_B \mid Y) = \frac{(1/3)\quad(1/3)}{(1/3)\ (1/3) + (2/3)\ (3/4)} = 2/11 \approx .18$$

Of course, $P(X_A \mid Y) + P(X_B \mid Y) = .82 + .18 = 1.0$

The information in (2) provides the prior probabilities in this example. The probability (.82) that Jack attends A given that he is male is a posterior probability. The posterior probability that Mary attends A given that she is female can also be calculated:

$$P(X_A \mid Z) = \frac{(2/3) \cdot (1/4)}{(2/3)\ (1/4) + (1/3)\ (2/3)} = 3/7 \approx .43$$

This simple example involves the possibility of two types of error--classifying students of A into school B and classifying students of B into A. In some types of classification some errors are more serious than others. For example, we consider it more serious for our legal system to classify an innocent person as a criminal than to declare a criminal innocent. Suppose the error of assigning an A student to B is twice as serious as the error of assigning a B student to A. Let the cost of the less serious error equal one cost unit. Then the expected cost of assigning Jack to school A is the cost of making the error (of assigning a B student to A) times the probability that the error will be made (i.e. the probability that Jack attends B.) In the general form:

$$0 \cdot (.82) + 1 \cdot (.18) = .18$$

- 0: cost of correct classification
- (.82): Prob. that Jack attends A
- 1: Cost of assigning B student to A
- (.18): Prob. that Jack attends B

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12 (cont.) Y = event that the student is male
Z = event that the student is a female.

Thus $P(X_A) = 2/3$ and $P(X_B) = 1/3$ from (2) above and $P(Y \mid X_A) = 3/4$ and $P(Y \mid X_B) = 1/3$ from (3) above.

Similarly the expected cost of assigning Jack to B is:

$$2 \cdot (.82) + 1 \cdot (.18) = 1.64$$

(2: cost of assigning A student to B)

Assigning Jack to A obviously involves less (minimum) expected cost and it is, therefore, the classification selection of non-metric discriminant analysis.

A further example emphasizes the effect of assumptions about relative misclassification costs. Under our previous assumption that misclassification of A students is twice as serious, Mary would be assigned to A:

$$\text{expected cost of misclassification (Mary assigned to A)} = 0 \cdot (.43) + 1 \cdot (.57) = .57$$

$$\text{expected cost of misclassification (Mary assigned to B)} = 2 \cdot (.43) + 0 \cdot (.57) = .86$$

However, if classification errors are deemed to be equally serious, Mary is assigned to B:

$$\text{expected cost of misclassification (Mary assigned to A)} = 0 \cdot (.43) + 1 \cdot (.57) = .57$$

$$\text{expected cost of misclassification (Mary assigned to B)} = 1 \cdot (.43) + 0 \cdot (.57) = .43$$

Throughout the research covered by this report, relative misclassification costs are assumed to be equal.

A sophisticated non-metric discriminant model may include many variables. All use Bayes Law to calculate posterior probabilities like the sex variable illustrated above. There may be more than two responses available for one variable. For example, possible responses to a marital status question might be married, single, divorced, widowed, and separated. Each possible response will be associated with its own posterior probability of each classification alternative. This probability enters into expected cost of misclassification

calculations for those records giving that response. Suppose 25% of A's and 75% of B's students are single. The posterior probability that a student attends A given that he/she is single is thus:

$$\frac{(1/4)\ (2/3)}{(1/4)\ (2/3) + (3/4)\ (1/3)} = 2/5 = .4$$

Final classification costs are obtained by summing the costs associated with each of an item's descriptive characteristics. Thus, if Jack is male and single, the expected costs of misclassification are:

(Jack assigned to A)

$$[0(.82) + 1(.18)] + [0(.4) + 1(.6)] = .78$$

(Jack assigned to B)

$$[1(.82) + 0(.18)] + [1(.4) + 0(.6)] = 1.22$$

Although Jack is single and three out of five single persons attend school B, Jack is still assigned to A because more than 4 out of 5 males attend A.

In the above cost calculations each variable is given equal weight. A further extension employed in this study takes into consideration that some variables may prove to be better class predictors than others. The percentage of observations classified correctly by each variable individually (i.e. not in conjunction with any other variable) is used as a weight in the misclassification cost equations. Note that it is the predictive ability of the variable as a whole that is relevant to the calculation of these weights. The sex variable described above, for example, seems adept at classifying males but appears less decisive for females. Both of these facts affect the overall predictive ability of the sex variable.

The results of the classification model can be summarized in a confusion matrix such as is used in traditional discriminant analysis. Some indication of the model's performance can be gained by observing the percentage of sample

items correctly classified. Since these are the same items on which the model is based, this performance figure will be upwardly biased. A more satisfactory procedure would be to apply the model to another set of observations and note its success in classifying those items.

As with the traditional linear discriminant method, it is possible to perform a class profile analysis in order to describe the distinguishing features of each class. In general, the goals and uses of this method are similar to those of regular discriminant analysis, but in this version the data used are of a non-continuous or nominal nature.

The last of the research procedures to be discussed is conditional logit analysis, developed at the University of California at Berkeley by Daniel McFadden (1973). Although the model's initial use was in studies of urban travel demand, its theoretical exposition makes clear its application to virtually any mutually exclusive choice problem among discrete alternatives. The principal innovation of the conditional logit model stems from its assumptions about the choice problem facing the individual consumer.

An orthodox regression model of demand, such as the one we utilize in our time series analysis, relates a continuous, dependent variable representing consumer choice to some collection of specified independent variables. For example, we might specify the following relationship as representing a model of choice in higher education:

$$S = a + b_1X_1 + b_2X_2 + \ldots,$$

where S = dollars spent on higher education,

X_1 = family income,

X_2 = student SAT score,

etc.

The implicit assumption of the orthodox specification is that slight changes in the independent variables are correlated with a marginal change in the choice behavior of all individuals in the sample. That is, an income rise of $1000 a year for all individuals in the sample will result in everyone spending a little more (i.e. b_1 times $1000) for higher education. This structure of individual behavior is termed "choice at the intensive margin." Conditional logit analysis envisions choice among discrete alternatives. Slight changes in the observed variables are correlated with a few individuals in the sample switching from one mutually exclusive choice to another. Thus, an income rise of $1000 a year will cause a few students to attend a private university instead of a state institution. Choice is made at the "extensive margin."

Conditional logit analysis is based on a utility maximizing theory of rational choice behavior. Each discrete alternative (in our case, an institution of higher education) is assumed to be viewed by the chooser as a bundle of attributes. These attributes (such as distance from home to school, academic quality of school, cost to the individual, etc.) are then arguments in the student's higher education utility function. The choice alternatives are ranked by the chooser in order of preference and, subject to budget and admission constraints, the top-ranking alternative (i.e. the alternative with the highest utility to the chooser) is chosen.

The distinctness of this approach can be seen more clearly if we contrast it with another used in the study. For example, discriminant analysis also seeks to classify individuals, on the basis of known characteristics, into one of several mutually exclusive groups. These groups represent alternative classes--perhaps community college attendance, private school attendance, and four-year public school attendance. The groups are mutually exclusive because

we do not think of choosers as simultaneously attending two or more schools (or falling into two or more groups, therefore). In educational demand studies, these groups or classes may be defined by the college choices of individuals; and the characteristics which best discriminate between these groups can be seen to explain the college choice. Discriminant analysis involves no theory of individual decision making.[13] It merely classifies individuals into groups on the basis of observed differences in characteristics between members of different groups. A discriminant analysis might reveal, for example, that the mean family income of private university students is significantly higher than that of state institution students and thus would use a family income criterion to classify higher income students into private universities and lower income students into state institutions.

Alternatively conditional logit analysis seeks to sort out the elements of individual choice and to calculate the effects of changes in school attributes on consumer choice. This calculation of changes in choice gives us something akin to elasticities of demand.

The significance of conditional logit's theoretical underpinnings can be seen in the following example. Assume a sample of prospective students faced with a choice between three schools (A, B, and C), and assume that distance from the family home to school is a significant determinant of college choice. Assume also that schools closer to home are preferred, for reasons of cost minimization. Under conditional logit analysis, a student living closer to school A than to schools B or C will suffer less disutility from going to school away from home by choosing school A over the other alternatives. Thus

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[13] See footnote 50 on page 251, Appendix H.

the probability of this student choosing school A will be increased by the distance variable. The focus of conditional logit analysis estimation is the isolation of the distance effect on the probabilities of choice of schools A, B, and C. Once this parameter is estimated, school B, suffering from a lack of enrollment, can determine how many more students it could attract by moving to a more accessible location.

Discriminant analysis, however, takes the existing discrete choices as given and seeks only to explain the choice between A, B, and C at their attributes. Using discriminant analysis, school B might be able to predict with some accuracy the school choice of a new arrival or the long term effects of population shifts as long as the attributes of the rival schools are constant. However, the effects of altering the attributes of the choice set are not readily determinable.

We can now summarize this section on the estimation techniques and data sets employed in our study. The results of the empirical investigation to be presented in the next section are based on the application of regression, discriminant, non-metric classification, and conditional logit analysis to three distinct, though related, data sets. The separate analyses are overlapping and provide some junctures of comparison and evaluation with one another. Thus are weaknesses or eccentricities in any of the techniques or data sets, taken singly, somewhat alleviated. It is our hope that the use of these techniques in combination will enhance the understanding of the separate results by indicating their relationship in an overall view of educational demand. We turn now to our findings.

V. RESULTS

The organization of this section is as follows. We begin in part A by presenting and examining a series of crosstabulations on the SRS data. This rudimentary data analysis provides a general description of our Oregon college and university student sample. The bulk of the tables here show student characteristics; costs; and resources, by institutional segment. At the end of this section a set of crosstabulations specific to Federal financial aid recipients is used to explore differences between recipient and non-recipient school goers.

Parts B and C of this section present our econometric results in examination of 1) the decision whether or not to enroll in an institution of higher education (part B) and 2) the choice between institutions (part C). The presentation of these results begins with our analysis of time series data. Here we take a step back from the current setting of higher education in Oregon and explore a fifteen year period of change, beginning in 1960. Ordinary least squares regressions were run on the data. In successive formulations of the estimation equation, we add combined state and Federal financial aid as an independent variable in order to examine the effect on demand, through time, of changing aid availability. This analysis of changing patterns of demand over time is really a long run view of the initial enrollment decision.

We examine this decision whether or not to enroll in an IHE more intensively by conducting a non-metric discriminant analysis of data on the post-secondary plans of high school seniors. Here we attempt to profile those students who say they plan to go on to school and those who do not.

In part C, the focus changes to that of the student's choice between institutions. We concentrate primarily on the choice between segmental types, although at times we divide particular segments into finer institutional cate-

gories (e.g. private sectarian and non-sectarian schools). To investigate this choice situation we apply two distinct techniques to the SRS data on current school attendees--discriminant and conditional logit analysis. We also take a closer look at the plans of high school seniors who intend to enroll, using the non-metric technique to develop profiles for those choosing various institutional segments.

In summary, this section on results takes the following outline:

A. Statistical description of our sample of present IHE attendees
   1. Crosstabulations on SRS data, by institutional segment and selected student characteristics (e.g. sex and parental income)
   2. Crosstabulations on SRS data, contrasting Federal aid recipients with non-recipients

B. Multivariate analysis of the decision whether to attend an institution of higher education in Oregon
   1. The enrollment decision viewed historically: ordinary least squares regressions on time series data, 1960-74
   2. The enrollment decision viewed currently: non-metric discriminant analysis of Oregon high school senior survey data

C. Multivariate analysis of the choice between schools
   1. Discriminant analysis of the 1974 SRS data
   2. Non-metric discriminant analysis of Oregon high school senior data
   3. Conditional logit choice estimation on SRS data

A. Statistical Description of the SRS Sample

Data presentation via crosstabs can make for pretty deadly reading. In an effort to minimize this problem, we try to keep this section brief by confining

our comments on the tables to minimal summaries. The appropriate place for interpretation and analysis is later on when results from the econometric analyses are presented. The differences which surface here between segmental student populations are not surprising, but they do suggest reasons for the significantly different segmental demand elasticities which are developed in our multivariate analyses. Reader examination of the following tables will prove helpful to an appraisal of the results presented in parts B and C.

These tables are based on 1,654 SRS observations. Our editing of the original SRS sample (N=2163) resulted in a purposefully designed subsample of fulltime, undergraduate, nonsectarian students in Oregon schools, with accurate proportionality between school segments in the edited sample. We eliminated part-time and post-baccalaureate students from this sample because our econometric analyses focus on the demand decisions of full-time undergraduates. It is this group in which we are most interested and in the tables below we seek to statistically portray them.

Sectarian students are edited out of the larger SRS sample because their presence confounds comparisons between the private segment and the two public segments. They are included in some portions of Part C--the analyses of choice between institutions--but it becomes quite obvious there that we do not have the data to adequately capture the factors which influence sectarian school choice. Looking, then, at full-time, undergraduate students in Oregon community colleges, and public and private four year schools (excluding sectarians), let us examine some general demographic contours of this student population.

1. Demographic, Cost and Resource Information for Undergraduate Students in the SRS

Beginning with basic characteristics, community college students are older,

more likely to be married and to be veterans than are their four year school counterparts. These differences are shown in Tables six through ten below.[1] As Tables 8 and 9 show, nearly one-third of the full-time students in Oregon community colleges are over 25 years of age.[2]

In Table 7 we see that three-fourths of all the students in our sample have never been married, while 20.3% are married at present. But within segments, only 5.9% of the independent college students as compared with 28.6% of the community college students are attending school while married.

Table 7

Marital Status of Students, by Segment

		Never Married	Married	Separated, Divorced, or Widowed
Community College	#	437	203	63
	%	61.5	28.6	8.9
State System	#	599	121	20
	%	80.9	16.4	2.7
Independent	#	190	12	1
	%	93.6	5.9	.5
Column Total	#	1226	336	84
	%	74.1	20.3	5.1

[1] In these tables and those to follow, the first figure in each cell gives the absolute count and the second represents the relative frequency. Thus for the first several cells in the community college row (Table 8), we see that no community college students were age 17 or under, 24 of them (or 3.4% of all community college students in our sample) were age 18, 106 were 19 (14.9%), and so on.

TABLE 8

Student Age (in Years), by Segment

		17	18	19	20	21	22-24	25-29	30-34	35-40	41+
Community College	#	0	24	106	150	83	120	125	38	25	40
	%	0.0	3.4	14.9	21.1	11.7	16.9	17.6	5.3	3.5	5.6
State System	#	1	11	162	119	153	186	76	15	10	7
	%	.1	1.5	21.9	16.1	20.7	25.1	10.3	2.0	1.4	.9
Independent	#	1	20	47	46	40	40	8	0	0	1
	%	.5	9.9	23.2	22.7	19.7	19.7	3.9	0.0	0.0	.5
Column Total	#	2	55	315	315	276	346	209	53	35	48
	%	.1	3.3	19.0	19.0	16.7	20.9	12.6	3.2	2.1	2.9

TABLE 9

Collapsed Student Age Distributions, by Segment

		17-18	19-24	25+	30+
Community College	#	24	459	228	103
	%	3.4	64.6	32.0	14.4
State System	#	12	620	108	32
	%	2.5	83.8	14.7	4.3
Independent	#	21	173	9	1
	%	10.4	85.3	4.4	.5

Table 10 displays a significant difference in the veteran status of respondents, by segment. This is important to our later discussions of student resources and of sensitivity to changing draft deferment pressures. In our sample, the proportion of community college students who are veterans is eight times that of their private school counterparts and more than double their representation in four year public schools. Over a quarter of our community college respondents are veterans, making them a sizable group of rather distinct students in the overall community college student body.

Table 10

Veteran Status of Students, by Segment

		Veteran	Non-veteran	No response
Community College	#	191	500	20
	%	26.9	70.3	2.8
State System	#	85	651	4
	%	11.5	88.0	.5
Independent	#	7	192	4
	%	3.4	94.6	2.0
Column Total	#	283	1343	27
	%	17.1	81.2	1.8

[2]Because the sample on which these and the ensuing crosstabs are based excludes part-time, graduate, and certain non-regular students (such as those in adult continuation programs), it significantly underestimates the proportion of older students. This is inconsequential for our purposes; it is the decisions of full-time, undergraduate students in which we are interested. But others may be interested in the following table drawn from the original sample of 2,163 SRS responses. These proportions reflect the age distribution of the full range of enrolled students.

Table 6

Student Age (in years). Full SRS Sample, by Segment

		17-18	19-24	25+
Community College	%	4.4	51.4	44.4
State System	%	1.4	75.1	23.3
Independent	%	4.9	80.0	14.9

The information contained in these five tables is, in some sense, overlapping: that proportionately more community college students are married and are veterans is related to their also being older. The characteristics are correlated, but not identical. As a result, each makes a separate contribution to our later interpretation of elasticities and student resource patterns.

The sample breakdown by sex appears earlier in Table 3, page 39. The differences by segment are very small: in the SRS sample, in fact, the two public school segments are identical in male/female proportions and only 2.1% away from the private school proportion. However, when we divide the sample by sex and examine other variables (such as degree aspirations), some differences emerge. These are investigated later in this section.

A second set of interrelated characteristics are those which describe the student's place of residence at admission and the location of his or her selected school. Tables 11 through 13 present selected variables from a larger set of SRS questions on student residence, status at admission, commuter status, and distance to chosen school. Table 4 (page 39) shows simple in-state, out-of-state proportions in our sample. In Table 11, we provide a finer breakdown of student place of residence at admission.

According to the numbers provided in Table 11, a full 96.2% of Oregon's community college students were residents of Oregon at the time of admission to their present school. This is considerably higher than the overall average of 85% for all higher education students and 85.7% for four year public school students. But the most significant contrast is between the community colleges and the independent schools, in which less than half the students (43.3%) were Oregon residents at admission. Let's look more closely at the place of residence of the independent students. Forty-one percent come from the nearby

TABLE 11

Student Residence Status, by Segment

Place of Residence at Admission

		Oregon Resident				Other	Plains	Midwest			Foreign	
		In-Dist.	Out	Calif.	Wash.	West. St.	State	State	South	East	Student	Other
	#	608	76	2	4	7	0	0	3	0	4	7
	%	85.5	10.7	0.3	0.6	1.0	0.0	0.0	0.4	0.0	0.6	1.0
Comm. College	#	684		13								
	%	96.2		1.9								
	#	634		39	11	20	1	10	2	9	10	4
	%	85.7		5.3	1.5	2.7	0.1	1.4	0.3	1.2	1.4	0.6
State System				70								
				9.5								
	#	88		36	24	24	3	5	2	11	3	7
	%	43.3		17.7	11.8	11.8	1.5	2.5	1.0	5.4	1.5	3.5
Independent				84								
				41.3								
Column Total	#	1406		77	39	51	4	15	7	20	17	18
	%	85.0		4.7	2.4	3.1	0.2	0.9	0.4	1.2	1.0	1.1

Western states, the highest proportion of these (17.7%) residing in California. In our sample, these schools even draw approximately 5% of their student bodies from eastern states.

That community college students stay close to home is further evidenced by the large numbers of them who attend a school in their community college district--85.5%. We can examine this characteristic further by looking at some additional SRS questions. Table 12 displays the results of our analysis of respondent zip codes, matched to the location of Oregon institutions of higher education. In constructing this table we looked only at those students who were Oregon residents at the time of admission. (By definition, an out-of-state student cannot attend an Oregon school located in his or her county). Within the state, then, what differences are there in patterns of "local" attendance? True to their name, the community colleges draw heavily from their locale--74% of the two year school students in our sample were attending a school in their county of residence, as compared with 50% in the overall SRS sample. The in-county proportions for community colleges are reversed for

Table 12

Student Attendance at Schools in County of Residence, by Segment

		Attended School in County	Attended School Out of County
Community College	#	479	169
	%	74.0	26.0
State System	#	154	454
	%	25.3	74.7
Independent	#	38	48
	%	44.2	55.8
Column Total	#	671	671
	%	50.0	50.0

state system schools, with 74.7% of their student bodies attending schools not in their county of residence. And 44.2% of the independent students left their Oregon county of residence to attend school somewhere else in the state. The reason for these differing proportions between the four year public and private segments may be a simple one. With one exception, the independent (nonsectarian) schools are located in or very close to the populated metropolitan areas of the state. Thus, these schools have a better chance to draw from the more dense populations around them. The seven state system schools are flung all over the state, some of them in fairly remote areas. Students must more often travel out of the populated counties of the state to avail themselves of the programs of these schools.

There is another interesting measure of where students are when they apply for admission. We can look at their status at the point of application. Tables 13 and 14 summarize this information, and it runs a bit contrary to our expectations. Column one of Table 13 shows the percentages of students who were admitted to their present institution as a first time freshman. The two year public and four year private schools are quite close in their proportion of students admitted with this status, over four-fifths in each case. But note (from columns 1 and 2, Table 14) that with their open door policies, community colleges are drawing 11% of their first time freshmen from non-typical populations--people who do not have regular high school diplomas.

That only 62% of the state system admissions are of first time freshmen, compared to 81% and 84% in the other two segments, signals a higher rate of transfer into these schools. The two tables show that this is indeed the case. 12.5% of the state system students in the survey were admitted as transfers from a community college in or outside Oregon--a number close to the 12.6% who were

TABLE 13

Status of Students at Admission, by Segment

		1st time Freshman	Oreg. CC transfer	Other CC transfer	Ore. SS transfer	Ore. Ind. transfer	Other 4 yr. transfer[a]	Other
State System	#	459	65	27	93	17	59	20
	%	62.0	8.9	3.6	12.6	2.3	8.0	2.7
Independent	#	171	6	3	6	1	14	2
	%	84.2	3.0	1.5	3.0	.5	6.9	1.0
Community College	#	576	13	7	58	13	14	30
	%	81.0	1.8	1.0	8.2	1.8	2.0	4.2

[a]These are transfers from public and private four year schools which are outside Oregon.

TABLE 14

Previous Education of First Time Freshmen at Community Colleges

		Non H.S. Graduate	GED holder	Oreg. H.S. diploma	Other H.S. diploma
Community College	#	17	61	434	64
	%	2.4	8.6	61.0	9.0

	First Time Freshman
#	576
%	81.0

transfers from other Oregon four year public schools. In this four year public segment, 8% of our respondents said they were admitted as transfers from out-of-state four year schools (public and private), while only 2.3% had transferred from a private school in Oregon. In all, 35.2% of the admissions in this segment in this year were of transfer students. Still there are not as many transfers from Oregon's community colleges as one might have expected--only 8.9%. This tends to contradict the common notion held in Oregon that the two year schools only temporarily draw students away from the colleges and universities, but then feed a goodly number of them to these schools through later transfer. In our sample, in fact, the transfer flow from Oregon community colleges to Oregon state system schools was balanced by a nearly equal flow of students (8.2%) who transferred in the opposite direction. Despite total student populations of nearly the same size (in F.T.E. terms) the community colleges are not providing transfers to state system schools in nearly the numbers supplied by other four year public schools--8.8% compared to 12.6% Oregon state system school transfers.

This intra-segment transfer flow is not repeated in the other two segments. Only 1.8% of the community college respondents were admitted as transfers from another Oregon community college, while the private schools showed 0.5% of their students as transfers from other Oregon private schools. A larger proportion transferred into the privates from two and four year public schools--3% in each case. But the largest single percentage of transfers to Oregon's private segment, 6.9%, was from out-of-state four year schools (public and private).

There is little about demand for education that can be inferred directly from these admission status data. That only 62% of the state system students entered their present school as a first time freshman means that a sizeable proportion of them have gone to another school first. But this does not per-

mit us to make the judgment, for example, that these students may evince a more sensitive (e.g. elastic) demand for education. The data do show, however, there is less inter-segment transfer of students than might have been supposed.

A third and final set of general characteristics have reference to academic success, educational aspirations and reasons for pursuing an education beyond high school. We will look first at academic success, as measured (admittedly roughly) by grade point averages for both high school and college work. These are combined in Table 15.

There is nothing startling in these figures. They bear out a pattern reported in other places and confirmed also by our later discriminant analysis of college-going high school students in Oregon. That is, students with the highest grade averages from high school tend to go to private four year schools, while those with the lowest grades are more likely to elect a community college. The state system schools fall somewhere in between. For example, nearly 30% of the private school respondents reported a high school grade point average between 3.75 and 4.00. The proportions of community college and state system students in this H.S. grade range were 6% and 17.2%, respectively. On the other end of the grade continuum, almost no private school respondent had less than a C average (2.00 GPA) in high school, while 15.5% of the community college students said they did.

If we aggregate the bottom three grade ranges, we see that altogether 30.4% of the community college students report high school grades of less than a 2.50. This means they would not have met the minimum grade requirement for admission to any of Oregon's state universities, while 17.2% apparently fell below the 2.25 admissions standard at the state's four year public colleges. This gives an indication of the increased access to Oregon post-secondary education provided by the existence of community colleges. The non-reporters

TABLE 15

Student High School and College Grade Point Averages, By Segment of Attendance

(Percentages Only)

		Below 2.00	2.00 - 2.24	2.25 - 2.49	2.50 - 2.74	2.75 - 2.99	3.00 - 3.24	3.25 - 3.49	3.50 - 3.74	3.75 - 4.00	N.R.*
Community College Students	H.S. GPA	15.5	1.7	13.2	5.3	22.2	5.2	13.5	7.2	6.0	10.1
	Coll. "	4.4	2.1	10.0	8.3	20.7	11.5	18.0	12.5	9.7	2.8
	Cum. % (Coll.)	4.4	6.5	16.5	24.8	45.5	57.0	75.0	87.5	97.2	100.0
State System Students	H.S. GPA	4.6	1.9	7.3	5.4	16.4	9.7	20.1	14.9	17.2	2.6
	Coll. "	2.8	3.5	12.7	9.6	25.8	15.8	16.4	8.8	3.9	0.7
	Cum. % (Coll.)	2.8	6.3	19.0	28.6	54.4	70.2	86.6	95.4	99.3	100.0
Private School Students	H.S. GPA	1.0	1.0	5.4	2.0	15.8	8.4	21.2	11.8	28.6	4.9
	Coll. "	3.4	0.5	7.4	8.9	24.1	14.3	21.7	10.3	7.4	2.0
	Cum. % (Coll.)	3.4	3.9	11.3	20.2	44.3	58.6	80.3	90.6	98.0	100.0

*N.R. = Non Reporters

among community college respondents (10.1%) probably reflect the proportion of these students who hold a G.E.D. or have no certificate or high school diploma (11.0% altogether).

The high school grades reported in Table 15 differ greatly from those (just below them) earned thus far in college work. The cumulative percentage figures which we have calculated (the third percentage in each cell) demonstrate how close in reported college grades the segmental student bodies are. For example, roughly 45% of the community college, 54% of the state system, and 44% of the independent students--or somewhere in the neighborhood of one-half the students in each segment--reported a college grade average below a 3.00. For a number of reasons, it is not really appropriate to draw comparisons between segmental grade point averages. Grading policies and standards are not uniform, nor are courses or perhaps even faculty expectations of students.

Looking at high school versus college grades, however, a few observations can be safely made. First of all, the community college experience is clearly providing many students with a degree of academic success which they did not have in high school. Less than one third of them achieved a B average or better in high school while over one half are doing so in college. This is the reverse of the typical higher education experience where students do not later maintain their high school grade averages. In our samples, over 60% of the state system students reported high school grades of 3.00 or above, but only 45% had maintained a B average or better thus far in their college careers. The comparable proportions for independent students are 70% (H.S.) and 53% (college).

If, then, there are segmental differences in the previous academic re-

cords of students, do their aspirations for college work also vary? We might expect so and the data in Table 16 would bear us out. The question which elicited these responses was: "What is the highest level of education you plan to complete?" The differences, by segment, are marked. For instance, if we sum the responses in columns 1, 2, and 3 for the overall sample, we find that 19.2% of these students intend to stop their schooling short of a Bachelor's degree. (I.e. they seek a non-degree certificate, or an Associate of Arts or Science degree; or they're pursuing self-improvement with no specific degree or program in mind.) The percentage of community college students with combined responses in these same three columns is 39.3%, double the sample wide figure, while private school students show up in only one of these columns, with a tiny 2.5%. The analogous, combined percentage for state system students is likewise small--4.5%. However, the figures show a similarity of intention, across segments, to obtain a Bachelor's degree: reading down column four in Table 16 gets 38.3%, 48.1%, and 37.4% for the three segments. Post-baccalaureate plans again differ more widely, however. The proportion of students planning to complete a Master's degree is close at the private and public four year schools--roughly one third; but only 13.1% of the two year school students have such post-baccalaureate plans. And the percentage of private students who report doctoral plans stays high, 27.6%, more than double and triple those in the four and two year public schools of 12% and 8%, respectively. An interesting wrinkle appears in our data at this point. Nearly two-thirds of the independent schools students planning post-baccalaureate work (at the Master's or Ph.D. level) say they will do so in a school outside Oregon!

Related to these data are students' expressed reasons for pursuing a post-secondary education. They were asked to rank their answers to this

TABLE 16

Planned Level of School Completion, by Segment

		Self-Improv. Only	Non-Degree Certificate	AA or AS	BA or BS	MA or MS	Ph.D.	N.R.
Community College Students	#	29	39	211	272	93	57	10
	%	4.1	5.5	29.7	38.3	13.1	8.0	1.4
State System Students	#	12	2	19	356	259	89	3
	%	1.6	0.3	2.6	48.1	35.0	12.0	0.4
Private School Students	#	5	0	0	76	62	56	4
	%	2.5	0	0	37.4	30.5	27.6	2.0
Column Totals	#	46	41	230	704	414	202	17
	%	2.8	2.5	13.9	42.5	25.0	12.2	1.0

question: "Currently what are your three main reasons for pursuing education beyond high school?" Table 17 displays percentages for the respondents' first and second ranked reason. As their first ranked reason for pursuing education, all three groups of students cite their desire to learn skills necessary for a job or career. It is interesting to further note that the distribution of rankings for the "First Ranked Reason" is very similar between state system and community college segments. For example, "Increase future income" is the second most often chosen reason, and "Self understanding" the third most often chosen, for both segments. The private segment exhibits a somewhat different distribution of first ranked responses, but comparing the three segments column by column the variation is not great.

Apparently this question does not discriminate among the segments as sharply as did those inquiring about degree aspirations or grade averages. If students in the three segments are substantially different across many of the dimensions which we explore in this section, they are quite alike in their reasons for going to school, whichever type of school they've chosen. And yet our research shows that they clearly do not view all schools as being the same. This seems an interesting result if not an altogether puzzling one. Consider this: students at both community colleges and at private schools (56% and 45%, in turn) say they are pursuing an education because they wish to learn job or career skills. Yet they are attending schools in two very different school segments. Since both groups appear strongly investment oriented in their demand for education, we might assume that their choice of segment reflects their

TABLE 17

First and Second Ranked Reasons for Pursuing Post-Secondary Education, by Segment[a]

		Learn Skills	Increase Fut. Inc.	Environ. of Change	Expos. to Culture	Be With Friends	Self Under-standing	My Best Alternat	No Other Alter.	Parents' Wishes	Other	No Response
Community College	(1)	56.4(1)	13.6(2)	4.4(4)	3.8(5)	0.0(10)	9.3(3)	2.8(7)	0.4(8/9)	0.4(8/9)	3.5(6)	5.3
	(2)	17.6	37.4	6.3	7.9	0.1	9.7	4.9	1.4	0.4	1.7	12.5
State System	(1)	56.6(1)	10.5(2)	4.3(6)	5.3(4)	0.0(10)	9.3(3)	3.0(7)	1.5(8)	0.9(9)	4.5(5)	4.1
	(2)	17.6	30.3	8.6	12.8	0.7	15.5	3.6	0.8	0.7	2.4	6.9
Independent	(1)	45.3(1)	8.4(4)	6.9(5)	8.9(3)	0.0(10)	16.3(2)	4.4(6)	1.0(8)	0.5(9)	3.9(7)	4.4
	(2)	17.7	18.2	6.9	16.3	1.0	22.2	4.9	1.0	1.0	1.0	9.9
Column Totals	(1)	55.1	11.6	4.7	5.1	0.0	10.2	3.1	1.0	0.7	4.0	4.7
	(2)	17.6	31.9	7.4	11.1	0.5	13.8	4.4	1.1	0.6	1.9	9.7

[a]The numbers in the cells are percentages. Thus in column 1, row 1 the cell entries tell us that 56.4% of the community college respondents ranked "to learn skills necessary for a job or career" as their first reason for pursuing education. Ranked second by them was "to increase lifetime earning power." The numbers in parentheses are the distribution of rankings for the first-ranked reason.

projected career choice.[3] A student wishing to prepare for a career in law would do well to enroll in one of Oregon's private schools, while a future welder or mechanic might be drawn to the facilities and programs in Oregon's community colleges. Both students seek to learn career skills. In many ways, the answers to this particular question do not tell us much about why students might choose one segment over another.

But there is a further dimension to demand for education which we hoped to pursue here--the question of investment vs. consumption motives in educational demand. Our interest grew out of a belief that people who were attending school primarily for reasons of investment differed from those who were there as consumers in the main. For example, we expected an investment prompted demand for education to be more price elastic, as rates of return were affected by changing tuition levels. Alternatively, the student who is in school as a consumer (e.g. to increase self understanding, to learn more as an end in itself) may be somewhat less sensitive to tuition changes--may exhibit a relatively price inelastic demand for education. Thus we wanted to see how the reasons for pursuing education, as given in the SRS, divided up along these two dimensions.

[3] This characterization--investment oriented--relates to the motive for schooling. When we speak of an investment motive, we mean investment in human capital--one's own. Such an investment is undertaken to enhance the productive capacity of, and/or increase income to, labor at some future time. Parents add to their children's stock of human capital attributes when they feed, nourish, clothe and socialize them. Young adults are acting to increase their human capital when they attend college for the purpose of learning career or job skills or simply to acquire a credential which will increase their access to certain jobs and thus their future income. This reason for attending school is to be distinguished from a "consumption" reason, where the benefits of attendance occur and are enjoyed in the present. Going to school to be with friends or to alleviate parental pressure are consumption reasons, as is going because one enjoys reading, listening to lectures, and interacting with an intellectual community.

We can lump together the responses in columns 1 and 2, Table 17, and call these investment reasons for pursuing an education. Then the other seven responses become consumption reasons. Within this framework, we do see some further differences by segment as shown in Table 18.

Table 18

Investment and Consumption Motives for Pursuing Education, by Segment

(Percentages only)

	Rank	Investment Motive	Consumption Motive	No Response
Community College	(1st)	70.0	24.7	5.3
	(2nd)	55.0	32.5	12.5
State System	(1st)	67.1	28.8	4.1
	(2nd)	47.9	45.2	6.9
Independent	(1st)	53.7	41.9	4.4
	(2nd)	35.9	54.2	9.9
Column Totals	(1st)	66.7	28.6	4.7
	(2nd)	49.5	40.8	9.7

Now a clearer division emerges between the two public segments and that of the private schools. Investment motives figure much more prominently in the responses of public school students. They are not nearly as important to the private students, ranking as the primary reason approximately 54% of the time and the second reason under one-third of the time. This is especially interesting given the plans of private students to invest, disproportionately, in post-baccalaurete schooling. If our hunches about the relationship between motive for school attendance and price elasticity of demand are correct, then, ceteris paribus, we would expect to see the differences in Table 18 reflected in our demand analysis later on. With consumption motives figuring more prominently

in the demand for private institutions, this segment's price elasticity should be lower than that for the two public segments, even with the markedly higher tuition levels in the private segments. We shall see.

While we are examining degree aspirations and the reasons for school attendance, it is interesting to see what differences, if any, exist between men and women students. Tables 19 and 20 enable us to do this. In Table 19, marital status and sex of respondent are brought together in a display of answers to this question: "What is the highest level of education you plan to complete?"[4] These figures are interesting but we should not push them too far. Remember that in constructing contingency tables such as these, all other factors are not held constant or "controlled for" as they are, for example, in a simultaneous regression model. The effect of hidden but important "other" variables can be demonstrated using Table 19. It appears, for example, that unmarried students of both sexes are much less likely to say that they will complete their studies with less than a Bachelor's degree. Likewise, a much larger number of unmarrieds (as opposed to marrieds) say they plan to complete a Ph.D. Does this mean that getting married negatively affects one's degree plans? Perhaps, but perhaps not. The frustrating thing about such tables is that they alone cannot provide a conclusive answer to this question. Other things may be operating here and we cannot control for them in a simple, two way table. For instance, the reader may recall that 60% of those students who are married are attending community colleges, and nearly 30% of all community college students

[4] We look at only two levels of response here--never married and married. Those students who are presently divorced, separated, widowed or "other," taken together, number less than 5% of our sample of full-time undergraduate students. We chose to omit them from these two tables rather than analyze them separately or add them to the group of students who were married.

TABLE 19

Highest Planned Level of School Completion,
By Respondents' Sex and Marital Status[a]

	Less Than Bachelor's	BA or BS	MA or MS	Ph.D.	N.R.	Row Total	
Unmarried Males	13.2	42.9	26.1	17.8	1.9	52.7 N=646	Total Unmarried Students = 1,226[b]
Unmarried Females	18.3	44.9	23.5	8.2	0.9	44.9 N=550	
Married Males	33.7	40.5	17.7	8.1	0.0	70.5 N=237	Total Married Students = 336[c]
Married Females	25.6	45.5	26.7	2.2	0.0	26.8 N=90	

[a]Percentages reported only

[b]Thirty (2.4%) of the respondents who told us they were not married did not identify their sex, thus they cannot be included in this breakdown. They are included in the total count however.

[c]Nine (2.7%) of the respondents who told us they were married did not identify their sex. They are included in this total figure but not in the body of the table.

are married (see Table 9). The degree aspirations of community college students differed markedly, as we saw earlier, from those of the students in public and private four year schools. Thus Table 19 reflects the degree aspirations of married students who are also preponderately community students, who also tend to be older. We cannot separate these "effects" out in this table. That said, let us proceed cautiously. There are still some things which we can safely point out.

First, married women are a decided minority in our sample, numbering 90 in all (or 5.4% of the total) compared to the 237 married men (or 14.3%). When we contrast their degree plans with those of the unmarried women students, the differences occur mainly in columns 1 and 4: far more unmarried women plan to complete a Ph.D., and proportionately fewer plan to complete their education with less than a Bachelor's degree. Since the proportion of women aspiring to a Master's degree seems to be higher among married women, perhaps we are seeing here a downward adjustment in plans, from Ph.D. to Master's degree.

The more substantial difference as regards doctoral plans is between men and women, marital status aside. In our (reduced) sample of "married" and "never married" students, 15% of the men and 7.3% of the women say they plan to complete a Ph.D. On the other hand, a goodly number of women do plan some post-baccalaureate work: 35% say they plan to complete a degree beyond a B.A. or B.S. This is not greatly different from the 40% of the men who have such post-baccalaureate plans. And the proportion of those men and women planning to stop with less than a Bachelor's is close--18.7% of the men and 19.2% of the women. In this category of plans, marital status appears important. 13.2% of the unmarried men say they'll stop with less than a Bachelor's degree but the percentage jumps to one-third for the married men. Similarly for women students--18.3% of the unmarried but 25.6% of the married females have less

than baccalaureate plans. Does marriage affect post-secondary degree aspirations? We cannot address issues of cause and effect in an analysis of this kind, but the crosstabs do tip us off that something may be happening here which merits further examination.

While we are looking at possible differences in response, by sex, there is one further item which also provides a transition to the next section on financial resources--the relationship between self-support and income tax status. We compared responses on two SRS questions, #16 and #57. The former asks, "Do you (and spouse if applicable) contribute to your own support?" The latter asks, "Did your parents claim you as a dependent for Federal tax purposes for the calendar year 1973?" (Remember that students were answering this question in May, 1974, just one month after the deadline for filing 1973 tax reports.) Table 20 displays the responses to these questions. There are three variables combined in the table--sex, tax dependence, and level of self-support--so some care is needed to keep things straight.

Looking at the first row, we see that 10% of all students surveyed said they contributed nothing to their own support. This figure includes 13.6% of the women and 6.9% of the men. Alternatively, row four indicates that roughly 20% of all students were classified as independent (self-supporting) students by the Financial Aid Officer (FAO) at their institution. Two thirds of the sample falls between these statuses: approximately one third (row 2) say that they contribute some toward their own support but that the bulk comes from their parents and another third say they are primarily self-supporting. The largest percentage of the women, 41%, falls in row two--they were primarily supported by their parents--while the largest percentage of men were primarily self supporting, 42.5%. However, if we lump together rows 1, 2 and 3 we see that three fourths of the respondents did not identify themselves as financially independent

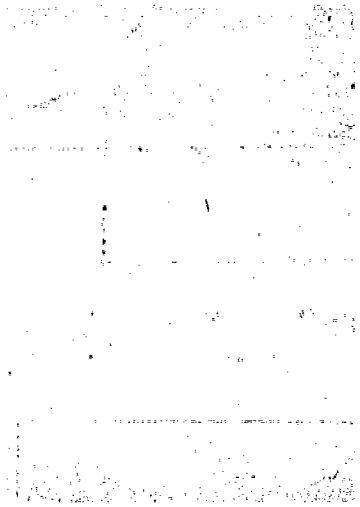

TABLE 20

Student Tax Dependent Status Compared with Financial Aid Status,
By Sex of Respondent

Did Parents Claim You as a Tax Dependent (1973)?

Level of Self Support		Male Respondents		Female Respondents		Row Total
		Yes	No	Yes	No	
None	#	36	23	66	25	150
	%	59.0	37.7	71.0	26.9	9.9
Some, but mostly parental support	#	202	14	263	11	490
	%	91.0	6.3	93.9	3.9	32.3
Primarily self-supporting	#	147	214	93	58	512
	%	38.7	56.3	58.1	36.3	33.8
Self-supporting, and FAO classified as such	#	8	176	6	112	302
	%	4.2	93.1	5.0	93.3	19.9
Self-supporting, but not FAO classified as such	#	19	10	25	9	63
	%	63.3	33.3	73.5	26.5	4.2

Males = 849 Females = 668

students.

Examining the table in another way, we see that 865 students, 57%, said that their parents did claim them as dependents in their 1973 tax claim. A higher proportion of the women students were so claimed than men--67.8% compared to 48.5%. And a disproportionate number of women were claimed as a tax dependent even though they considered themselves to be independent students. If a student has been claimed as a dependent for Federal tax purposes, he or she cannot be classified as "Independent" by their institution's Financial Aid Office. This may be a problem for some of the students in row 5 of the table: 19 men and 25 women report that they were claimed as tax dependents and also say they are self-supporting. This could be the reason why they were not FAO classified as such.

This completes the crosstabulations which describe the general demographic characteristics of the SRS sample. We move now to a presentation of data on student reported costs and resources. Following that, there is a brief section specifically on Federal aid recipients.

As its name implies, the Student Resource Survey focuses on the resource aspect of school attendance; and it does so in considerably more detail than any other instrument we have seen. Altogether, 49 questions on the survey inquire about schooling costs and student resources. We report the responses to some of these questions below, along with appropriate qualifications where necessary. At the start it should be noted that many knowledgeable people who work with student financial aid in Oregon doubt the accuracy of student reported financial information. We do not share their doubts, but we do know the limitations of our data. It has been examined for internal consistency and compared with "real world" data where possible (for example, actual tuition and fees). Where

inconsistencies do occur, they are taken into account. Above all we have tried to work within the limitations imposed by the data, not using it for purposes that assume more accuracy than we have reason to assume. We start this section with information about which a good deal is already known--the direct and indirect costs of schooling. The reader can straightforwardly judge the accuracy of these student reported cost figures. Here and throughout this section on financial information, data are typically grouped in ranges and then means and standard deviations are given.

Table 21 displays total cost by segment. This cost figure was computed by us from student reports of their expenses in these five categories: tuition and fees; books, supplies and course materials; room and board; trasnportation; clothing, recreation and incidentals. Of these, the first two categories are regarded as direct costs and the remaining three are summed to derive indirect costs of schooling. Remember that the SRS questionnaire was filled out in May 1974 and students were reporting their budgets for the 1973-74 academic year which was coming to a close. The largest percentage of community college students, 18%, said that their total expenses were in the range of $1501-2,000.[5] Over one-fifth of the state system students also reported total costs in this range; but a larger number of them, 27.4%, gave their costs as being between $2,001 and $2,500. In contrast, only seven independent students said their budgets were below $2,500 for the school year! Fully a fifth of them were paying between $3,501 and $4,000 and another fifth were between $4,001 and $4,500. These differences in costs are attributable for the most part to differences in tuition charges, by segment. We shall see this in a moment.

A further table on total cost data shows up again the striking differences

[5]The nine-month expense figures were given to us in "exact dollar figures" by respondents. We have imposed ranges on them for purposes of data display and analysis.

TABLE 21

Total College Expenses, by Segment[a]

		(1) 0-200	(2) 201-400	(3) 401-600	(4) 601-1000	(5) 1001-1500	(6) 1501-2000	(7) 2001-2500	(8) 2501-3000	(9) 3001-3500	(10) 3501-4000	(11) 4001-4500	(12) 4501-5000	(13) 5001-5500	(14) 5501-6000	(15) Over 6000	(16) N.R.	(17) Row Total
Community College	#	4	4	18	56	58	128	99	38	43	8	15	9	6	2	1	222	711
	%	0.6	0.6	2.5	7.9	8.2	18.0	13.9	5.3	6.0	1.1	2.1	1.3	0.8	0.3	0.1	31.2	43.0
State System	#	0	0	0	8	21	162	203	85	68	43	24	5	2	0	10	109	740
	%	0.0	0.0	0.0	1.1	2.8	21.9	27.4	11.5	9.2	5.8	3.2	0.7	0.3	0.0	1.4	14.7	44.7
Independent	#	0	0	0	0	0	4	3	10	18	42	43	27	13	5	2	36	203
	%	0.0	0.0	0.0	0.0	0.0	2.0	1.5	4.9	8.9	20.7	21.2	13.3	6.4	2.5	1.0	17.7	12.3
Column Totals	#	4	4	18	64	79	294	305	133	129	93	82	41	21	7	13	367	1654
	%	0.2	0.2	1.1	3.9	4.8	17.8	18.4	8.0	7.8	5.6	5.0	2.5	1.3	0.4	0.8	22.2	100.0

[a]"Total college expenses" includes tuition and fees; books and supplies; room and board; transportation; and clothing, recreation and incidentals.

between school types. Table 22 omits all incomplete responses and displays cumulative percentages by segment for those students who gave us a dollar figure for all five categories of school expense.[6] Several columns serve to drive home the cost differences. For example, in column six we see that 54% and 30% of all community college and state system students, respectively, are paying $2,000 or less for their total college expenses, while a tiny 2.4% of the independent students report costs in this range. And column 10 indicates that 92% and 93% of students in the two public school segments pay anywhere up to but not over $4,000, while less than half of the independent students do. This means that over half of the latter pay more than $4,000 a year to go to school. In fact, column eight shows that 90% of the independent students pay over $3,000 a year in total expenses.

Let's break down the total expense figure and see what students report as their costs in each category.[7] Table 23 gives maintenance budgets (or indirect costs of school attendance), by institutional segment. As with the total cost figures reported a moment ago, the incidence of missing or incomplete information, for room and board especially, must be kept in mind when looking at these percentages. In all three segments, the largest percentage of students

[6] Remember that we developed the total cost figures by summing the five budget items which students gave us. This procedure generates a larger number of unuseable items because if any one of the cost categories is incomplete a total cost item cannot be computed. The expense item usually omitted was room and board. Here "no response" may mean that the student is living at home--that there is no out of pocket cost for room and board. However, we cannot legitimately consider an omitted response to be "zero", hence these responses cannot be used and a total cost item cannot be computed for these surveys.

[7] These five budget categories are the same ones used by institutional financial aid officers and by the Oregon State Scholarship Commission. Thus the student reported information which we discuss in this section can be directly compared with the information regarding student budgets developed by educational institutions and state agencies.

TABLE 22

Distribution of Total College Expenses, Given in Cumulative Percentages by Segment

(1) -200	(2) 201- 400	(3) 401- 600	(4) 601- 1000	(5) 1001- 1500	(6) 1501- 2000	(7) 2001- 2500	(8) 2501- 3000	(9) 3001- 3500	(10) 3501- 4000	(11) 4001- 4500	(12) 4501- 5000	(13) 5001- 5500	(14) 5501- 6000	(15) Over 6000	(16) Row Total
0.8	1.6	5.0	16.5	28.0	54.0	74.0	81.7	90.5	92.0	95.0	97.0	98.0	98.4	100.0	N=489
0.0	0.0	0.0	1.0	4.0	29.6	61.7	75.0	86.0	93.0	96.8	97.5	97.8	97.8	99.4	N=631
0.0	0.0	0.0	0.0	0.0	2.4	4.0	10.0	21.0	46.0	72.0	88.0	96.0	98.8	99.9	N=167

reported indirect costs between $1,001 and $1,500, although a large proportion were also in the $1,501-2,000 range. Note how much closer the distribution of indirect costs is than that of total costs.

Since the indirect cost figures are a composite of three budget categories we can look at these separately. A straightforward way to do this is with means. Table 24 brings together a collection of our cost data and displays it as means, by segment. In column one, the differences in segmental total cost that we saw earlier are again illustrated. As we move across the table the basis for these cost differences is readily apparent. Direct instructional costs (DIC--a figure which includes tuition, fees, books, supplies and course materials) bear nearly the entire responsibility for the difference in costs. As reported by students, DIC at the community colleges are 55% of those costs at the state system schools. The ratio of DIC in community colleges to independent schools is 19%: instructional costs are more than five times higher at the private schools than the two year public schools. This cost ratio between the four year public and private schools is 35%.

If we had expected the segments to evidence cost differences in the other budget categories, Table 24 would not bear us out. Students in the state system schools report the highest overall maintenance budgets while community college students show the lowest, but the spread between the two is only 7.5%. Looking at the three categories which comprise the maintenance budgets, we see first that private students report the smallest room and board costs. All three figures in this column are close, however. What differences there are may be attributable to variations in living accomodations. Over 38% of the community college students live with a spouse, compared to 21.6% and 9.4% of the four year public and private students. Alternatively, 56.7% of the private students vs. 26.6%

TABLE 23

Maintenance Budgets (or Indirect Schooling Costs), By Segment

		$0-200	201-400	401-600	601-1000	1001-1500	1501-2000	2001-2500	2501-3000	3001-3500	3501-4000	4001-4500	4501-5000	5001-5500	5501-6000	Over 6000	N.R.	Row Total
Community College	#	23	32	30	47	133	88	49	51	12	10	9	4	0	0	1	222	711
	%	3.2	4.5	4.2	6.6	18.7	12.4	6.9	7.2	1.7	1.4	1.3	0.6	0.0	0.0	0.1	31.2	43.0
State System	#	3	5	5	49	262	164	78	25	21	7	3	0	1	3	5	109	740
	%	0.4	0.7	0.7	6.6	35.4	22.2	10.5	3.4	2.8	0.9	0.4	0.0	0.1	0.4	0.7	14.7	44.7
Independent	#	1	0	3	15	57	56	24	6	1	2	0	0	1	0	1	36	203
	%	0.5	0.0	1.5	7.4	28.1	27.6	11.8	3.0	0.5	1.0	0.0	0.0	0.5	0.0	0.5	17.7	12.3

TABLE 24

Means and Standard Deviations for Various Categories of Cost, by Segment (in $)

		Total Cost	Direct Instr. Costs	Indirect Costs	Room and Board	Transportation	Clothing, Recrea., etc.
Community College	M	$2047	$467	$1580	$1187	$245	$279
	SD	1056	-	985	727	232	331
State System	M	2546	842	1704	1186	195	342
	SD	1003	-	905	631	200	361
Independent	M	4097	2423	1674	1114	237	342
	SD	945	-	738	424	213	348
Column Totals	M	2558	905	1653	1176	222	316
	SD	1199	-	918	642	217	348

of the state system and 2.4% of the community college students live in college owned dormitories. We do not know how carefully respondents isolated for us some measure of their own room and board costs as opposed to such costs for themselves and their spouses and/or families. This could account for the lower room and board budgets of the independent (mostly unmarried) students.

Transportation costs differ some by segment. The community college students pay the most in this budget category. This is because they are commuters. A fourth of them reported that they drive between 5-10 miles to school, while a fifth commutes between 10-15 miles. Eleven percent more live 15-25 miles distance from their school campus. This is quite a contrast from the 74% of independent and 64% of state system students who live on campus or less than one mile away. That the private students pay more than those in state system schools probably reflects the cost of travelling to school from out of state. Remember that 55% of these students were not Oregon residents.

A final set of data completes this section on costs: Table 25 repeats the previous categories of means, but breaks them down further by sex. In each segment, women students report lower total costs than do the men. (We show these differences as female/male cost ratios at the bottom of the table.) The differences are not large though. We do not have a ready explanation for the larger variation in costs, by sex, for the state system sample. It is greatest in the transportation budget category, reaching a .67 female/male cost ratio. It will be interesting to see if and how the various resources used to defray schooling costs reflect these differences in what students say they are paying. We come next to the matter of student financial resources.

From where do students say they are getting the finances to go to school? On the SRS they were asked to identify which of 28 specific resources they

TABLE 25

Means for Various Categories of Cost, by Segment and by Sex (in $)

		Total Cost	Direct Instr. Costs	Indirect Costs	Room and Board	Transpor-	Clothing, Recrea., etc.
Community College	Male	$2084	$484	$1620	$1253	$253	$293
	Female	2005	471	1534	1113	233	259
State System	Male	2690	863	1827	1268	229	362
	Female	2372	809	1563	1096	153	319
Independent	Male	4220	2502	1718	1116	242	357
	Female	3977	2346	1631	1114	233	327

$\frac{\text{Female Total Cost}}{\text{Male Total Cost}}$ = .96 at CC, .88 at SS, .94 at Ind.

$\frac{\text{Female Dir. Instr. Cost}}{\text{Male Dir. Instr. Cost}}$ = .95 at CC, .86 at SS, .95 at Ind.

are utilizing (survey questions #22 through #49). These 28 individual items were clustered into five major areas for which respondents computed an exact dollar support figure--1) family support, 2) student's own employment and savings, 3) grants, 4) benefits, and 5) loans. The aggregate resource categories are analyzed below, using ranges and means as in the previous section on costs.

To provide an initial context, we show student-reported parental income (before taxes) for 1973. This is done in two ways. Table 26 distributes the data into 10 ranges using the (continuous) responses just as they were given on the survey--that is, missing responses are included in calculating the frequencies. Table 27 contains the parental income distribution for only those students who gave us a response. Since the frequency of missing responses differs by segments, this approach results in a different relative distribution of income than in Table 26. However, both tables evidence the same basic pattern of income by segment.

According to Table 26, the largest percentage of community college students reported their parents' gross annual income as between $9,000 and $12,000. The distribution given us by four year school students is somewhat more diffused. In the public segment four income ranges are quite close in frequencies: $9,000-11,999, $12,000-14,999, $15,000-17,999, and over $25,000. The independent segment shows a higher parental income with the largest single percentage of responses at $25,000 or above. The number of missing responses to this question are explained, though only in part, by the presence of students who define themselves as self-supporting and do not regard their parents' income as relevant information in their financial resource picture, or who do not even know what this income figure is. Included in this category of self-supporting students are 27.2% at the community colleges, 22.3% at state system school, and 12.3% at the private schools.

Table 26

Parental Income, By Segment

		(1) $1-2999	(2) 3000-5999	(3) 6000-7499	(4) 7500-8999	(5) 9000-11999	(6) 12000-14999	(7) 15000-17999	(8) 18000-20999	(9) 21000-24999	(10) Over 25000	(11) N.R.
Community College	#	28	35	20	39	79	58	49	32	6	31	334
	%	3.9	4.9	2.8	5.5	11.1	8.2	6.9	4.5	0.8	4.4	47.0
State System	#	17	19	34	27	86	82	80	62	28	85	220
	%	2.3	2.6	4.6	3.6	11.6	11.1	10.8	8.4	3.8	19.7	29.7
Independent	#	3	8	4	3	13	30	29	25	8	40	40
	%	1.5	3.9	2.0	1.5	6.4	14.8	14.3	12.3	3.9	19.7	19.7
Column Totals	#	48	62	58	69	178	170	158	119	42	156	594
	%	2.9	317	3.5	4.2	10.2	10.3	9.6	7.2	2.5	9.4	35.9

If we look at the parental income figures with missing responses left out, the percentages in each income range are, of course, increased. The third figure in each cell, Table 27, is a cumulative percentage. Looking at it, we find that the income differences are striking. For example, over half of the responses from community college students gave parental income levels of $11,999 or below. The analogous proportion among four year schools was about a third for the state system and under a fifth for privates. Further over in the columns (Table 27) we see that roughly 80% of the two year students reported parental incomes of $17,999 or less, while 66% and 55% of the four year public and private students, respectively, said their parents' incomes were less than this amount.

Parental income may or may not have a relationship to the level of financial support which students receive from their parents. The former figure reflects the resources potentially available while the latter shows those actually tendered. Students were asked to estimate the amount of money they had received during the 1973-74 academic year from their parents, as well as from their spouses, their own employment and savings, and various kinds of grants, benefits and loans. (See items #22 through #49 on the SRS questionnaire, Appendix B.) The answer to each of these 28 individual items is expressed as a code, corresponding to one of nine dollar ranges given on the questionnaire. In addition, exact (aggregate) dollar figures were elicited at certain points in the resource information. For example, students were asked to add parental support to that from a spouse and give us a total dollar amount--"total family support." Table 28 shows the means, by segment, for this category of financial support. From other work we have done with this data we know that a higher relative proportion of this family support for community college students comes

Table 27

Parental Income (Missing Responses Omitted), by Segment

		$1-2999	3000-5999	6000-7499	7500-8999	9000-11999	12000-14999	15000-17999	18000-20999	21000-24999	Over 25000
Community College	#	28	35	20	39	79	58	49	32	6	31
	%	7.4	9.2	5.3	10.3	21.0	15.4	13.0	8.5	1.6	8.2
	Cum %	7.4	16.6	21.9	32.2	53.2	68.6	81.6	90.1	91.7	99.9
State System	#	17	19	34	27	86	82	80	62	28	85
	%	3.3	3.7	6.5	5.2	16.5	15.8	15.4	11.9	5.4	16.3
	Cum %	3.3	7.0	13.5	18.7	35.2	51.0	66.4	78.3	83.7	100.0
Independent	#	3	8	4	3	13	30	29	25	8	40
	%	1.8	4.9	2.5	1.8	8.0	18.4	17.8	15.3	4.9	24.5
	Cum %	1.8	6.7	9.2	11.0	19.0	37.4	55.2	70.5	75.4	99.9
Column Totals	#	48	62	58	69	178	170	158	119	42	156
	%	4.5	5.8	5.5	6.5	16.8	16.0	14.9	11.2	4.0	14.7
	Cum %	4.5	10.3	15.8	22.3	39.1	55.1	70.0	81.2	85.2	99.9

from their spouses (i.e. higher than in the other segments; spouse support in all three still falls substantially below that from parents however). Roughly a third of these students (those community college respondents who report some family support) had support from a spouse. This is to be compared with the 8% of private and 18% of state system students who reported financial support from a spouse.[8]

Table 28

Means and Standard Deviations for Family Support, by Segment

		Level of Support	Support/Total Cost
Community College	Mean	$ 621	.30
	S.D.	(1143)	
State System	Mean	920	.36
	S.D.	(1155)	
Independent	Mean	1908	.47
	S.D.	(1563)	
Column Total	Mean	928	
	S.D.	(1275)	

But when money for school expenses was contributed by a spouse, it tended to be much larger in absolute amount than that given by parents, from two times higher among independent students to four times higher among community college students. And far fewer parents of community college students contributed to school costs than did the parents in other segments--25% for community college, 51% for state system, and 67% for private school students. This phenomenon should not surprise us. It is likely explained by a number of convergent factors. Remember that the distributions of age, marital status, and veteran status all differ substan-

[8]The proportion of students in each segment who report some support from a spouse is roughly equivalent to that proportion in the sample who are presently married. In other words, if students are married it is usually the case that their spouse helps defray school costs. However, the proportion of married students differs greatly by segment, as we have seen.

tially according to segment. To take a polar case, parental support is more likely (and necessary) for a 19 year old, unmarried, private school student than for a 30 year old married veteran attending a community college. The point here is that the differing rates of parental support among student groups should not be interpreted as a reflection of differing values placed on education or of willingness to contribute to educational costs.

In Table 28 (p. 92) we included the "0's" in calculating the average amounts of support. What we have, then, is a kind of "supply of resources" figure--one that includes the situation where no money was forthcoming from certain categories of potential support. In this particular case, we see that the average level of family support (including those students who received none) differed substantially by segment. For private students, family support was three times that for community students and twice that for state system students. And even though the cost of attending a private school is relatively high, the proportion of that cost defrayed by family support is highest for private students--47% as compared with 30% and 36% in the two public segments.

To what degree do students support themselves through their own employment and savings? We shall look first at what they told us about their hours of work during the school year. From Table 29 we see that around a third of the community college and private students say they did not work at all while school was in session, and so too with half the state system students. The picture changes quickly thereafter as the cumulative percentages (the figures in parentheses) show. Working 10 hours a week or less, or not at all, were 45% of the community college respondents and 65% and 72% of state system and private students, respectively. A half-time job or less might be represented by the hours for columns 1-4 (i.e. 0-20 hrs.). In this case, about 70% of community college, 87% of state system and 91% of private students worked no more than half time,

Table 29

Average Weekly Work Hours During School, by Segment

		(1) None	(2) 6-10	(3) 11-15	(4) 16-20	(5) 21-25	(6) 26-30	(7) 31-35	(8) 36+	(9) N.R.
Community College	#	233	86	99	73	63	20	12	111	14
	%	32.8	12.1 (44.9)	13.9	10.3 (69.1)	8.9	2.8	1.7 (82.5)	15.6	2.0
State System	#	369	112	75	90	37	15	8	26	8
	%	49.9	15.1 (65.0)	10.1	12.2 (87.3)	5.0	2.0	1.1 (95.4)	3.5	1.1
Independent	#	74	72	23	16	10	2	0	2	4
	%	36.5	35.5 (72.0)	11.3	7.9 (91.2)	4.9	1.0	0.0 (97.1)	1.0	2.0

if at all. It appears that a significant number of community college students hold down fulltime jobs: this would seem to be the appropriate interpretation of a 36+ hour work week, and 15.6% of the community college sample report this work situation. A negligible number of four year school students (private or public) report fulltime work.

How do these work hours affect student self-support? Table 30 provides part of the answer. Here an average dollar figure is given, by segment, for "total money from employment and savings." It is highest for community college students and lowest for those in the private segment. The relationship between hours of school time employment and this dollar support figure is not direct, however. "Total money from employment and savings" is a composite of nine elements: school year employment (College Work Study, assistantships, on-campus employment other than CWS, and other employment); summer employment (divided into the same four categories as those just given); and personal savings.[9] School year employment is represented by four of these nine categories, so it is only a portion of the potential sources of "total employment and savings."

Table 30

Means for Total Support from Employment and Savings, by Segment

Community College	Mean	$1356
	S.D.	1619
State System	Mean	1436
	S.D.	1418
Independent	Mean	1258
	S.D.	1058
Column Total	Mean	$1382
	S.D.	1466

[9] Remember that the sample we are presently analyzing has only undergraduate students in it. Therefore, no support from teaching or research assistantships was reported by this group.

Nonetheless, school year employment was the single largest component of this total support figure for students in all three segments.

The figures in Table 30 are surprising, for the community college students, despite their heavier work hours, fall between the two segments of four year schools in average amount of support coming from their own employment and savings. How can this be? We picked this total figure apart and examined each of the nine components of it, by segment. The differences are intriguing. First of all, the community college students report more resources than other segments in only two of the nine items--college work study and "other" school year employment (i.e., off campus employment). They have substantially less income, on average, from on campus employment (other than Work Study), from off campus summer employment, and from personal savings. These last two items give us data that we are not really in a position to explain. One further datum adds to our information but not our understanding. Our analysis shows that a smaller proportion of community college students report income from summer jobs than do four year school students. We don't know why this is so, but it is these relatively fewer summer jobholders who are reflected in the lower dollar average for this segment's support from summer employment.

Combining family support and own support we get a figure for "personal resources." This represents all the resources that the student brings to bear from self and from family. It is to be contrasted with "aid resources"--grants, benefits, loans. We were interested in whether the two personal resource categories differed by sex. Table 31 presents data in examination of that question. The mean figures for employment and savings are easier to understand than are those for family support. Like all labor markets, the one in which college age women seek work likely offers a substantially smaller range of jobs and at

TABLE 31

Means for Family Support and Own Employment and Savings, by Sex and by Segment

		Support from Family		Support from Own Empl. and Savings	
		Male	Female	Male	Female
Community College	Mean	$ 704	$ 510	$1597	$1027
	S.D.	1270	934	1761	1315
State System	Mean	823	1044	1729	1045
	S.D.	1239	1021	1594	1018
Independent	Mean	1690	2094	1443	1025
	S.D.	1628	1484	1096	956
Column Totals	Mean	$ 872	$ 999	$1642	$1035
	S.D.	1334	1189	1621	1135
		N=808	N=622	N=833	N=609

lower wages than what is available to men. Working as secretaries, clerks, waitresses, etc., women are less able to earn a level of self-support equal to that of their male counterparts.

There are also differences in family support by sex. But as the reader can see, there is no clear pattern here. It appears that the families of community college students provide less support to females than to males. However, this is reversed for the students at four year schools. Oregon officials who work with financial aid programs have suggested to us that family support dollars are "last in" in student aid packages. After support from all other quarters has been solicited, earned and/or assured, families are then called upon to make up any remaining difference between cost and resources. This provides one explanation for higher family support for women students: their own support capabilities are lower and "last in" dollars could make up this difference. What then are we to think of the data for the community college segment? Some hints come from the earlier demographic data. First, many more men than women students are married (14.3% compared to 5.4% in our undergraduate sample). Also, more community college students are married than are students in the other two segments. Thus a much larger percentage of family support for community college students, but married males in particular, comes from spouses. Remember that when support from a spouse is reported, the absolute amount tends to be higher than that from parents. Given the demographic differences reported above, we would expect the average family support reported by community college males to be higher than that of their female counterparts.

Counterposed to personal resources are aid resources--grants, benefits, and loans. Grant resources, as defined by the financial aid community, come from grants, scholarships, fellowships and traineeships. These may be state (as in the Oregon State Scholarship Commission awards), federal (as in Basic Educational

Opportunity Grants or Bureau of Indian Affairs grants), institutional (for example, tuition wavers or institutional traineeships), or private (e.g. an Elks scholarship). Benefits are categorical and are comprised of such things as the GI Bill, Social Security Administration benefits, welfare payments, State Vocational Rehabilitation monies, W.I.N. payments, etc. Although most of these benefits are really "income" to recipients (as opposed to grants which help defray school expenses), they are distinguished on the SRS from "income from employment." Lastly, the separate loan categories listed on the questionnaire were NDSL, Health Professions, LEEP, State Guaranteed or Federally Insured, institutional long-term, and other.

Obviously, the availability of such aid resources is not as widespread as is support from self or family. Therefore, it seems appropriate to present the information on these categories of resource dollars in two ways--1) a supply of aid dollars to the specific student populations, or aid dollars/capita; and 2) average dollar amounts delivered per recipient. Both kinds of information on aid dollars can be shown by segment. Table 32 does this for the three categories of aid resources and then for total aid resources.

There are substantial differences by segment. Students in private schools are disproportionately represented among the grant recipients and borrowers. Of this SRS sample of non-sectarian private students, 50% gave us a dollar figure for the aid category "total amount from grants." And the average amount was $1093--over twice that in the two year public segment and considerably higher than the $835 average for four year public students. Our other analysis of ranged data for the twenty-eight distinct aid items shows that three grant items are contributing heavily to the higher dollar average for privates: tuition waivers, institutional grants, and "other" grants. So <u>institutional</u> aid dollars emerge as a significant resource for private students. A higher inci-

Table 32

Average Per Capita Aid Dollars and Actual (Average) Recipient Dollars, By Segment

		Grants		Benefits		Loans		Total Aid Resources	
		(1) Dollars per Capita	(2) Dollars/ Recipient[a]	(3) Dollars per Capita	(4) Dollars/ Recipient[a]	(5) Dollars per Capita	(6) Dollars/ Recipient	(7) Dollars per Capita	(8) Dollars/ Recipient[a]
Commun. College	Mean	$182	$522	$1018	$1860	$145	$599	$1038	$1580
	#	500	174 (24%)	570	312 (44%)	460	111 (15%)	711	467 (66%)
	S.D.	368	459	1231	1096	356	502	1207	1166
State System	Mean	259	835	476	1749	245	894	775	1475
	#	593	184 (25%)	584	159 (21%)	580	159 (21%)	740	389 (53%)
	S.D.	532	658	940	1009	637	950	1102	1130
Independent	Mean	699	1093	252	1499	595	1199	1133	1783
	#	158	101 (50%)	137	23 (11%)	143	71 (35%)	203	129 (64%)
	S.D.	731	635	706	1062	797	744	1169	994
Column Totals	Mean	284	773	692	1808	248	861	932	1565
	#	1251	459 (28%)	1291	494 (30%)	1183	341 (21%)	1654	985 (60%)
	S.D.	531	624	1100	1069	797	814	1164	1134

[a]The numbers in parentheses represent the percentage of the total segmental population which the recipients in each aid category comprise.

dence of Federal grants was also reported by private students; but these, and state grants, were not nearly as prominent in the grants category as were institutional grants.

Looking further at the ranged data for individual aid items, we note that the average reported amount of both Federal and state grant awards was quite close in each segment. For the Federal awards the averages were $604 (CC), $651 (SS), and $547 (Ind.). The Oregon State Scholarship Commission awards averaged $477 (CC), $508 (SS), and $519 (Ind.). The dollar differences occur with the institutional awards. For example, tuition waivers in the private segment averaged $631, while the very small numbers of public segment students who reported receiving a waiver said they averaged $215 and $520, at the two year and four year schools, respectively.

Let's move now to benefits. The same analyses of continuous and ranged data on individual items can be brought to bear in disecting the reported figures in this aid category. Here the situation is rather like a mirror image of that for grants: fully 44% of community college students reported benefits of some kind, as compared to 21% and 11% of state system and independent students. It is not hard to figure out the bases for these differences. An earlier table reported the veteran status of SRS respondents. A disproportionate number of vets were community college attendees. This information is reflected in high average benefits per capita in the community college segment (Column 3, Table 32)--$1018 as compared to $476 and $252 in the two four year segments! For those actually receiving benefits (remember that the percentage of recipients differs greatly between segments) the dollar amount is much closer, ranging from the $1860 average among community college students to $1499 among independent students. As might be expected from our earlier demographic and income data, those students reporting either welfare or State Vocational Rehabilitation benefits

are to be found in the community college segment almost exclusively. Thus it is benefits that comprise the largest component of the financial aid package of community college students--both in terms of numbers of students reached and in average amount of dollars per beneficiary.

Finally, as noted earlier, students in private schools are more often borrowers of money for school. The average amount of loan per borrower is also high, $1199, compared to $599 for community college and $894 for state system borrowers (Column 6, Table 32). In our examination of the individual loan items on the survey, we found that NDSLs were the loans most often used by students in both public segments while private students used both NDSLs and GSLs but slightly more of the latter. The average amounts borrowed under NDSLs were $564 (CC), $728 (SS), and $881 (Ind.). The average amounts of Guaranteed or Federally Insured Loans were $821 (CC), $1012 (SS, and $1228 (Ind.). Loans from other sources were small in number.

In summary, the total aid resources column shows that when we aggregate aid from grants, benefits and loans, differences tend to "wash out." Reported total aid resources, for actual recipients, are lowest for state system students, $1475 on average, and highest for private students, $1783. About half of the former and two-thirds of the latter report receiving some kind of aid. The proportion of community college aid recipients is also two-thirds. Aid dollars would appear to be very important in meeting the costs of school attendance. But we needn't surmise this, we can let students speak for themselves about how important financial aid was to their educational decisions.

Question #53 on the SRS asks: "Without financial aid, what alternative method would you have primarily utilized to meet your school expenses?" The responses are shown in Table 33.[10] The differences, by segment, are notable.

[10] Respondents were instructed to skip this question if they had not received financial aid. Therefore, the responses here are for aid recipients only.

Table 33

Alternative Ways to Meet School Expenses, Without Aid, by Segment

		Community College	State System	Indepen.	Row Totals
Attend Lower Cost Institution	#	6	16	33	55
	%	2.0	7.0	35.0	9.0
Additional Help From Parents	#	15	21	10	46
	%	5.0	9.0	11.0	7.6
Additional School Year Employment	#	18	22	3	43
	%	7.0	9.0	3.0	7.1
Additional Summer Employment	#	7	5	1	13
	%	3.0	2.0	1.0	2.0
Loans	#	26	25	12	63
	%	9.0	10.0	13.0	10.0
Combination of Previous 4 Items	#	28	52	19	99
	%	10.0	22.0	20.0	16.0
Alter Standard of Living	#	23	8	0	31
	%	8.0	3.0	0.0	5.0
Postpone Attendance Until Financially Able	#	71	49	10	130
	%	25.0	21.0	11.0	21.0
Live at Home	#	4	8	0	12
	%	1.0	3.0	0.0	2.0
Not Attend School	#	77	33	5	115
	%	28.0	13.0	5.0	19.0
Column Totals	#	275	239	93	607
	%	45.3	39.4	15.3	100.0

Over one-third of the private students said that their primary alternative would be to attend a lower cost institution. Only 2% and 7% of the community college and state system students, respectively, mentioned this alternative. It is significant that altogether 40% of the total sample and 53% of the community college students said they would either postpone attendance or not attend school at all in the absence of aid. It is relatively inexpensive to attend a community college in Oregon. Even so, these figures tell us that the decision to attend school is a fragile one for many students, and particularly those at two-year public schools--a decision quite reversible by a change in their aid resources. A fifth of the state system students also said they would postpone attendance until financially able if they did not have financial aid. But they were equally likely to think of other alternatives, like putting together some combination of additional parental help, employment and laons. This alternative was the second most frequently cited one for private students too, who were relatively unlikely to say they would postpone school attendance. Note that in all three segments, additional school year or summer employment was infrequently mentioned as an alternative. Why would community college students, for example, give up plans to go to school altogether before they would consider the alternative of additional work? The data cannot tell us. Perhaps this reflects a lack of work opportunities for college age people.

Responses to another SRS question further demonstrate the impact of financial aid on schooling decisions. This one asks more specifically about the choice among schools: "If you would not have attended this college without the offer of financial aid or academic scholarship, where would you most likely have attended?" Table 34 presents the distribution of answers (again, for financial aid recipients only). Looking a row at a time, we can see different

Table 34

Students' Alternative School of Choice in the Absence of Financial Aid at Present School, by Segment

		4 Yr. Public Schools		4 Yr. Private Schools		2 Yr. Public Schools		Proprietary Schools			
		Oregon	non-Oregon	Oregon	non-Oregon	Oregon	non-Oregon	Oregon	non-Oregon	None	Row Totals
Community College	#	28	5	0	0	67	10	2	0	143	255
	%	11.0	2.0	0.0	0.0	26.0	4.0	0.7	0.0	56.0	44.3
State System	#	56	34	0	3	55	3	0	0	78	229
	%	24.0	14.0	0.0	1.0	24.0	1.0	0.0	0.0	34.0	39.8
Independent	#	34	30	2	6	3	6	0	0	11	92
	%	37.0	32.0	2.0	6.0	3.0	6.0	0.0	0.0	12.0	16.0
Column Totals	#	118	69	2	9	125	19	2	0	232	576
	%	20.0	12.0	0.3	1.6	22.0	3.3	0.3	0.0	40.0	100.0

patterns of choice among schools in the hypothetical situation that this question poses. The alternatives reported by community college students reduce quickly to three: over half would not attend school at all, a quarter would go to another Oregon community college and 11% would go to an Oregon State system school, if their present school did not offer them aid. The choices as state system students saw them were four: the largest percentage (one-third) would not go to school, a quarter each would go to an Oregon community college or another Oregon state system school and 14% would go to a four year public school outside of Oregon. (Perhaps these latter are non-resident students who can reduce their costs thereby.) It appears that the private school students would turn to four year public schools--37% specified schools in Oregon and 32% outside. Twelve percent said they would not attend school. Clearly, then, financial aid does have an impact on student choice among segments as well as among schools in a segment.

There are clear differences in resource patterns among the student groupings we have examined above. These differences will likely be reflected in varying sensitivities to changes in prices of and/or resources for schooling. For one thing, variation in the source and level of financial resources implies differences in the effective or "real" cost to students of obtaining a college education. Thus, in turn, resource patterns affect enrollment demand. Although it is not possible to disaggregate our analyses to the point of evaluating individual resource packages, we are able to investigate the demand for education by segment. This provides a specificity and depth to our work which most studies in this area lack. The results in this section underscore the appropriateness of a segmental demand analysis, while reminding us that crosstabs can do little more than describe what is. In order to sort out the arguments of different, segmental demand equations, we will need to employ multivariate

techniques. In parts B and C of this results section we do just that. Before that, a final collection of crosstabs disects the SRS data yet another way.

2. BEOG and SEOG Recipients.

This section presents basic descriptive information on BEOG and SEOG recipients in Oregon. Data for the crosstabs examined here comes from the 1974 SRS. Question #68 on the survey asks: "If you indicated receiving at least some financial support from Federal Grants in item #35, what type did you receive?" Five responses were possible: 1) first award of Supplemental Educational Opportunity Grant (SEOG), 2) second award (or third, fourth, etc.) of Supplemental Educational Opportunity Grant (SEOG), 3) Basic Educational Opportunity Grant (BEOG), 4) Nursing Scholarship, 4) Health Professions Scholarship. Altogether, 183 students identified themselves as BEOG or SEOG recipients on this question. Of these, ten were attending proprietary schools; they are not included in the analysis below. The remaining 173 respondents are compared with 1192 undergraduate, non-sectarian students who reported that they received none of these five types of Federal aid. This makes a sample of 1365 in all. Two general questions guided our choice of variables for analysis and display. First, how do financial aid recipients differ from non-recipients? Here we looked at basic demographic characteristics and at financial resources. Second, what is the impact of Federal financial aid on the educational decisions of recipients? That is, in what ways do they say their school choices have been modified, or would be modified in the absence of aid?

As in the previous section of general crosstabs on Oregon students, the tables here follow this general outline: general demographic characteristics, student financial resources, alternative courses of action in the absence of aid. Tables 35, 36, 37 and 38 present the distribution of responses for ques-

tions about age, sex, marital status and veterans status, contrasting BEOG/SEOG recipients with non-recipients.[11] These first four tables tell us more about similarities than differences between the two populations portrayed. The age profile is perhaps the most distinct of the four, but it is not startling. Apparently the aid recipients are younger on average: over a third of them are 19 years old or under, compared to less than a quarter of the non-recipients in this age group. If we choose 21 years as a dividing line, then exactly 66% of recipients are below it vs. just under 60% of the non-recipients. This is consonant with our understanding that BEOGs, in particular, are targeted to entering college freshmen. In our sample of 1973 aid recipients, the following breakdown obtains: 120 students with BEOGs, 30 with 2nd (3rd or 4th) awards of SEOGs, and 23 with 1st award SEOGs. In percentages of total recipient sample this is 69% BEOG, 13% 1st SEOG, 17% 2nd (or more) SEOG. The BEOGs are exerting a pull on the age distribution, skewing it toward freshman students.

The aid recipients are fairly equally apportioned by sex, as shown in Table 37; but there is a higher representation of women among them than among the general student sample. The SRS sample we are using here is 54% male and 43% female (3% of the respondents did not specify their sex). The aid recipients are 48.6% male and 49.7% female. Thus females gain 15% in the representation among those aided by BEOGs and SEOGs. Looking at the same information in another way, using the row percentage in each cell, we see that the male aid recipients represented 11.4% of all males in the total sample of

[11] Our discussion in this section will be greatly simplified by the use of the terms "aid recipients," "aid sample," or simply "recipients," in our discussion of the BEOG/SEOG student group. These terms would ordinarily mean something much more general than the specific purpose for which we use them here: BEOGs and SEOGs are but two of the many kinds of Federal, State and private aid. However, no harm will be done if the reader keeps in mind our specific meaning for the term "aid" here--that is, BEOG and SEOG aid only.

Table 35

Students' Age, by Federal Aid Status

Years of Age		BEOG/SEOG	non-Recipient
18	#	8	42
	%	4.6	3.2
19	#	53	236
	%	31.0	20.0
20	#	28	216
	%	16.0	18.0
21	#	26	214
	%	15.0	18.0
22-24	#	30	263
	%	17.0	22.0
25-29	#	12	141
	%	7.0	12.0
30-34	#	9	32
	%	5.0	2.7
35-40	#	3	25
	%	1.7	2.0
41+	#	4	23
	%	2.0	2.0
Column Totals	#	173	1192
	%	12.7	87.3

Table 36

Students' Sex, by Federal Aid Status

		BEOG/SEOG	non-Recipient
Males	#	84	656
	Row %	48.6	55.0
	Col %	11.4	88.6
Females	#	86	503
	Row %	49.7	42.2
	Col %	14.6	85.4
No Response	#	3	33
	Col %	1.7	2.8

1365, while recipients of both sexes, taken together, represent 12.7% of the overall sample and female recipients account for 14.6% of all females in the larger sample. Thus in our data, which conform acceptably well to the male/female ratio in the actual student world, females are a slightly larger proportion of recipients than they are of the general sample we are employing here. We could not obtain information on BEOG/SEOG applicants from Oregon, as the U.S. Office of Education would not release these data to us. Hence we do not know what proportions obtain among applicants, vis-a-vis sex. It may well be that a disproportionate number of women students apply for these two Federal grants, and this affects their ultimate numbers among the grant awardees. Lacking the data to examine this further, we cannot say more.

The two groups look quite similar in their marital status. Twelve percent of the recipients were married at the time of the survey compared to 19% of the non-recipients. Understandably, this undergraduate sample has few divorced students in it, although 7% of the aided students vs. 2% of the non-aided said they were divorced. For the most part, these are students who have never been

married--about four-fifths in each group indicated this status.

Table 37

Marital Status, by Federal Aid Status

		BEOG/SEOG	non-Recipient
Never Married	#	138	920
	%	80.0	77.0
Married	#	21	225
	%	12.0	19.0
Separated	#	1	14
	%	0.6	1.0
Divorced	#	12	27
	%	7.0	2.0
Widowed	#	1	1
	%	0.6	0.1
No Response	#	0	5
	%	0.0	0.4
Column Totals	#	173	1192
	%	12.7	87.3

There is a smaller percentage of veterans among the recipients than the non-recipients, 6.4% and 15.7%, respectively. This may tell us something about access to these Federal aid dollars. Perhaps the information about BEOGs, especially, does not reach veterans as readily as it does high school seniors. Then again, veterans, with their access to GI Bill benefits, may not be a population for whom these Federal dollars were primarily intended. In any case, whether the result of intention or not, veterans are underrepresented in our sample of recipients.

Table 38

Veterans' Status, by Federal Aid Status

		BEOG/SEOG	non-Recipient
Veteran	#	11	187
	%	6.4	15.7
Not a Veteran	#	153	992
	%	88.4	83.2
No Response	#	9	13
	%	5.2	1.1
Column Totals	#	173	1192
	%	12.7	87.3

The next group of tables focuses on student grade point averages, both high school and college, and academic plans. Table 39 shows mean GPAs for aid recipients and non-recipients. The aided sample reports a lower grade point average from high school. In the matter of grades, a 16-point difference, such as is evidenced here, is not inconsequential. Still the grade averages for both groups are respectable and the gap between them almost closes in college. Recipients' grades improve considerably over their marks in high school.

Table 39

Means for High School and College Grades, by Federal Aid Status

		BEOG/SEOG	non-Recipient	Row Total
High School Grades	Mean	2.84	3.00	2.98
	S.D.	.96	.91	
College Grades	Mean	2.97	3.01	3.01
	S.D.	.70	.62	

How far in school do these students say they plan to go? Table 40 shows their answers to the question, "What is the highest level of education you plan to complete?" Aid recipients were somewhat more likely to say they did not

Table 40

Degree Plans, by Federal Aid Status

		BEOG/SEOG		non-Recipient	
No degree plans	%	7.0	18.6	4.3	13.8
AA or AS	%	11.6		9.5	
BA or BS	%	38.7		43.7	
MA or MS	%	28.3		28.2	
Ph.D.	%	13.9		13.2	
No Response	%	0.6		1.1	
Column Totals	%	12.7		87.3	
	#	173		1192	

plan to complete a Bachelor's degree--18.6% of them either had no specific degree plans or intended to stop with an Associate degree. The comparable percentage for non-recipients is 13.8. This disparity is reflected in the proportions in each subsample who said they planned to complete a Bachelor's degree--38.7% among recipients and 43.7% in the general subsample. The balance of the table reports advanced degree plans that are essentially identical for both groups.

Thus far we really seem to be talking about marginal differences, if any. Those students with BEOGs or SEOGs are younger, on average; and less likely to be veterans; about as prone to marriage as are their aidless counterparts; and somewhat more likely to report no degree plans. There are slightly more women among them than in the SRS sample from which they come; and their high school grades are below that sample's marks. All in all, however, these two groups are not distinguished by any significant differences in our inspection of them

thus far. Let us see how they compare in the matter of financial resources. Family income is a good place to begin.

Table 41 shows overall income means for each group. Table 42 reports family income distributions as we have ranged them. As before, we omitted "0's" in our calculations for these two tables. The income differences are striking. The cum. percentages (Table 42, third number in each cell) portray them the most clearly. Fully 14.4% of the recipient sample reported their parents' income as below $3,000. And more than half of this group said the income of their parents was below $9,000, while only 17.4% of the non-aided sample so reported. At the other end of these income ranges, over a fifth of the non-recipients identify a parental income of over $21,000; 2.5% of the recipients say the same. The means in Table 41 repeat the point: the $8907 income average obtaining for recipient parents is approximately half (52%) the $17,143 average of non-recipient parents.

Table 41

Means for Parental Income, by Federal Aid Status

	BEOG/SEOG	non-Recipient
Mean	$8907	$17143
S.D.	4811	12100

$$\frac{\text{Parental Income of Recipients}}{\text{Par. Income of Non-Recipients}} = .52$$

We seek next to examine family support and self support for these two groups. Table 43 shows the distribution of ranged data for parental contribution to schooling costs. This is by far the largest component of "family support" as only a handful of grant recipients reported any financial aid for school from their spouses. First of all, note that 45.1% of the aid group and 32.1% of the

Table 42

Student Reported Parental Incomes, by Federal Aid Status

		BEOG/SEOG	non-Recipient
Under $3000	#	17	25
	%	14.4	3.1
	Cum %	14.4	3.1
3000-5999	#	16	36
	%	13.6	4.4
	Cum %	28.0	7.5
6000-7499	#	19	39
	%	16.0	4.8
	Cum %	44.0	12.3
7500-8999	#	12	42
	%	10.0	5.1
	Cum %	54.0	17.4
9000-11999	#	25	123
	%	21.0	15.0
	Cum %	75.0	32.4
12000-14999	#	18	137
	%	15.0	17.0
	Cum %	90.0	49.4
15000-17999	#	6	133
	%	5.1	16.0
	Cum %	95.1	65.4
18000-20999	#	2	102
	%	1.7	13.0
	Cum %	96.8	78.4
21000-24999	#	1	38
	%	0.8	4.7
	Cum %	97.6	83.1
25000 and over	#	2	140
	%	1.7	17.0
	Cum %	99.3	100.0
Column Count	#	118	813

others reported receiving no contribution from their parents. We may consider, too, the effect of adding in the "no response" frequencies to the reports of "no aid." This is appropriate if students simply inserted code numbers (as instructed) for those items on the survey that were sources of support and left blank the others, rather than specifically inserting a "0" for any of the 28 items that were not a source of support for them. In that case, the percentages who did not report some parental contribution rise to 57.3% for the recipients and 43.7% for the non-aid sample. Looking just at the frequencies for those who did report some amount of aid we see further differences. About 31% of the aid group report contributions of $1 to $600 per academic year. The analogous percentage for the non-recipient sample is 22.3%. In all, then, 88.4% of the aid sample did not report a parental contribution or said it was less than $600 for the academic year--$200 a quarter.

At the other end, fully one quarter of the non-aided sample received $1,500 to $3,000 or more from their parents, while 5.9% of the grant sample so reported. Of these, 4.1% were in the $1,000-2,000 range. In this ranged data it is easy to see the basis for the differing average "family support" dollars per group. Considering only those who did report some dollar figure for family support (i.e., parental contribution and spouse contribution), we calculated means of $726 for the aid sample and $1471 for the others. The former is less than half the latter.

We turn now to those dollar amounts which come from the students' own employment and savings. Table 44 shows, in two different ways, the level of self support provided. Row 1 contains a derived per capita support figure. This mean includes the "0" responses from students in both groups who gave us no specific information on self support. Row 2 contains the means for only those

Table 43

Parental Contribution, by Federal Aid Status

		BEOG/SEOG	non-Recipient
None	#	78	383
	%	45.1	32.1
$1-200	#	21	114
	%	12.1	9.6
201-400	#	19	73
	%	11.0	6.1
401-600	#	14	79
	%	8.1	6.6
601-1000	#	10	104
	%	5.8	8.7
1001-1500	#	2	83
	%	1.2	7.0
1501-2000	#	5	63
	%	2.9	5.3
2001-2500	#	1	53
	%	0.6	4.4
2501-3000	#	2	30
	%	1.2	2.5
over 3000	#	0	76
	%	0.0	6.0
No Response	#	21	138
	%	12.2	11.6

students who did report some dollar amount from their own employment and savings.

Table 44

Means for "Total Money From Employment and Savings," by Aid Status

		BEOG/SEOG	non-Recipient	
Dollars/Capita	Mean	$ 821	$1437	N=1240
	S.D.	749	1440	
Dollars/Recipient	Mean	940	1598	N=1111
	S.D.	729	1431	

As these number show, 80% of the aid group and 82% of those not on Federal aid report some amount of money from employment and savings. But the level of support provided thereby is much less for aid recipients. We carried out a very tentative (and tedious) analysis of the nine coded range items that comprise the aggregate employment and savings category. Ths analysis suggests some possible sources of the sizeable differences in Table 45's means. Non-aid students reported more income from school year and summer employment than did aid recipients. The differences were large. For example, 55% of the non-aid group said they worked in the summer and earned $955 on average, while the percentage of the aided group reporting summer work was 36% and the average amount given was $429. About a third of each group said they used funds from personal savings but the amount was $360 for recipients and $660 from the others. Finally, a little over half of the recipients indicated some kind of school year work and the average amount earned therefrom was coded as approximately $400. But the slightly less than half of non-recipients who said they worked during school coded between $900-1,000 for the earnings. So now we are left with a different set of questions: why do BEOG and SEOG recipients have less money available to them for employment and savings than do other students? What factors are

constraining their ability to contribute more to their own support? Our data do not enable us to answer. On the other hand, it suggests that the sorting procedure used to determine who will receive grants is working: they are going to those students with fewer resources.

It appears that personal resources--family support plus own support--are substantially lower for our sample of aid recipients than for the sample of students not receiving BEOGs or SEOGs. The next logical question is whether and how this resource "deficit" is met by state, federal and/or private aid monies. Table 45 provides information pursuant to that question. Three categories of aid are considered--grants, benefits and loans. The several items included in each of these categories have been described earlier. For each category we have calculated two measures of support (also described earlier), a per capita dollar amount for each group of students and a mean for the actual recipients in each group. The former is rather like a "supply of categorical aid dollars" to a given student group or segment, while the latter tells us more about the actual level of support provided. Each measure has its own usefulness. We will proceed through Table 45 one category at a time, starting with grants.

Remember that grants included seven items on the SRS: tuition waivers, Oregon State Scholarship Commission awards, Federal grants, LEEP grants, institutional grants or scholarships, BIA grants, others. A student could tell us that he or she received money from one or more of these individual grant items by filling in a code for the range within which the dollar amount of the grant fell. We subsequently developed summary information on each of the 28 items in the overall financial resource section of the SRS. Since ranges, not exact dollar amounts, were the item data worked with, it is best to employ the results of this ranged data analysis for fairly general questions. For example, we might use it to examine overall tendencies rather than refer to exact dollar

amounts which might have been derived. However, when it comes to the aggregate aid categories of grants, benefits, and loans, exact dollar amounts were reported by students on the survey; means and other measures for these data can be used more literally. However, the range and continuous data were compared to satisfy our concerns about their internal consistency. (See p. 40-41, 178-79 for further discussion of this "consistency check.") With these caveats in mind, we can proceed.

In our non-recipient sample, about one quarter reported receiving some amount of grant money. For this minority, the actual amount reported from grants was about $100 below the $898 average reported by the BEOG/SEOG group. Since the non-recipient sample, as we have defined it, could not have received BEOG or SEOG monies, from where do their grant dollars come? The analysis of individual grant items shows that the largest number of these students who reported grant monies (about 40%) said they received an average of $700 or so from "other" sources (e.g. scholarships from private individuals or groups). And about a third of those who reported some support from grants said the source was institutional and the amount received averaged $700-800. The third largest source was tuition waivers and then Oregon State Scholarship Commission awards, but the numbers of students in the non-aid group receiving these were small. Since three-fourths of the non-recipients did not report support from grants, the per capita support figure (Row 1, Table 45) is small. All the "0's" averaged in reduced the mean amount to $252.

Alternatively, the BEOG/SEOG group reported an average dollar award of approximately $898 from grants, of which some $580 was attributed to Federal grants. In addition to this, some 20% of these students reported award money from the Scholarship Commission (approximately $460, on average) and 14% indi-

Table 45

Means for Various Categories of Financial Aid, by Fed. Aid Status

			BEOG/SEOG	non-Recipients
GRANTS	Per Capita Support	Mean	$ 848	$ 252
		S.D.	585	529
		Count	N=160	N=901
	Average Recipient Support	Mean	898	801
		S.D.	563	672
		Count	N=151[a]	N=283
BENEFITS	Per Capita Support	Mean	382	624
		S.D.	844	1053
		Count	N=138	N=918
	Average Recipient Support	Mean	1507	1807
		S.D.	1060	1035
		Count	N= 35	N=317
LOANS	Per Capita Support	Mean	455	252
		S.D.	548	628
		Count	N=143	N=853
	Average Recipient Support	Mean	749	947
		S.D.	524	908
		Count	N= 87	N=227

[a]Since this figure reports the number of grant recipients who reported receiving some grant dollars, the number ought to be 173--the exact number of students in our recipient subsample. However, of the 173 people who told us, in Question 68, that they were BEOG or SEOG recipients, 22 did not fill in a dollar amount for "total money from grants." (I.e., they either left it blank, put in a "0," or filled in a "✓".) Thus we can't include them in this particular calculation of the mean award for recipients.

cated that they had been helped by "institutional" and "other" awards, these averaging from $600-700 each. The per capita grant dollars for the BEOG/SEOG group remains high (Row 1, Table 45), due to the virtual lack of zeros averaged in. It is $848, compared to the non-aid group's $252 per capita figure. The picture changes for benefits however.

Recall that benefits include monies from the GI Bill, Social Security Administration, Welfare, State Vocational Rehabilitation, and "other." Since we already know that veterans are underrepresented in the aid sample, we might expect this to affect the total dollar amounts to each group from benefits. It does. Only 35 of the 173 students in the aid group reported financial support from benefits. About 40% of this small group said their benefits were from welfare but for them the dollar amount was relatively high, around $1,800 per recipient. In contrast, only a handful of the non-aid group reported welfare benefits and they averaged $950 each. Fewer than 10 of the Federal aid recipients reported receiving funds from each of the other benefit sources. Thus the per capita benefit figure is only $382 (Row 3, Table 45) for the aid group. For the other group the per capita figure is $624, but it too is much lower than the actual benefit level for recipients because so many students did not receive benefit dollars. The actual dollar average for recipients in this group is $1807 and it apparently comes mostly from the GI Bill. Almost 60% of the 317 students who told us they received benefits reported them as veterans' benefits. The next largest group of beneficiaries received money from the Social Security Administration; they were 30% of those reporting receipt of some benefit monies. For those who did receive it, support from benefits was relatively high as the means in row 4, Table 45 show.

Loans present a third picture in this mixed collage of aid resources. A larger proportion of our aid group were borrowers, but the 50% who were re-

ported loans that averaged $749. About 20% of the non-aid group reported taking out loans during the 1973-74 school year and the average amount borrowed by them was $947. Both of these loan averages fell considerably when calculated on a per capita basis. Here the mean is $455 for the recipient group and $252 for the non-recipients. National Direct Student Loans were the favored loans in each group. But among the non-aid students, Guaranteed State or Federally Insured Loans were taken out just about as often. Alternatively, GSLs were reported by only 14% of the BEOG/SEOG group who were borrowers. However, for both groups, the dollar amount borrowed under a GSL was between $880-1080, on average, while the average amount reported for NDSLs was $630-760. Thus the Federal aid recipients were more likely in the position of borrowers but they tended to borrow less than did their non-recipient colleagues.

Five financial resource categories have been discussed, in turn, above--family support, own support, grants, benefits, and loans. If we aggregate them we have "total resources." Table 46 presents part of the data we have developed on total financial resources for school, for each of the two groups of students under study in this part of the report. It is informative to cast this distribution of total resources reported against the earlier percentages showing parental contribution and money from student employment and savings (Tables 43 and 44). The distribution of student resources which came from parental contributions was substantially different in the aid and non-aid groups. Remember that 57% of the former group did not report parental financial support in any amount, while 31% said such support was from $1 to $600. On the other side, one quarter of the non-aid group said they received $1,500-3,000+ from their parents during the school year. The disparity between these distributions led to a parental support ratio, between the two, of .59 (aid group own support/

TABLE 46

Total Student Financial Resources, by Aid Status

		BEOG/SEOG	Non-Recipient
0 - $200	#	2	14
	%	1.2	1.1
	Cum %	1.2	1.1
201 - 400	#	2	14
	%	1.2	1.2
	Cum %	2.4	2.3
401 - 600	#	1	19
	%	0.6	1.6
	Cum %	3.0	3.9
601 - 1000	#	8	49
	%	4.6	4.1
	Cum %	7.6	8.0
1001 - 1500	#	21	67
	%	12.1	5.6
	Cum %	19.1	13.6
1501 - 2000	#	26	146
	%	15.0	12.2
	Cum %	34.7	25.8
2001 - 2500	#	32	187
	%	18.5	15.7
	Cum %	53.2	41.5
2501 - 3000	#	20	136
	%	11.6	11.4
	Cum %	64.8	52.9
3001 - 3500	#	19	106
	%	11.0	8.9
	Cum %	75.8	61.8
3501 - 4000	#	14	105
	%	8.1	8.8
	Cum %	83.9	70.6
4001 - 4500	#	6	78
	%	3.5	6.5
	Cum %	87.4	77.1
4501 - 5000	#	5	68
	%	2.9	5.7
	Cum %	90.3	82.8
5001 - 5500	#	5	36
	%	2.9	3.0
	Cum %	93.2	85.8
5501 - 6000	#	2	24
	%	1.2	2.0
	Cum %	94.4	87.8
6000+	#	4	95
	%	2.3	8.0
	Cum %	96.7	95.8
No Response	#	6	48
	%	3.5	4.0
	Cum %	100.0	100.0

non-aid own support).

Posed against this earlier information, the distributions reported in Table 46 are especially notable. About one-third of the aid group and one-fourth of the other group (without Federal aid) report total resources of $2,000 or below. Moving to $3,000, 65% of the BEOG/SEOG students and 53% of the others have total resources at this level or below. And at $4,000 the cumulative percentages are approximately 84% (aid group) and 71% (non-aid group).

The addition of public and private (non-personal) aid resources to the initial financial resources of students and their families has significantly closed the "resource gap." So much so, in fact, that the ratio of average total resources (aid students/non-aid students) is .82. The group means for total resources tell the story at a glance: average reported total resources are $2658 and $3235. For the two groups we are studying, grant monies made the

TABLE 47

Means for Total Resources, by Fed. Aid Status

		BEOG/SEOG	non-Recipient
Average Resources Per Capita	Mean	$2626	$3224
	S.D.	1360	1939
	N =	167	1144
Average Resources Per Recipient	Mean	2658	3235
	S.D.	1337	1933
	N =	165	1140

$$\frac{\text{Average Resources per Recipient for Aid Group}}{\text{Average Resources per Recipient for non-Aid Group}} = .82$$

critical difference, though the willingness of BEOG/SEOG students to borrow money for school helped close the gap too. The distribution of benefits,

as we saw, tended to add to the initial resource differences between the groups. GI Bill and, to a lesser extent, Social Security Administration benefits were important factors in the benefits distributions.

Some words of caution are in order here. When we talk about total resources available for school, we must remember that these resources are dependent upon the cost of the school attended. Students attending private schools will report more total resources in part because more resources must be marshalled to meet costs. To the extent that BEOG/SEOG recipients attend lower cost schools, their total resources will be lower. This does not, by itself, mean that their potential resources are lower. However, we do have some evidence, both direct and indirect, that they are. Remember that the parental income average for aid recipients was $8907 while that for non-recipients was $17,143. (See Tables 40 and 41.) The BEOG/SEOG group also received fewer non-welfare benefits. (See Table 45.) When asked about their reliance on aid, recipients were likely to tell us that their school attendance decision was very sensitive to the availability of these dollars. Thus it seems reasonable to maintain that there is a resource gap for BEOG/SEOG recipients, which these particular aid dollars help to close.[12]

Do total resources, as reported, defray total cost? One further set of data will help us figure this out. Table 48 reports several categories of cost, including total cost, for the aid and non-aid groups. The reported costs in

[12] An additional problem of interpretation remains. The cost categories on the SRS Survey are specified in such a way that they are more likely to effectively capture the costs of a younger, single student. Many costs of older, particularly married, students do not fit neatly into the five listed categories and thus may be left out. This means that the total costs of the younger, single recipient population may be more accurately reflected in our data than those of the non-recipient group. This, in turn, directly affects our resource/cost calculations.

each group are close. They are closer in magnitude than are reported total resources for the two groups and much closer than we had expected. The non-aid students in our sample overrealize their resource needs: $\frac{\text{Total Resources}}{\text{Total Costs}} = 120\%$.

TABLE 48

Means for Student Reported School Costs, by Fed. Aid Status

		BEOG/SEOG	Non-Recipient
Tuition & Fees	Mean	$ 824	$ 842
	S.D.	628	742
	Count	171	1190
Maintenance Budget	Mean	1570	1677
	S.D.	797	912
	Count	146	954
Total School Cost	Mean	2561	2687
	S.D.	946	1213
	Count	146	956

For the BEOG/SEOG students the ratio is 1.03 (or 103%). By definition, any student who was still around to fill out our questionnaire in May 1974 had managed to come up with the resources necessary to meet school expenses. Therefore, unless the student reported financial data was quite inaccurate, we did not expect total resources/total costs to be less than 1.00. The 1.03 figure for the aid group, however, indicates how close to the financial edge they are. One last set of tables provide subjective information to confirm this judgment based on objective data.

Students were asked, "What effect did college costs have on your choice of an institution?" (SRS, question #75). They had three possible answers: 1) none, I was able to afford to pay the cost at all the schools I applied to; 2) some, I had to eliminate more expensive schools from consideration;

3) considerable, I chose one of the least expensive schools to which I was accepted. Their responses are shown below in summary form.

TABLE 49

Effect of College Costs on Choice of Institution, by Federal Aid Status

		BEOG/SEOG	non-Recipient
None	#	33	379
	%	21.0	33.0
Some	#	70	507
	%	44.9	44.0
Considerable	#	53	260
	%	34.0	23.0
Column Totals	#	156	1146
	%	12.7	87.3

It would be interesting to have these responses tabulated also by school segment of the respondent. It may be that the 33 aid recipients who reported that school costs did not affect their choice of institution only applied to schools in the community college segment. In any event, roughly one fifth of the aid group said costs had no effect while a third or so said the effect was considerable. The frequencies for these two answers are approximately reversed for the non-aid group.

Related to the importance of costs on school choice is the availability of financial aid. We asked students, "What effect did financial aid have on your selection of this college?" The possible responses were four: 1) none, I did not need financial aid to attend this school; 2) none, I did not need financial aid to attend this school, but would have attended a more expensive school if aid had been available; 3) I received financial aid, but would have

attended this college without it; 4) I would not have attended this college without financial aid. Table 50 displays the responses.

Here we see more clearly the direct effect of aid on the choice between schools. Only 6.4% of the aid group said they did not need financial aid to attend their present school, while over 50% of the non-aid group said the same. Approximately 27% of the aided students, and 14% of the others, said they did receive aid but would have attended their present school without it. But fully 62% of the aid group said they would not have attended the college they're at without financial aid. This was reported by 21% of the non-aid sample. Without aid, would these students have gone to another school, or dropped out, or what? They were asked this question also, and now we're really inquiring more about the decision whether to go to school at all. SRS questions #53 and #54 were addressed to financial aid recipients only. This means

TABLE 50

The Effect of Financial Aid on Choice of Present School, by Aid Status

		BEOG/SEOG	non-Recipient
None, didn't need it to attend	#	11	615
	%	6.4	51.6
None, but would have chosen more expensive school	#	1	116
	%	0.6	9.7
Received aid, but would have gone here without it	#	46	167
	%	26.6	14.0
Would not have gone here without aid	#	107	247
	%	61.8	20.7
No Response	#	8	47
	%	4.6	3.9
Column Totals	#	173	1192
	%	12.7	87.3

that virtually all of the BEOG/SEOG recipients answered them and so did some of the "non-aid" group--that is, those students who, according to our definitions in this section, did not receive a BEOG or an SEOG but a number of whom did receive other types of financial aid, as we saw earlier. Because this second group is mixed, with some students receiving aid and some not, we have looked only at the responses from the BEOG/SEOG group to these two SRS questions.

Question #53 asked, "Without financial aid, what alternative method would you have primarily utilized to meet your school expenses?" The ten alternative methods from which they could choose are listed below, along with the percentage of BEOG/SEOG recipients who selected each.

5% 1) additional assistance from parents

5% 2) additional school year employment

3.6% 3) additional summer employment

14% 4) some combination of 1, 2, 3, and 5

10.2% 5) loans

8.8% 6) attend a lower cost institution

0.7% 7) alter my spending patterns and/or standard of living

19.0% 8) live at home

33.6% 9) postpone attendance until financially able

26.0% 10) not attend school.

A small minority of these students were willing to utilize alternative personal resources still further in the absence of financial aid. That is, alternatives 1 through 4 above--more help from parents or additional work--were mentioned only 3% to 5% of the time. Some of the responses had to do with cutting school attendance costs and these were more likely chosen, e.g. attending a cheaper school, altering spending patterns, or living at home.

Over 10% were willing to take out loans (or more loans). But by far, the majority said they would either postpone attendance (33.6%) or not attend school at all (26%), accounting for 60% of the responses altogether! As we saw earlier, financial aid makes up an important part of their resources--resources which, on average, just barely covered total school costs. These BEOG/SEOG students are on the financial borderline: a change in their aid pushes them over it. Likewise, these students should evidence a relatively high price elasticity of demand for education.

Finally, we analyzed the aid group's responses to this question, "If you had not attended this college without the offer of financial aid or academic scholarship, where would you most likely have attended?" We have collapsed the original nine alternative responses into five (see question #54 on the survey in Appendix B). These are examined in Table 51 by present segment of school attendance for the respondent.

TABLE 51

Alternative School of Attendance, Without Aid at Present School
(Percentages of Responses for BEOG/SEOG Recipients,
by Present Segment of Attendance)

Alternative School		Community College	State System	Private
Two year public school	%	18	28	39
Four year public school	%	16	20	29
Four year private school	%	0	4	3.4
Proprietary school	%	0	0	1.7
Not attend school	%	66	48	27

As Table 51 shows there are major differences among Federal aid recipients on the question of alternative school choice, if respondents are grouped by

their segment of present school attendance. Seventy-two percent of all our recipient group at private schools said they would attend some alternative school if not offered aid where they are now attending (i.e., a private school). But their alternatives were, first, a community college; second, a four year public school; and, only once in a long while, another private school. Twenty-seven percent said they wouldn't attend school at all. Nearly half the state system and two-thirds of the community college attendees among the recipients said they would not attend either in the absence of aid at their present school. But for those that though they would, a community college was, again, their first alternative and a state system school their second.

For these BEOG/SEOG recipients, then, a desire to go to a particular school or any school at all seems easily reversed by a change in financial aid availability. One interesting conjecture, out of this last section of tables, is that changes in the cost of schooling in either of the four year segments, ceteris paribus, might quickly move certain groups of students into the community colleges. Likewise, changes in the availability of aid in these segments, ceteris paribus, would clearly have this effect also, from what students have themselves told us.

We are not partisans of one leaning or another on issues of school financing, and the point here is not to build a case for one course of action or program over another. Given the total resources reported by the students in our non-BEOG/SEOG sample (with a resource/cost ratio of 1.2) it is possible that a lower level of grants, benefits, and/or loans could be offered with relatively little impact on school choices. Remember that over half of our non-aid sample said they didn't need aid to attend their present school, and another 14% said they had received aid but would have gone to their present

school even without it. These students are telling us that their school choices are not very aid sensitive.

It is not so, however, with the Federal aid recipient group. And perhaps that is the most important policy point of this section. The BEOG/SEOG monies are going to students in Oregon who report a highly sensitive cost/benefit situation, even with the Federal aid. Without it, most of them say they would not be in school at all.

B. The College Attendance Choice

The many tables, descriptions and conjectures of the previous section have presented a good deal of information about students in Oregon's institutions of higher education. The focus is on students because we wish to understand the demand side of the educational market. Economists suggest that the demand for a particular commodity or service (for example, education) is a function of its price, the price of other goods (which may be substitutes for or complements to it), consumers' incomes (or financial resources), their tastes and/or values, and their expectations about the future. It simplifies things enormously to assume that all but the first of these theoretically important factors may be held constant in the "short run." Then, an analysis of demand for or supply of some good may proceed in two dimensional space, dealing only with changing prices for the good in question and the differing quantity demanded or supplied in response to the changes. However, we know that in the real world, the workings of which we seek to understand and predict, human decisions result from processes and are usually affected by a multiplicity of factors. Ideally our analyses, then, are also complex and our techniques

flexible and robust.

These next two sections of the report (B and C) move to multivariate analysis of our various sets of data on Oregon students--high school and post-secondary. Hopefully, a foundation for inspecting and evaluating the results of these analyses has been laid in the previous section. There, extensive information was presented on factors thought to influence demand--"prices" of school and related costs, parental and student incomes and financial resources, various demographic characteristics, present motives for attendance, future aspirations, reactions to alternative resource situations, and other things. Now combinations of these variables will be employed as we further investigate and describe demand for education in Oregon.

In this part we explore the decision whether or not to attend college. Two techniques, regression and non-metric discriminant analysis, are utilized in looking at the factors which affect this attendance decision.

1. Regression Analysis

The decision whether or not to pursue higher education is assumed in this study to be the end result of rational evaluation and comparison of the costs and benefits of enrollment versus alternative activities. Ordinary least squares regression (OLS) was applied to time series data in order to investigate how changes in these costs and benefits have influenced the demand for enrollment in Oregon institutions of higher education over the past fifteen years.

In order to assure that the results of the OLS procedure are not clouded by an identification problem, it is necessary to assume that a supply constraint did not exist during the study period. Examination of data on applications and denials of admission to the Oregon State System of Higher Education

indicates that a very small percentage of freshman applications by Oregon residents have been denied, even during the period (1972-1974) when undergraduate enrollment ceilings were in effect.[13] Further, individuals who have been involved with admissions decisions at private schools in the state have indicated to us that many of these institutions essentially have "open-enrollment" policies although this is not typically publicized.[14] Oregon community colleges, however, explicitly follow an "open door enrollment" policy. It therefore seems supportable to assume that during the period under consideration, any Oregon high school graduate who could afford enrollment cost could have enrolled in an institution of higher education in Oregon.[15] A problem may still exist, however. Although the supply assumption appears justified, there has been a substantial increase in community colleges during the period in question. If this is viewed as merely a lowering in price of higher education, then no difficulty results. If, however, this growth is perceived as a structural change, then interpretation of the results becomes less clear.

Demand for higher education is investigated here first in terms of freshman enrollment. We postulate that the decisions of freshmen can be expected to be more sensitive to changes in relative costs and benefits than

[13] At least until the present, these ceilings were intended to facilitate planning rather than to ration places to resident students. In virtually all cases, special enrollment status could be obtained even though grade point and test score minimums for entrance were not met.

[14] In looking at the private segment separately, the assumption of perfectly elastic supply is more tenuous than in the total or other segmental equations.

[15] We are unable to take account of individuals who may have felt that a supply constraint did exist, were discouraged and did not apply for admission.

than are total enrollments. In other words, demand elasticities might be expected to decrease with the amount of time which had already been devoted toward obtaining a degree.[16] For instance, in the extreme case, the price elasticity of a third term senior is likely less than that of a first term freshman. Further, analysis of total enrollment might be hampered by changes in the additional factors that influence the "survival" rates of college students. As a result, we first utilize freshman enrollment as the dependent variable in the time series analysis. In an alternative formulation, later in this section, we use total enrollment as the dependent variable. If our reasoning is correct, we should expect the elasticities resulting from that equation to be lower than those developed below in the equation for freshman enrollment.

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[16] The concept of demand elasticity is an important one in economics. It is employed primarily as an indicator of how total revenue changes when a change in the price of some commodity prompts a change in the quantity demanded of that commodity. More generally, the formula for elasticity is

$$e = \frac{\%\text{ change in the dependent variable}}{\%\text{ change in the independent variable}},$$

where a value less than 1 is defined as inelastic, and over 1 as elastic. It will serve our purposes adequately if the reader thinks of elasticity as "responsiveness." This responsiveness will vary by commodity. Thus we might think of quantity demanded of some good as the dependent variable in the above equation, and its price as the independent variable. A change in the price of cigarettes or salt will not likely result in a substantial change in the quantity demanded of these items--the elasticity, or responsiveness of demand is small in these cases. But consumers will react, be responsive to, a change in the price of beef or new American cars. How elastic the demand is for any particular commodity, say education, is dependent upon many factors and is capable of measurement. Our work parallels that of other studies in showing a relatively inelastic (unresponsive) demand for education. That is to say if we examine the percentage changes in school enrollments and in levels of tuition, and if we make the assumption that other factors influencing enrollment decisions are constant for the moment, then we find a relatively smaller change in enrollment than in tuition. This holds out the possibility that schools might increase their total revenue by raising their tuitions.

A formal statement of the postulated demand relationship is given in equation 5.1.

$$(5.1)\quad E_t = f(P_t, Y_t, U_t, D_t, I_t, W_t, HSG_i)$$

where,

E_t -- fall term freshman enrollment in an institution of higher education in year t

P_t -- average annual real tuition in year t, weighted by institutional enrollments

Y_t -- mean real per capita personal income in year t

U_t -- annual rate of unemployment in Oregon in year t

D_t -- the number (in thousands) of 18-21 year olds in the Armed Forces in year t

I_t -- an investment proxy calculated as the difference in mean annual lifetime earnings of high school and college graduates, express in real terms for year t

W_t -- average real hourly wages of Oregon production workers in year t

HSG_i -- total number of Oregon high school graduates as a proxy for eligible population; if i = 1, graduating seniors in year t; if i = 2, graduating seniors in year t plus those in year t - 1.[17]

We can state the expected relationship between demand for enrollment and each of these eight explanatory variables, in turn.

A downward sloping demand curve for higher education requires that the quantity of education demanded will decrease if tuitions are increased--that the sign of the coefficient of the price variable (P) will be negative. A

[17] The two year pooling of seniors is an appropriate proxy for eligible population when the estimates in point include community college enrollments. This is because the relevant undergraduate class unit for community colleges is "lower division collegiate"--a composite of freshmen and sophomores. As noted earlier, community colleges do not differentiate between freshmen and sophomores in their enrollment reporting.

change in W, average real hourly wages of Oregon production workers, is also expected to influence freshman enrollments inversely. This relationship will hold only insofar as production or manufacturing work provides a meaningful alternative to further education for graduating high school seniors. Thus it is assumed that the real wage rate in this sector operates as an opportunity cost to education and its increase negatively affects enrollments. The remaining explanatory variables are expected to bear positively on enrollment--income, (Y), as a measure of ability to finance educational costs; unemployment, (U), as a proxy for the availability of alternatives; age composition of the military, (D), as a proxy for the deferment motive given changing draft pressures; lifetime earnings differences, (I), as a measure of an investment motive in enrollment demand; and (HSG_i) as the relevant eligible enrollment pool.

As if often the case with time series data, significant collinearity among the explanatory variables made it impossible to simultaneously include all of these theoretically important and potentially significant factors.[18] The most satisfactory freshman enrollment demand equation, estimated in log linear form on 15 observations, is shown as equation 5.2.[19] The coefficients of all variables included have the sign that is predicted in our discussion above and are significant at (at least) the 5% level. The interpretation of the price and income variables, P and Y, is quite straightforward. As the price of schooling (i.e. tuition and fees) increases, there is a corresponding decline in enrollments, all other things being equal. And, with this same disclaimer hold-

[18] Perusal of the residuals indicates that the assumption of homoskedasticity is justified.

[19] The problem of collinearity among the explanatory variables is an especially persistent and vexing one in time series analyses which employ economic variables. Because the presence of collinearity affects our results and cannot be satisfactorily excised, we have devoted an appendix to discussion of it. (See Appendix G.)

ing, an increase in personal income enables and occasions an increase in school enrollments. It is fundamental to a demand analysis that the coefficients on price and income turn out in this way. Let us proceed to some of the other variables.

$$\ln E = -14.4489 - \underset{(-8.90)^{**}}{.6586} \ln P + \underset{(8.76)^{**}}{1.8822} \ln Y + \underset{(4.40)^{**}}{.3306} \ln U + \underset{(2.43)^{*}}{.1485} \ln D + \underset{(6.79)^{**}}{1.0758} \ln HSG_2 \quad (5.2)$$

9 degrees of freedom $\quad \bar{R}^2 = .9948$

D-W = 2.45

t-statistics in parentheses

** = significant at the 1% level

* = significant at the 5% level

The unemployment rate, U, is a proxy for the availability of attractive alternative activities. Thus, as unemployment increases and work alternatives become more limited, college enrollment becomes the best option available to more individuals. The draft variable, D, is used to estimate the net effect on enrollment of the military build-up which occurred in the mid-1960's. Here we postulated that the deferment benefits of college attendance outweighed the reduction in eligible population due to involuntary induction. The positive coefficient of this variable supports that hypothesis.

Since the equation is log linear in form, the coefficients are directly interpretable as enrollment elasticities. We can compare them with the elasticities developed in the work of others. Despite several differences in the studies, the price and income elasticities (-.6586 and 1.8822, respectively), found here are reasonably close to those found by Campbell and Siegel (-.4404 and 1.2036) in their national time series analysis. The coefficients reported here are larger (in absolute value) in both cases. This may reflect the ex-

pected higher sensitivity of freshman enrollment, the dependent variable in this equation. Recall that Campbell and Siegel studied total enrollment. We will compare our total enrollment equation with theirs later in this section.

Further, lower elasticity is to be expected in a national analysis since there are fewer substitutes available than in a more limited area. The Oregon student observed in this study has the option of attending an out-of-state institution. The presence of this alternative should thus serve to increase his or her price elasticity.

Enrollment sensitivity with respect to changes in the size of the armed forces was estimated at -.2568 by Galper and Dunn. The estimate of draft pressure obtained here is of the opposite sign and significant at the 5% level.[20] These conflicting results are likely attributable to differences in study design, variable definition, and particularly to differences in the time period under investigation. Galper and Dunn's estimates are based on college enrollments between 1925 and 1964, a period which includes the World War II years. This study, in contrast, covers the Vietnam era of military build up and domestic discontent--a period in which the size of the military (and thus draft pressures) might well be expected to play an opposite role to that observed during World War II and perhaps during the Korean War. We favor our conjecture that there were strong "avoid draft" motives for post-secondary enrollments during the period we are examining. It is gratifying that the positive and significant sign on the draft coefficient lends support to our a priori hypothesis.

[20]The significance level of Galper and Dunn's coefficient is not reported in their paper, nor is it easily calculated from their reported results due to their use of a distributed lag structure.

Although the sign of the unemployment variable is positive as hypothesized, an argument can be made that insofar as the unemployment rate reflects a negative impact on ability to pay, it might be expected to negatively influence enrollments. However, it appears that on balance over the time period in question, this reduction in ability to pay is outweighed by the absence of attractive alternatives as suggested above. This may be due to the offsetting influence of savings, unemployment benefits and financial aid on income lost due to unemployment. It is possible that in a period of extended high unemployment the earnings component of the unemployment rate might swamp the scarcity of work alternatives effect, yielding a negative influence on enrollment demand.

Similar log linear equations were estimated for the three institutional segments: community colleges (2-year public); Oregon State System of Higher Education (4-year public); and independent colleges (4-year private). These results are presented in Table 52. Multicollinearity, while present in the total equation (5.2), is a much more serious problem in the segmental equations.[21] Although all of the coefficients retain the appropriate signs, some of the variables no longer have significant t-statistics. Since interpretation is hazardous when estimation is troubled by collinearity, only a general comparison of these equations will be presented here.

Community college enrollments appear to be more sensitive to changes in the explanatory variables than those of either public or private four-year schools. Own price elasticity is lowest for the private schools and highest for commun-

[21] Because of this difficulty, care should be exercised in the interpretation of the coefficients. For example, in the community college equation, the coefficient of income (5.51) appears quite high. This is because income is positively correlated with time and thus the income coefficient is picking up the growth of the community college system. Including a time trend in the equation lowered the coefficient of income to 1.5944, but increased substantially the amount of multicollinearity present.

TABLE 52

Regression Results: Institutional Segment Equations

ln Freshman Enrollment, Segment j	Constant	ln P_j	ln Y	ln U	ln D	ln HSG_i	D-W	$\bar{R}^2$
Community Colleges	-74.4605 (-7.20)**	-.8667 (-1.19)	5.5154 (7.57)**	.3063 (1.44)	.6455 (3.37)**	$\underset{i=2}{3.4947}$ (7.09)**	2.64	.9957
4-Year Public Schools	-3.1762 (-2.12)*	-.0723 (-0.63)	.7222 (1.53)	.1984 (1.11)	.0831 (0.64)	$\underset{i=1}{.6139}$ (1.93)*	2.30	.8363
4-Year Private Schools	-0.5136 (-0.14)	-.0296 (-0.06)	.3862 (0.64)	.1127 (0.92)	.0802 (0.69)	$\underset{i=1}{.4795}$ (2.18)*	2.16	.8851

Each equation is estimated on 15 observations (1960-1974), yielding 9 degrees of freedom.

t-statistics in parentheses

** = significant at 1% level

* = significant at 5% level

$\bar{R}^2$ = coefficients of determination adjusted for degrees of freedom

D-W = Durbin Watson statistic

ity colleges. It seems reasonable that community college enrollees would be particularly sensitive to economic variables, given that their income is substantially less than that of students in the other two segments.[22] The presence of alternatives also appears to have a relatively greater effect on potential community college enrollees. This is especially evident in the relatively large coefficient of the draft variable. This could also be the result of the enrollment policies of community colleges which ensure ease of entrance to high school graduates who might otherwise not have attended college.

We undertook an extension of our time series analysis to include state and Federal financial aid. There are a number of compelling reasons for doing so. First, it is clear from the analysis of SRS data that the availability of financial aid has an impact on school attendance decisions. It affects entering and continuing students, renders some schools more and others less feasible as alternatives, enables or constrains future attendance, and impacts differently on differing groups of students. Clearly we omit financial aid from our analysis at the risk of excluding a factor that may have been as important over time for some students as are price and income.

Second, we felt that the 1960-74 period under study was a particularly significant one for financial aid programs. In 1960, the only Federal educational aid monies available were NDEA loans and some funds to institutions for their own loan programs. The total amount of Federal financial aid which came to Oregon students and post-secondary institutions in this year was $393,200. By 1974 many additional programs had appeared to boost these total Federal

[22] Based on 1974 Student Resource Survey sample data, the mean parental income of community college students was $13,399; state system students was $16,363; and private (non-sectarian) students was $18,274.

dollars to $15,200,400 -- Federally Insured Student Loans, College Work Study, Supplemental Educational Opportunity Grants, Basic Educational Opportunity Grants and Student State Incentive Grants. Financial aid to students from the state of Oregon has also grown dramatically during this period. Our hope was to combine these two sources of aid, state and Federal, and capture in our analysis the effect of this volatile economic variable.

Third, we have seen no studies of demand for education which include financial aid as one of the explanatory variables. Most researchers note its potential significance for attendance decisions; but are, apparently, unable to give it explicit consideration. Thus we hoped that our work could initiate empirical discussion of this previously neglected factor. The neglect of aid as a variable in at least time series analyses has likely been necessitated by the lack of data. It was extremely difficult to collect and organize information on state and Federal financial aid. Virtually inaccessible to us were data on private aid to students and institutions. This is an important component in the overall aid picture and we regret its omission in the analysis below.

The U.S. Office of Education provided us with information on Federal financial aid to Oregon education for the 15 year period of our time series analysis. However, these data were not available by institutional segment. On the other hand, acceptable data on State aid, by segment, was developed for us by the State Scholarship Commission. We were forced to aggregate it in order to combine it with the Federal data.

The demand equation which includes financial aid was estimated in log linear form, on fifteen observations, for total, Fall term, undergraduate headcount enrollment in all three segments. As before, the first five explanatory or independent variables are average annual tuition (P); Oregon per capita

personal income, (Y); annual unemployment in Oregon, (U); the number of 18-21 year olds in the Armed Forces, (D); and eligible high school population, expanded to a five year pool of students to be consistent with the broadened scope of the dependent variable, (HSG_5). The sixth independent variable, (A), pools state and Federal financial aid to reflect total public aid dollars available to students during this period (i.e. grants, benefits and loans). It should be interesting to see how the elasticities in this total enrollment equation differ from those just examined for the freshman enrollments. We show it below as Equation 5.3.

$$(5.3)\quad \ln E_t = \underset{(-2.03)^{**}}{-11.1914} - \underset{(-0.99)}{.3717 \ln P} + \underset{(1.02)}{1.2049 \ln Y}$$

$$+ \underset{(1.30)}{.2655 \ln U} + \underset{(0.77)}{.1106 \ln D} + \underset{(1.71)^{*}}{1.1264 \ln HSG_5}$$

$$+ \underset{(2.05)^{**}}{.1572 \ln A}$$

8 degrees of freedom $\quad \bar{R}^2 = .9916$

D-W = 1.97

t-statistics in parentheses

** = significant at 5% level

* = significant at 10% level

Let us begin with a general inspection of the direction and magnitude of the coefficients. First, all of the coefficients retain their predicted sign, making the results of this equation for total enrollment generally consistent with equation 5.2, which estimates freshman enrollment. Our new variable, financial aid, has the expected positive sign and turns out to be the most significant variable in this formulation. This variable performs surprisingly well given the problem here again with multicollinearity, which does depress the t-values for price, income and aid.

Once again, the logarithmic form of the equation produces coefficients which are directly interpretable as elasticities. If we compare them, individually, with the coefficients in equation 5.2, we find they are quite close but have in every case decreased in size. This bears out our a priori reasoning that total enrollment demand, representing the attendance decision of freshman through senior undergraduates, would be less sensitive to changes in the various factors thought to influence attendance than would freshman enrollment demand, taken alone. Thus the price elasticity of freshman enrollment is -.6586 while for total enrollment it falls to -.3717. In both cases, the coefficient is less than one, telling us that both total and freshman enrollment is relatively inelastic--relatively unresponsive to changes in tuition. Alternatively, the income coefficients in equations 5.2 and 5.3 are close in magnitude, positive and elastic--1.8822 and 1.2049, respectively. As in equation 5.2, the only other coefficient in 5.3 that is also elastic is that for the pool of eligible students--HSG_5.

The income and price coefficients in our total enrollment equation are very close to those of Campbell and Seigel. Recall that they found price and income elasticities of -.4404 and 1.2036, respectively, in their national time series analysis. Our price elasticity for total enrollment is -.3717 and the income elasticity is 1.2049. The closeness is the more surprising given the differences between their study and ours. They estimated demand for education over a 45 year period, using only nine observations, and did not include two year schools.

If great caution is used, the elasticities can be translated into more literal terms, rendering their policy implications more explicit. For example, the coefficient on price in equation 5.3 tells us that if the average (weighted)

tuition level was raised by 10%, enrollments would drop approximately 3.7%, ceteris paribus. Herein lies the great caution--ceteris paribus, or, all else unchanged. For we must assume that during this period of changing tuition and the adjustments to it, all of the other factors influencing attendance (such as income) remain constant. If one or more of them change too, then we cannot really separate out the effects on enrollments. And, without the ceteris paribus assumption, the concept of elasticity is no longer meaningful as a clear measure of the (isolated) effect on one (dependent) variable of another (independent) variable. Elasticities are important but tricky things.

The coefficient on financial aid (.1572) is rather small and inelastic. This means that total enrollment decisions are relatively insensitive to changes in aid monies. This result is reasonable. While aid may loom large in the attendance decisions of particular groups of students, many are ineligible to receive it. Hence we would not expect aid to have a large coefficient in a total enrollment equation. Translated into policy terms, the coefficient means that if total state and Federal aid dollars to Oregon were to increase by 10%, enrollments would increase by 1.6%. However, the results would likely be quite different if we were looking only at the enrollment decisions of those students with parental incomes below $10,000. In the crosstabs of the last section, students from relatively low income families reported a high attendance sensitivity to financial aid. Still, the statistical significance of the aid coefficient in equation 5.3 tells us that this particular financial resource has been an important factor in enrollment variation over time.

We are pleased with the results obtained when financial aid is included in the time series analysis. While we lose some significance in the coefficients of the other variables, the results are still consonant with our earlier equa-

tions and with our theoretical expectations.

In summary, the time series analysis supports the hypothesis that enrollment demand is influenced by both financial variables and alternative opportunities. The results give additional evidence to the belief that enrollment demand tends to be price inelastic and income elastic. The segmental equations, furthermore, indicate striking differences in the sensitivity of demand among types of schools. While the final total enrollment equation supports our conviction that financial aid has been an important factor, historically, in attendance decisions and should be included in the future research efforts of others.

2. Non-metric Discriminant Analysis of the Enrollment Decision

The post-secondary plans of high school seniors are the basis for a further look at the enrollment decision. Here, the non-metric discriminant technique is applied to survey responses from a large number of 1975 Oregon high school seniors in order to investigate the differences in profiles of individuals planning to attend an institution of higher education versus those choosing a non-school alternative. By examining profile differences, it was hoped that further factors influencing the decision whether or not to attend school would become apparent.

The variables in the non-metric model selected for presentation here describe each individual's high school grade point average, his or her parents' occupations and education levels, type of high school program, high school size and location. These variables were thought to reflect secondary school and community environment as well as socio-economic class. The sample chosen contains responses of 4,000 students planning to attend college and 4,000 planning not to enroll.

Based on the differences in responses of these two classes of individuals, the non-metric model including the eight variables listed above was able to correctly predict over 70% of the enrollment decisions made by these 8,000 students. Table 53 summarizes the percentages of correct and incorrect classifications made by the model. The diagonal elements of this "confusion matrix" indicate the percentages of decisions correctly predicted--67.6% of those planning to enroll were predicted as having such plans, while 79% of those planning not to enroll were correctly predicted to have "no-go" intentions.

TABLE 53

Confusion Matrix: Schooling vs. Non-schooling Choice (Percentages)

Actual Choice	Classified As	
	Go	No-Go
Go	67.6	32.4
No-Go	21.0	79.0
$\chi^2_1 = 1732^{**}$		

**significant at .001 level

The off-diagonal elements reflect percentages of incorrect prediction (or confusion). 32.4% of those planning to enroll were incorrectly predicted to make a non-enrollment choice. However, only 21% of those planning not to go were predicted as intending to enroll. As can be seen, the model does a better job of determining those who will not choose to pursue higher education than it does in detecting those who will attend. A chi-square test can be used to evaluate the overall effectiveness of the model in classifying the data set as compared with chance classification. The results of this test (also shown in Table 53) indicate that the probability of obtaining such accurate prediction

by chance is extremely small. Stated differently, the variables included in the model contribute significantly to the prediction of enrollment plans. We will now examine the variables individually, in more detail. Although all eight factors enter into the prediction calculations simultaneously, these variables will be presented in separate tables for ease of exposition.

Table 54 gives the probabilities associated with various high school grade point levels. Interpretation of this table is straightforward. The posterior probability of attending college increases monotonically with high school grades.

TABLE 54

Non-metric Model--Variable 1: High School Grade Point Averages

Level of Variables	Posterior Probabilities	
	Class I-Go	Class II-No Go
1. Less than 2.00	.126	.874
2. 2.00-2.24	.222	.778
3. 2.25-2.49	.285	.715
4. 2.50-2.74	.324	.676
5. 2.75-2.99	.420	.580
6. 3.00-3.24	.496	.504
7. 3.25-3.49	.667	.333
8. 3.50-3.74	.761	.239
9. 3.75-4.00	.854	.146

It should be kept in mind that the figures given are <u>not</u> relative frequencies. Rather they are probabilities which are to be interpreted as follows: based on our sample, <u>given</u> than an individual has a grade point average of less than 2.00, her or his probability of choosing to enroll is .126, and that of choosing not to enroll is.874. As grade point average moves from level 1 (less than 2.00) to level 2 (2.00-2.24), the probability of attending college increases from .126 to .222. Conversely, the probability of not attending decreases from .874 to .778. Although grade point averages are far from a perfect measure of

ability, they do partially reflect an individual's "success" in secondary educational endeavors. Grades may also reflect an individual's taste or preference for education. Further, a person with low grades may view college attendance as a riskier proposition than might someone who has a better performance record. This greater risk would tend to discourage enrollment as opposed to other alternatives.

The model was run on several samples of varying sizes and including differing sets of observations. The probabilities remain quite consistent, with the switch-over point (probability greater than .5) occurring at level 5 (2.71-2.99) or level 6 (3.00-3.24). The grade point average variable taken singly served as the best indicator of discriminant class membership.

Table 55 includes two variables, father's and mother's occupations. Although father's job was singly a better predictor of the attendance choice than was

TABLE 55

Non-metric Model--Variables 2 and 3:
Father's and Mother's Occupation

Level of Variable	Posterior Probabilities			
	Class I - Go		Class II - No Go	
	Father	Mother	Father	Mother
1. Skilled Labor	.374	.333	.626	.667
2. Semi-skilled	.435	.385	.565	.615
3. Farm Labor	.409	.200	.591	.800
4. Small Bus.	.531	.515	.469	.485
5. Office Wkr.	.532	.533	.468	.467
6. Manager	.535	.536	.465	.464
7. Sales (Comm.)	.669	.539	.331	.461
8. Professional	.722	.665	.278	.335
9. Non-earner	.469	.352	.531	.648
1 Homemaker	N/A	.490	N/A	.510

mother's occupation, the probabilities are quite similar for most job categories. In the case of each of the variables, students who reported that their parents were skilled or semi-skilled laborers, farm laborers or farm foremen, or were non-earning (e.g. retired, disabled or unemployed head-of-household), have a posterior probability of choosing to attend college of less than 50%. Those whose parents were owners of a small business or farm; office workers (e.g. clerk, bank teller or secretary); managers, supervisors or foremen; commission sales-persons (e.g. real estate, insurance, cars); or particularly, professionals (e.g. doctors, lawyers, teachers, accountants); have a probability greater than .5 of choosing to attend college. As can be seen from Table 55, attendance probabilities tend to increase with the socio-economic status of parents' occupations.

Socio-economic status is further indicated by parents' educational levels. The probability of choosing to pursue higher education increases monotonically with parents' educational levels as listed in Table 56. Students whose parents pursued some form of post-secondary schooling (college or vocational) are more likely than not to choose to attend college. Those individuals whose parents did not pursue formal training beyond high school, or who are not aware of their parents' educational achievements, are less likely to seek further education for themselves.

Several factors may be reflected by the parental occupational and educational indicators (variables 2-5). Insofar as these variables indicate socio-economic groupings, they may correlate with parental income and thus ability to pay for college enrollment. Or perhaps young people from lower or working class families calculate that the returns to them from additional schooling, in terms of expected increased occupational status and/or future income, are outweighed by the costs. This may be especially true given their lower expected

TABLE 56

Non-metric Model--Variables 4 and 5:
Parents' Educational Levels

Level of Variable	Posterior Probabilities			
	Class I - Go		Class II - No Go	
	Father	Mother	Father	Mother
1. Less Than H.S.	.326	.312	.674	.688
2. H.S. Graduate	.444	.454	.556	.546
3. Bus. or Techn.	.558	.634	.442	.366
4. Some College	.586	.645	.414	.355
5. College Grad.	.714	.708	.286	.292
6. M.A. - Ph.D.	.762	.762	.238	.238
7. Don't Know	.357	.350	.643	.650

probability of finishing school.[23]

The last three variables--type of high school program, high school size and location--are included to capture the effect of secondary school and perhaps community environment.

TABLE 57

Non-metric Model--Variable 6:
Type of High School Program

Level of Variable	Posterior Probabilities	
	Class I-Go	Class II-No Go
1. College Prep.	.876	.124
2. Voc-Techn.	.330	.670
3. General	.448	.552
4. Don't Know	.233	.767

A majority of students in the sample (approximately 51%) were enrolled in general

[23]For an analysis of the effect of class and race on schooling decisions and successes see, respectively, Gintis (1971) and Michelson (1971). Sennett and Cobb (1974) also provide a fuller cultural context in which one might assess the school and career choices made by working class people.

or combined (college preparatory and vocational) programs. However, those who pursued more specialized course work in high school have distinct corresponding choice probabilities. Individuals enrolled in college prep programs have a very high probability of choosing further education while those receiving vocational or technical training are quite likely to make the no attendance choice. A "don't know" response may indicate general lack of interest in education, be it secondary or post-secondary in nature. It is not, however, possible to determine from the probabilities alone whether this variable represents an attendance choice made at some previous time, or the influence on choice of the type of program available at specific high schools. Whichever the case, enrollment in specialized coursework proved to be an important predictor of the college-going decision. For example, students who were enrolled in a college prepatory curriculum in their high school had a .876 probability of choosing to attend college. The probability of this attendance choice for students enrolled in a vocational technical program was .330.

Oregon high schools were grouped according to size of their 1975 senior class. These groupings are shown in Table 58.

TABLE 58

Non-metric Model--Variable 7: Size of Senior High School Class

Level of Variable	Posterior Probabilities	
	Class I-Go	Class II-No Go
1. Less than 100	.445	.555
2. 100 - 299	.465	.535
3. 300 - 499	.544	.456
4. 500 and greater	.546	.454

The probability of choosing to attend college appears to increase with the size of the high school attended. The distinction seen here may reflect an urban/rural demarcation or the availability of information and counseling facilities at various sized high schools.

An area or location variable was included with the hope of looking more closely at urban-rural differences. (See Appendix C for county groupings.) The students from the predominantly rural areas of Oregon appear to have a higher

TABLE 59

Non-metric Model--Variable 8:
High School Location

Level of Variable	Posterior Probabilities	
	Class I-Go	Class II-No Go
1. Coastal Counties	.399	.601
2. Willamette Valley Counties	.488	.512
3. Eastern Counties	.441	.559
4. Portland Metropolitan Area Counties	.587	.413

probability of non-attendance than do those from more urban areas. Students from the area which includes Portland and surrounding suburbs have the highest probability of attending college. In applying this model to other sample sizes and observations, the ranking of areas was generally consistent; however, the Willamette Valley area sometimes had a "go" probability of greater than .5. A finer breakdown of areas (e.g. separating urban areas such as Eugene, Salem and Corvallis from rural Willamette Valley areas) might be more informative. Unfortunately, the form of the data did not permit this further disaggregation.

Combined, these eight variables give a profile of a high school senior who intends to enroll versus one who does not. The potential enrollee would likely

have a high school grade point average of 3.25 or better, have parents of mid- to high socioeconomic class (as indicated by occupation and education levels), and be attending a large, urban high school where he or she is enrolled in college preparatory coursework. An individual with lower grades, socioeconomic status, attending a small rural high school appears more likely to pursue an immediate work alternative than to continue schooling.

These findings support the theory of schooling choice presented earlier. The results are complementary to those derived through the time series analysis, since this disaggregated data emphasizes social and environmental (home and school) aspects which were not included in the time series model.

C. The Choice Among Institutions of Higher Education

The choice of a particular institution in which to enroll is also a vital part of the college going decision. Analysis of this choice is thus an integral component of our study of educational demand. Specific school selection is expected to be a function of many of the same criteria which influence the decision whether or not to attend college. In general, these factors include such elements as financial condition of the individual, relative cost and location of the college in question, program offerings (as they relate to interest and job prospects), ability and background of the student and quality of the school. It is therefore interesting to note differences in the populations who actually attend or plan to attend various types of institutions to see if these differences are consonant with our expectations regarding the choice between segments based on these factors.[24]

[24] Examination of the demand for each of the [illegible] schools included in our data is prohibitively cumbersome. Thus the data [illegible] aggregated by type of school, as explained in the reporting of results below.

This section contains the results from the application of three multivariate analytical techniques to two previously described data sets (i.e. the 1974 Student Resource Survey and the Oregon high school senior survey). Our purpose in these investigations was to understand more systematically the choice between types of schools. Part 1 applies discriminant analysis to SRS data. Part 2 brings the non-metric technique to bear on the responses of Oregon high school seniors who are planning to attend college. Part 3 utilizes the conditional logit procedure to re-examine the SRS data from a more disaggregated perspective. We feel that the application of these methods, with their varying emphases, yields greater insight into the questions addressed by this study than would any of the techniques applied singly.

1. Discriminant Analysis of the Choice Between Institutional Types

Linear discriminant functions were estimated on SRS data in order to highlight differences among students attending three general types of institutions of higher education. The same general partitioning of school types or segments is utilized here as was presented earlier for the time series data. The community colleges and four-year public schools correspond exactly with those used before. However, the private schools examined here are exclusive of those schools which we judged to be mainly sectarian in orientation.[25] Some comments are made later, however, regarding the application of a similar model which did include these

[25] The schools included in the private segment are Linfield, Lewis and Clark, Museum of Art, Pacific, Reed, University of Portland, and Willamette University. The sectarian schools will be briefly discussed later. Recall that in the time series analysis all four year private institutions were considered, inclusive of sectarian schools. However, in the earlier crosstabulations using SRS data, the sectarian schools were omitted and the private segment was collapsed to the same seven schools given here.

sectarian schools.

The selection of these three institutional segments implies stratification by factors other than the obvious distinction of control (public vs. private) and length of program (two-year vs. four-year). Tuition charges differ significantly among the sectors. Weighted average prices for the 1974-75 school year were calculated to be approximately $290 for in-district community college students, $598 for Oregon residents attending state system schools, and $2120 for individuals who chose private institutions. In a less certain sense, this stratification may also represent differences (real and perceived) in the qualifications necessary for admittance and the quality or prestige associated with the college type in question.

The general form of the discriminant functions is shown as equation

(5.4) $Z_i = \lambda_{i0} + \lambda_{i1}Y + \lambda_{i2}R + \lambda_{i3}F + \lambda_{i4}V + \lambda_{i5}A$

where,

Z_i -- discriminant score for segment i (i=1, community college; i=2, four-year public; i=3, four-year private)

λ_{ij} -- coefficient of variable j, in segment i

Y -- gross parental income for 1973

R -- total financial resources available for college expenses, including own savings and earnings, plus family support and financial aid

F -- dummy variable indicating receipt of food stamps (0 if food stamp recipient, 1 otherwise)

V -- dummy variable indicating veteran status (0 if veteran, 1 otherwise)

A -- high school grade point average (used as a proxy for ability)

These particular variables were selected to reflect uniqueness of student profiles among segments. Other variables, such as sex of the respondent, were found to show only slight differences among the institutional segments. The

data used for this analysis were edited to include only residents, undergraduate students taking nine or more hours of classes (i.e. full-time students), and those whose surveys contained valid responses on the questions needed to determine values for the variables listed above.

The discriminant functions which were estimated using standardized data are presented in Table 60. Standardization (which is accomplished by subtracting the mean and dividing by the standard deviation) facilitates interpretation of the discriminant coefficients in terms of student profiles as reflected by these variables. Using these discriminant functions, 67.2% of the sample observations are correctly classified.

The first three variables (parental income, total resources and food stamp receipt) reflect components of the financial position of the students involved. Community college students tend to have the lowest level of parental income and monetary resources at hand. (Negative coefficients indicate variable values which fall below the mean for all classes.) Further, they are most likely to be receiving food stamps. At the other extreme, individuals attending private schools have high resource availability and thus are quite unlikely to receive food stamps. Private school students also exhibit relatively high ability rankings as measured by high school grade point averages. Not surprisingly, students at four-year public schools appear to have resources and abilities between those evidenced by students in the other two segments.

The weightings on the variable indicating veteran status may yield several possible explanations. It is possible to view the apparent preference of veterans for community colleges as a response to both the "open-door" admissions policy and low-cost nature of these institutions, as well as the directly job-oriented emphasis of many of the programs offered. In addition, older returning students may prefer the community colleges' more heterogeneous student bodies,

TABLE 60

Discriminant Function Coefficients
For Three Classes--Model I
(Based on Standardized Data)

Variable	Classes, representing institutional segments (1) Community College	(2) 4-Year Public	(3) 4-Year Private
1. Parental Income (Y)	-0.2181	0.0508	0.1528
2. Total Resources (R)	-0.3616	-0.0373	1.0532
3. Food Stamps (F)	-0.1154	0.0199	0.1265
4. Veteran Status (V)	-0.2364	0.0368	0.2861
5. High School GPA (A)	-0.5320	0.1082	0.4774
Constant	-1.7108	-0.4100	-2.8726

Total sample size (N) = 589; n_1 = 134, n_2 = 395, n_3 = 60

% correctly classified = 67.2

U-Statistic 0.8083
Approximate F = 13.071**

Degrees of Freedom 5, 2, 586
Degrees of Freedom 10, 1160

F Matrix for Pairwise Comparison

	Community College	4-Year Public
4-Year Public	12.4**	N.A.
4-Year Private	21.8**	11.0**

Degrees of Freedom = 5, 580 ** = significant at 1% level

See Appendix F for means and standard deviations of nonstandardized variables.

which include peers more nearly their own age. While the individual G. I. Bill benefits form a significantly large financial resource with which to defray costs of schooling, the veteran's preference for lower cost institutions may indicate larger family responsibilities and perhaps lower levels of parental support.

A similar discriminant model, containing two additional variables, was also estimated. These variables are:

D -- straight line distance from residence in Oregon (at time of admission) to school of attendance

L -- dummy variable indicating if chosen school was located within respondent's county of residency in Oregon (0 if out of county, 1 otherwise)

Both of these variables seek to reflect components of attendance cost--commuting expenses, opportunity to live at home, and in the case of community colleges, in- versus out-of-district tuition charges. This model is presented separately since there is some doubt as to the appropriateness of including institution specific information in a model which attempts to examine segmental choice. The results of this estimation are shown in Table 61.

Explanation of the distance variable may to some extent be specific to higher education in the State of Oregon. The mean distance from residence at time of application to the college actually attended is 28.6 miles for community colleges, 77.2 miles for state system schools and 37 miles to private colleges, while the mean for the entire sample is 62 miles. Thus the average distances for both the community colleges and private schools are less than the overall mean, yielding the negative discriminant coefficients for this variable. The low mean distance for community colleges is not unexpected, since the tuition and fee charges are substantially higher for students with permanent residences outside the tax district of the community college in question. The mean value (and variance) is actually higher than might have been anticipated, having

TABLE 61

Discriminant Function Coefficients
For Three Classes--Model II
(Based on Standardized Data)

Variable	Classes, representing insitutional segments		
	Community College	4-Year Public	4-Year Private
1. Parental Income (Y)	-0.2617	0.0695	0.1269
2. Total Resources (R)	-0.3612	-0.0361	1.0447
3. Food Stamps (F)	-0.1269	0.0258	0.1132
4. Distance (D)	-0.0963	0.0813	-0.3199
5. Veteran Status (V)	-0.1664	0.0110	0.2990
6. High School GPA (A)	-0.5187	0.1037	0.4771
7. Location (L)	0.8866	-0.3027	0.0130
Constant	-2.0671	-0.4604	-2.8745

Total sample size (N) = 589; n_1 = 134, n_2 = 395, n_3 = 60

% correctly classified = 72.8%

U-Statistic 0.66079
Approximate F = 19.095**

Degrees of Freedom 7, 2, 586
Degrees of Freedom 14, 1160

F Matrix for Pairwise Comparison

	Community College	4-Year Public
4-Year Public	27.9**	N.A.
4-Year Private	18.4**	10.3**

Degrees of Freedom = 7, 580

** = significant at 1% level

See Appendix F for means and standard deviations of nonstandardized variables.

been raised by a few students who apparently travel great distances to attend a certain community college, despite the higher charges.[25]

The distance to private schools also appears relatively short. The large majority of the schools included in the private segment are located in the urban centers of the state. Since income and parental education levels tend to be correlated with population density (i.e. urban and suburban areas), it seems reasonable that these high cost and (in some cases) prestigious schools would draw a large share of their in-state students from these areas. (As we learned earlier, however, 56% of the private school students in our non-sectarian sample were from out of state.) It is likely too that more familiarity with and information concerning these schools is available to those living in or near cities. On the other hand, information on the four-year public schools is widely disseminated throughout the state through yearly visits by state system representatives to every high school in the state.

This distance pattern of attendance is reaffirmed by the location variable, which indicates that a community college student is highly likely to be attending a school located in the same county as her or his permanent residence.

A discriminant model using the variables defined above was unable to distinguish students attending schools with strong religious orientation from students in the other segments.[26] Mean parental income is lowest in this group ($12,622), and exhibits the smallest standard deviation. Average total resources

[25]Several students traveled over a hundred miles to attend a particular community college. This is most notably the case for Treasure Valley Community College which is located in Ontario. There are several possible reasons that an individual might choose Treasure Valley over a nearby community college. Treasure Valley boasts a strong athletic scholarship program, has special programs not available at other schools (e.g. pilot training) and is located within accessible distance to ski areas.

[26]The schools included in the sectarian grouping are Columbia Christian, Concordia, George Fox, Judson Baptist, Marylhurst, Mt. Angel Seminary, Multnomah Bible, Northwest Christian, Warner Pacific, Western Conservative Baptist, and Western Evangelical College.

available to these students is, however, nearly the same as those of undergraduates at state system schools. Despite low reported parental income, sectarian students appear highly unlikely to receive food stamps. (This may be a matter of conviction rather than eligibility.) Ability ranking is quite close to that exhibited by four-year public school students, and is above the average for the whole sample.

These students tend to travel greater distances to their chosen schools than do individuals attending community or private colleges, and appear relatively likely to come from rural areas of the state. Overall, the profile of these students is not distinct enough to allow proper classification based on the discriminant function derived. Nearly all these students were classified as belonging in the four-year public segment. Evidently, all of the factors which influence the choice of a sectarian school have not been included in our model. Perhaps what is needed to distinguish these individuals is information regarding strength of religious preference or family environment.

In summary, the profiles of the groups investigated, with the exception of sectarian school students, tend to support the importance of the choice criteria postulated by economic theory.[27] Financial constraints appear most severe for those who have chosen the low cost community colleges, while individuals with high resource availability in conjunction with high ability rankings tend to choose the more expensive and prestigious private institutions. The choice of those attending sectarian schools reflects the unlikely combination of low parental income and relatively high cost institutions. It is assumed that this reflects a strong preference for a religious environment and/or specific program

[27]This is not to say that economic thoery fails to explain the sectarian choice, rather that all the important factors which enter into the decision have not been included in the simplified model presented here.

offerings. Several of these schools emphasize preparation for the ministry or missionary work to the near exclusion of other programs.

2. Non-metric Discriminant Analysis of the Choice Between School Types

The survey responses of those Oregon high school seniors who indicated plans to attend an institution of higher education were further investigated in order to analyze the reasons for choice of a particular type of school. This analysis serves to enhance the discriminant findings reported above by including additional explanatory variables. Some of these variables are overlapping (e.g. high school g.p.a.'s), others are complementary (parents' occupations and education), while some concern areas not addressed by the Student Resource Survey data analyzed above (e.g. educational aspirations, stated reason for choice.) The included variables are as follows: high school g.p.a., father's occupation, mother's occupation, father's education, mother's education, reason for attending college, educational aspirations, prime reason for selecting first choice school, high school size and geographic area.

A four class model, based on the segments developed above (four-year public, community colleges, private institutions, and sectarian schools) and using these ten variables, was able to correctly classify slightly over 50% of the 1,267 observations involved. Table 62 presents a normalized confusion matrix for the model. The entries on the diagonal indicate the proportion correctly classified in each segment. Students choosing community colleges have the most distinct profiles and the highest percent correct classifications (73%). As was the case using traditional discriminant analysis in the previous part of this section, those choosing the sectarian segment could not be distinguished from state system or community college students. This difficulty is exacerbated by the low

prior probability of choosing a sectarian school--only 8.4% of the selected

TABLE 62

Normalized Segmental Confusion Matrix

Actual Choice	Predicted Choice				
	Com. Col.	4-yr Public	Private	Sectarian	Sample Size
Com. Col.	.730	.240	.030	.000	400
4-yr Public	.322	.543	.135	.000	400
Private	.233	.414	.353	.000	360
Sectarian	.514	.355	.131	.000	107

Percentage Correctly Classified = 50.20

χ^2_1 = 315** **significant at .001 level

sample on which this model is estimated chose schools in the sectarian segment.

The predicted choice is based on the combined results of all the variables, each weighted by its respective ability to predict correctly when taken singly.[28] For ease of exposition, however, the variables will be presented and interpreted separately in tabular form. Recall that the appropriate interpretations of the posterior probabilities estimated on our sample is as follows: given that an individual high school student plans to attend college and given that he or she exhibits the level of a variable under discussion (e.g. variable is "student educational aspirations", level is "less than B.A. degree"), then that individual has a probability (as reported in Table 63) of choosing each of the various types of schools.

Educational aspirations appear to be an important factor in determining in-

[28] See Appendix E for the variable weights calculated for this model.

stitutional choice. Those intending to pursue a bachelor's degree are likely to pick four-year public schools, while those planning shorter programs choose community colleges. Students reporting high aspirations (more than a B.A.) appear most likely to select private institutions. The significant portion of community college and sectarian students responding "I don't know" may reflect the inapplicability of the other categories listed. The community college

TABLE 63

Non-metric Segmental Model--Variable 1:
Student Educational Aspirations

Level of Variable	Posterior Probabilities[a]			
	Com. Col.	4-yr Pub.	Private	Sectarian
1. Less than B.A.	.634	.145	.145	.076
2. B.A. Degree	.223	.414	.275	.087
3. More than B.A.	.156	.359	.432	.052
4. I don't know	.413	.262	.212	.110

[a]Posterior probabilities are weighted by prior probability of being in a class. Since the sample of sectarians is small, the posterior values will in all cases be low.

students may be seeking vocational or technical certification, while sectarian training for missionary work may not yield a formal degree. (See the above Table.)

Table 64 gives the posterior probabilities relating to the stated reason for selecting the student's first choice school.

Specific program offerings and the variety of courses available (level 3) along with influence of parents and friends (level 6) appear relatively important to those planning to attend four-year state schools. Those weighting the financial factors heavily--distance and cost--are likely to select the community college segment. This result is comparable to that postulated in the previously

TABLE 64

Non-metric Segmental Model--Variable 2:
Primary Reason for Selecting First Choice School

Level of Variable	Posterior Probabilities			
	Com. Col.	4-yr Pub.	Private	Sectarian
1. School Reputation	.088	.319	.488	.106
2. Distance	.655	.215	.102	.028
3. Program or Variety	.262	.366	.308	.064
4. Characteristics (size, type, etc.)	.221	.265	.336	.177
5. Cost	.581	.298	.113	.008
6. Influence of parents or friends	.180	.400	.220	.200

discriminant results. School reputation and characteristics (e.g. size, type, location) appear influential in the choice of a private school, while the selection of the sectarian segment is relatively heavily affected by parental influence and school characteristics. While individuals who consider cost factors important to their choice are quite likely to attend community colleges, they are highly unlikely to choose a school in either the private or sectarian sector. This reinforces the hypothesis that those choosing church-related schools are affected by non-financial factors and is also consistent with the earlier regression results showing a low price elasticity for the private sector.

High school grade points are also a good predictor of certain discriminant classes.

TABLE 65

Non-metric Segmental Model--Variable 3:
High School Grade Point Averages

Level of Variable	Posterior Probabilities			
	Com Col.	4-yr. Pub.	Private	Sectarian
1. Less than 2.00	1.000	.000	.000	.000
2. 2.00 - 2.24	.488	.279	.186	.047
3. 2.25 - 2.49	.500	.250	.192	.058
4. 2.50 - 2.74	.415	.293	.158	.134
5. 2.75 - 2.99	.409	.329	.215	.047
6. 3.00 - 3.24	.353	.315	.240	.092
7. 3.25 - 3.49	.306	.314	.297	.083
8. 3.50 - 3.74	.249	.328	.324	.100
9. 3.75 - 4.00	.153	.341	.421	.085

The likelihood of choosing a public four-year or private school increases with grade point, while that of attending a community college falls. This is consistent with the findings presented earlier based on continuous data from the

Student Resource Survey. In the case of sectarian schools, there is no unambiguous relationship between high school performance and segmental choice. The attendance probabilities rise with grade point averages at lower levels and fall at higher levels. This variable, like several of the others reported, does not appear to reflect the true factors which determine sectarian choice.

Students planning to attend college were asked to give the reasons which most influenced their decision to enroll. We have aggregated these responses into consumption and investment criteria as follows:

TABLE 66

Reasons for Choosing to Attend College

Consumption Responses
I feel it is expected of me
I don't know what else to do
To become a better citizen
A desire to become more educated
Investment Responses
Further training is required for what I intend to do
To increase future earning power

This variable, perhaps because of the groupings selected, did not prove a particularly good choice predictor. However, it can be noted that those giving investment reasons have relatively high posterior probabilities of attending a community college while those stating consumption reasons are most likely to attend private schools. These results are consistent with our previous findings regarding varying price elasticities of demand between the private schools and community colleges. That is, one might expect those pursuing college education for investment reasons to be more sensitive to price changes, which directly affect the expected rate of return from education. This is indeed what the

TABLE 67

Non-metric Segmental Model--Variable 4:
Reason for Choosing to Attend College

Level	Posterior Probabilities			
	Com. Col.	4-yr. Pub.	Private	Sectarian
	Why Attend College			
1. Consumption Reasons	.249	.315	.353	.082
2. Investment Reasons	.342	.316	.256	.085

combination of our time series and cross-sectional results suggest.

Some general patterns can be detected in the posterior probabilities associated with parents' occupations. The probabilities are highest for students whose parents have jobs in the upper socio-economic ranges to attend four-year public or private schools. Those whose parents are laborers are likely to attend sectarian schools or community colleges. For example, a student who is planning to attend college and whose father is a professional, has the highest probability of attending a private school; whereas, if the father is a skilled laborer, the student has the highest probability of selecting a community college. These occupational distinctions, as suggested earlier in conjunction with the non-metric model of the school versus no school choice, probably reflect varying abilities to pay, as well as social background. The delineation between those choosing community colleges and those selecting state system schools is not clear cut based on these occupational variables. Mother's occupation appeared less significant in determining the school type choice than it did in the decision of whether or not to attend school. However, having a mother in a relatively high status job (levels 6, 7, or 8) did tend to increase selection of a private or 4-year public school, as opposed to a community college or

TABLE 68

Non-metric Segmental Model--Variables 5 and 6:
Parents' Occupations

Level of Variable	Posterior Probabilities			
	Com. Col.	4-yr Pub.	Private	Sectarian
Father's Occupation				
1. Skilled Labor	.388	.317	.189	.107
2. Semi-skilled Labor	.310	.310	.172	.207
3. Farm Labor	.333	.444	.222	.000
4. Small Business	.344	.338	.266	.052
5. Office Worker	.306	.210	.419	.065
6. Manager	.333	.303	.281	.082
7. Commission Sales	.271	.370	.309	.049
8. Professional	.198	.317	.396	.090
9. Non-earner	.356	.322	.271	.051
Mother's Occupation				
1. Skilled Labor	.435	.348	.217	.000
2. Semi-skilled Labor	.402	.268	.232	.097
3. Farm Labor	.000	1.000	.000	.000
4. Small Business	.387	.387	.226	.000
5. Office Worker	.347	.298	.266	.089
6. Manager	.282	.359	.359	.000
7. Commission Sales	.333	.333	.333	.000
8. Professional	.225	.355	.348	.072
9. Non-earner	.600	.200	.133	.067
10. Homemaker	.301	.314	.287	.098

sectarian type.

Parents' educational levels reflect a pattern of posterior probabilities similar to those indicated by occupational groups. Students with more highly educated parents are likely to choose private institutions, while those with lower educational levels choose community colleges. Those with mid-range parents'

TABLE 69

Non-metric Segmental Model--Variables 7 and 8:
Parents' Educational Attainment

Level of Variable	Posterior Probabilities			
	Com. Col.	4-yr Public	Private	Sectarian
Father's Education				
1. Less than H.S.	.386	.343	.199	.072
2. H.S. Graduate	.423	.255	.223	.098
3. Business or Techn.	.313	.388	.224	.075
4. Some College	.253	.346	.313	.088
5. College Graduate	.218	.355	.355	.073
6. M.A. - Ph.D.	.159	.312	.447	.082
7. I don't know	.500	.293	.121	.086
Mother's Education				
1. Less than H.S.	.421	.262	.243	.075
2. H.S. Graduate	.354	.320	.235	.090
3. Business or Techn.	.343	.353	.284	.020
4. Some College	.281	.272	.341	.106
5. College Graduate	.178	.375	.370	.077
6. M.A. - Ph.D.	.143	.367	.429	.061
7. I don't know	.509	.208	.151	.132

education (vocational or business, some college to college graduates) tend to select state system schools. However, probabilities based on this variable of attending any of these three segments (public two- or four-year, or private)

have overlapping values, making definitive comments difficult. The probabilities associated with educational levels of students choosing sectarian schools show no discernible patterns.

High school size and location results were not as informative as had been expected. Students who were from smaller high schools and located in coastal and Willamette Valley counties would be predicted to attend community colleges by the model. The high school size probabilities of those choosing private schools had small variance, but the Portland area location had a relatively high weighting for this sector. Students from small high schools were relatively

TABLE 70

Non-metric Segmental Model--Variables 9 and 10:
Area and High School Size

Level of Variable	Posterior Probabilities			
	Com. Col.	4-yr Pub.	Private	Sectarian
Area (County Groupings)				
1. Coastal	.362	.277	.287	.074
2. Willamette Valley	.345	.304	.231	.120
3. Portland	.298	.276	.357	.068
4. Eastern	.298	.426	.200	.075
High School Size				
1. Less than 100	.355	.319	.223	.102
2. 100 - 299	.322	.284	.297	.097
3. 300 - 499	.335	.306	.289	.068
4. 500 or more	.207	.420	.293	.080

more likely to select sectarian schools, while those from the largest schools picked the state system segment.

In combination, the descriptive variables included in these segmental models can be used to sketch general profiles of the kind of high school senior likely to choose each type of institution of higher education. The picture of the individual who tends to select a community college is the most distinct. Cost and distance are of primary importance in this individual's school choice. He or she seeks a level of training less than that reflected by a bachelor's degree, and has a high school grade point average of 3.25 or lower. The parents of this student are likely to be of mid to low socio-economic standing, living in coastal or Willamette Valley counties.

The profile of the individual prone to select a state system college includes a g.p.a. of 2.75 or better, aspirations to attain a B.A. degree, and relatively high socio-economic status. The choice of the particular school selected is apt to be influenced by friends and parents and the variety and availability of program offerings.

The private segment profile is similar to that of the four-year public school students in terms of high g.p.a. (3.00 and above) and high scoio-economic level. However, urban or suburban location, and college reputation and characteristics (such as size) also figure strongly in this description.

The outline of the individual who tends to choose a church-related institution is the least clear. The prime reasons for the choice will probably reflect parental influence and the particular atmosphere (characteristics) of this type of school. It is probable that the student's parents will be laborers, and that he or she attends a small high school. Cost considerations appear to be of little importance despite the low economic status of these students.

These profiles, while not completely definitive, are consistent with the segmental differences suggested by the use of traditional discriminant analysis and the regression results developed earlier. We now proceed to the application

of the conditional logit technique.

3. Conditional Logit Analysis of the Choice Between School Types

Our application of conditional logit analysis to the SRS data shares many of the shortcomings of previous attempts to apply logit analysis to studies of higher education demand. The SRS questionnaire was not designed to meet the exhaustive data requirements of a comprehensive logit analysis. The principal difficulty is that logit analysis requires information detailing each individual's relationship to every available choice alternative, not just the one which was selected. For example, in order to estimate the probability that a prospective student will choose school A, we need to know not only how much financial aid school A granted him but also how much school B offered him.

Our analysis follows the basic approach used by Miller and Radner (1975). We, however, specify three mutually exclusive choice alternatives--the three institutional sectors used in the earlier discriminant analysis. The SRS contains no responses from non-students and opportunity cost data is not available for students.[29] We must therefore assume that the individuals in our sample have already decided to attend some post-secondary institution and are now only concerned with the decision of which school (and thus sector) to attend. The primary weakness of Miller and Radner's SCOPE[30] data is the lack of

[29] Miller and Radner assume the opportunity cost of post-secondary school attendance is zero.

[30] School to College: Opportunities for Post-secondary Education

adequate information on potential financial aid resources of prospective college students. The attempt of our analysis is to incorporate the extensive information on student financial resources contained on the SRS into part of a conditional logit model of Oregon higher education demand.

Roughly one-half of the SRS questionnaire concerns student financial aid resources. To include a financial aid variable into the logit model, however, we need to generate not only the aid received in the student's chosen sector but also the aid the student would have received in those sectors which were not chosen. This latter aid information requirement cannot be met directly by the SRS or any other conventional questionnaire. We thus estimate the potential aid which the student would have received in the non-attended sectors from parameters derived from a regression on attendees in each sector. We judge potential aid received at different schools within each sector to be equal since:

1) cost factors within sectors are similar,
2) the institutional resources within sectors are similar,
3) awards seem to be based on similar decision criteria (i.e., financial need).

Thus, the general outline of our research in this section is:

1) specification of a $ figure for financial aid received by each individual in his/her chosen segment,
2) regression of financial aid received on variables common to all individuals in the sample, and
3) use of these estimated aid figures in a general conditional logit model.

a. The Data for Aid Regressions

As described earlier, the SRS elicited financial resource responses in 28 specific categories and 5 general (cumulative) classifications. (See the survey form in Appendix B.) The responses for the 28 specific categories are in range form. The five general responses are continuous figures. For the purposes of the logit model, our definition of financial aid received includes the two work study categories under "employment and savings," all the grant categories except "other grants," all the loan categories except "other loans," and the "welfare" category of "benefits." The type of aid found under the "other" categories frequently is not need related. It could be such things as sports scholarships or scholarships which are awarded because the student met some specific non-need requirement (the winning of a beauty contest or a special interest competition, for example). Examination of our data records also seems to indicate that some of the responses in these two categories (especially "other loans") describe resources used for non-educational purposes (car loans or even home mortgages). The "welfare" category is added to aid in the sector estimation regressions because current Oregon practice is to subtract any financial aid received dollar-for-dollar from welfare benefits.

The categories we wish to include in our financial aid variable cut across the general classification divisions. Generation of a continuous figure for financial aid received thus requires a continuous figure for each specific category of aid. This is done by "dividing up" each continuous general classification figure into each of its specific categories in a manner consistent with the range responses for each individual. The specific method dictates that the same percentage of each indicated range is filled up while

insuring that the sum of all the categories within a general classification equals the total given for that classification.[31]

Although the data processing gymnastics required by the data format may seem unfortunate, it does provide one important external advantage. All records are checked for internal consistency within each general classification. If a continuous general classification figure is lower than the sum of the range minimums or higher than the sum of the range maximums for the appropriate specific categories, then the responses are judged inconsistent. These inconsistencies are resolved in various ways. If minor, the general classification figure is assumed correct and categories are assigned continuous data reflecting the same relative distribution as the range response but with an absolute sum equal to the general continuous response. Some cases can be explained by reference to other questions on the survey. Records with unexplained large divergences are discarded. In any case, this consistency requirement provides an excellent check for data transcribing and other errors. We thus feel that

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[31]For example:

Category	Range Response	Generated Continuous Figure
NDSL	4	600 + (1/4)400 = 700
LEEP loan	0	0 + (1/4) 0 = 0
Guaranteed loan	2	200 + (1/4)200 = 250
Institutional loan	0	0 + (1/4) 0 = 0
Other loan	2	200 + (1/4)200 = 250
Total loans	1200	1000 + 200 = 1200

$x(400 + 0 + 200 + 0 + 200) = 1200$

$x = 1/4$

our data on personal experiences is as accurate as is possible for this type of questionnaire.

The raw personal income figure (SRS question 50) is also revised for this study. Problems with this response seem to arise from two sources.

1) Despite the parenthetical instructions included in the question, respondents seem to differ markedly about what resources they chose to include in personal income. Work study income and the various benefits seem to be included in some cases and not in others. We assume the personal income figure is correct unless the sum of the spouse's contribution, the resources from employment, and total benefits is greater than the income figure.

2) The personal income is requested for the calendar year 1973 while the desired figure is for the 1973-74 school year. This causes a problem with students who recently quit jobs to go to school or who have recently changed marital status (particularly if recently separated or divorced). Little can be done to correct the former problem. However, since the potential error in income estimation of divorced or separated persons is so large, we assume that the sum of the resources mentioned in 1) above are correct no matter what response is given to question #50.

In any case, after a basic income figure is determined, we add "other grants" and subtract "welfare benefits," and work study aid to arrive at the final personal income figure used in the aid regressions.

b. The Aid Regression

Four aid regressions are summarized in Table 71. The first two columns of results represent different regressions for dependent and independent students of state system institutions. Theoretically, the determinants of aid for these

Table 71

Coefficients for Financial Aid Regressions, by Student Type and Institutional Sector

	Dependent Students	Independent Students		
	State System Schools		Community Coll	Private Univ
Independent Variables	Total Aid Coefficients	Total Aid Coefficients	Total Aid Coefficients	Aid-Loans Coefficients
(log) Parental income	-117.6 (-2.592)			
(log) Personal income	-153.2 (-4.128)	-531.21 (-11.294)	-368.28 (-8.080)	-565.34 (-4.301)
Married (1 = yes)		299.17 (3.324)	225.93 (1.844)	391.32 (1.472)
No. of dependents		154.10 (2.692)		
Applied for Aid (1 = yes)		484.58 (6.179)	579.95 (5.295)	
State resident (1 = no)	355.0 (1.848)	538.09 (4.431)		
Extra cost of attended school				1.1198 (3.768)
Live at home (1 = yes)	-261.8 (-1.556)			
No. of siblings in college	- 93.50 (-.8351)			
Age (in ranges)	75.143 (1.413)	91.015 (2.487)	62.481 (1.910)	-339.86 (-2.322)
H.S. GPA (4.00 = top)			-87.097 (-1.910)	
Intercept	3004. (5.847)	3863. (9.092)	2908. (6.840)	6888. (5.274)
Degrees of freedom	99	265	184	26
Corrected R^2	.2180	.5397	.5035	.4660

t = statistics are in parentheses

* = significant at the .05 level

** = significant at the .01 level

two student types should be vastly different. Independent students are defined to be those who receive less than $500 from their parents, are married or are at least 21 years old, and do not live at home. The aid estimates for independent students are markedly more successful. We attribute this success to the qualitatively better information we have on personal resources--theoretically the primary determinant of aid for independent students. In contrast, our data on parental resources--theoretically the primary determinant of aid for dependent students--is weak. The available parental income response is a student-reported figure and thus is of less certain value. Further, no checks of the parental resource figure were available to us. Thus, for the purpose of this section of the study, we confine our analysis to independent students.

The last three columns represent regressions for independent students of the three higher education sectors. These results are interesting in their own right. In considering them, please note the following:

1) The dependent variable in the private university regression is total aid minus loans (that is, grants plus work study).[32] Private university regression attempts using total aid as the dependent variable simply did not work. We attribute this failure to the dominance of loans in total aid to private university students. Loans (not counting "other loans") account for 58% of total aid to our sample of independent private university students. Loans constitute 45% and 26% of aid to independent state system and community college students, respectively. More significantly, the average loan held by

[32] No independent private university students in our sample received welfare income.

all independent private university students in our sample is a whopping $894.[33] The comparable figures for independent state system and community college students are $208 and $117 respectively. When loans are required in large magnitudes, it seems reasonable that they will not be viewed by the recipient in the same light as other forms of financial aid. By imputing a cost to their loan obligation, some private unitersity students may choose to accept a lower amount than their financial need would qualify them for. This would be particularly true if need requirements are less strict on loans than on other forms of aid, thus allowing greater leeway for personal choice in the amount of loan aid received. In any case, even if the total aid including loans had proved estimable for private university students, its use in our conditional logit analysis would be suspect. Since loans are a much larger part of private university aid, total financial aid to private university students does not constitute as much a reduction in perceived cost as the raw numbers suggest. Thus, in our logit analysis, we somewhat arbitrarily estimate total perceived financial aid to independent private university students to be 3/2 times the estimate for grants plus work study.

2) The positive coefficient on the state resident variable indicates that non-residents receive, other things equal, about $538 more aid than residents. This is presumably due to the much higher tuition fees charged non-residents. A residence variable could also be included in the community college regression (1 = out of CC district). This changes the other parameters slightly and reveals that, other things equal, about $273 less aid

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[33] That is, $894 = total loans (minus "other loans") divided by the total number of students, whether they received aid or not. Some students put together loan packages exceeding $3,000.

(t-statistic = -1.564) goes to out of district residents. This variable is omitted in the final regression because, for in state students, it relates more to a student's decision to attend a particular community college than it does to the decision concerning which type of school to attend. Out of state residence proves insignificant to private university aid.

3) Tuition costs at individual community colleges and state system institutions are virtually identical within their respective sectors. Tuition at private universities varies widely. Thus, a variable defined as the deviation of actual tuition paid by the individual student from the mean tuition for all private university students[34] is used to correct the aid regression for differences in private university costs. The estimated coefficient (1.1198) indicates that slightly more than one dollar is added to aid for every dollar of additional tuition cost. This variable is eliminated in the estimation of aid for our conditional logit analysis since mean tuition is used as the cost variable for the private university sector. Thus, the deviation is always zero.

4) The age variable is in the ranges specified by the SRS questionnaire. Other specifications do not yield any better results. We originally included this variable with the thought that older students might be more aware of financial aid opportunities and/or more experienced at obtaining aid. The significance of the age variable using the ranges specification seems to confirm this expectation for state system and community college students. The significant negative coefficient for private university students seems to indicate either that age is correlated with some other variable which

[34]The mean tuition for private university students (weighted by attendance) ≈ $2,300.

influences aid or that private universities prefer to grant more aid to younger students.

5) The high school GPA variable was originally included to determine whether schools competed for higher ability students by offering them more aid than other students. One of our preliminary private university regressions seemed to confirm this expectation. When the tuition deviation variable was added, however, the GPA variable became insignificant. This is due to the not surprising fact that high GPA's and attendance at schools with high tuition costs are strongly correlated. We can only wonder about the reason for the negative coefficient in the community college regression.

6) The applied-for-aid variable is set equal to one if the response to question #52 on the SRS is anything other than zero. A theoretical problem for our conditional logit analysis arises here in that non-application for aid to attend a low cost school does not necessarily imply that a student would not apply for aid at a higher cost school. Fortunately, this problem is largely averted because the applied-for-aid variable is insignificant in private university aid estimations and is thus omitted in the final private university aid regression. Furthermore, the cost differences between community colleges and state system schools are large enough to induce a significant increase in state system aid applications from independent non-applicants for community college aid.[35]

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[35]For dependent students, these cost differences may be large because switching from a community college to a state university often implies moving away from home.

c. The Logit Analysis Variables

The goal of our analysis is to arrive at an estimate of the probability that a student's college choice will fall into each of the three available higher education sectors (community college, state system, private universities). We specify this probability to be a function of certain observed independent variables:

$$\log\left(\frac{P_i(cc:A) = \{cc,ss\}}{P_i(ss:A) = \{cc,ss\}}\right) = a + b_1\left(\frac{C_{cc} - FA_{cc,i}}{I_i} - \frac{C_{ss} - FA_{ss,i}}{I_i}\right)$$

$$+ b_2\left([GP_i - GP_{cc}]^2 - [GP_i - GP_{ss}]^2\right) + \ldots$$

That is, the log of the odds between any two alternatives is a linear function of the observed independent variables, as specified above.

The first independent variable is similar to Miller and Radner's cost-to-income ratio. The difference, of course, is that estimated financial aid is subtracted from the student's perceived school cost. The cost figure used here is the average basic educational cost (tuition and fees plus books) for the sector. The hypothesis involved in this variable structure is that the odds between any two sectors are a function of the difference between the financial burdens imposed by attending the sectors. We expect b_1 to be negative--the more the state system burden exceeds the community college burden, the greater the likelihood of the choice of the community college.

Although the second independent variable looks different than Miller and Radner's achievement interaction variable, it is very similar. The mathematical form used reduces readily as below:

$$(GP - GP_{cc})^2 - (GP - GP_{ss})^2$$

$$= GP^2 - 2GPGP_{cc} + GP_{cc}^2 - GP^2 + 2GPGP_{ss} - GP_{ss}^2$$

$$= -2\left\{GP(GP_{cc} - GP_{ss})\right\} + GP_{cc}^2 - GP_{ss}^2$$

The expression in braces is the same functional form as Miller and Radner's achievement interaction variable with GPA substituted as the measure of achievement. We expect a negative coefficient for this term, indicating that students with large GPA's prefer private schools to state schools and state schools to community colleges. Alternatively, students with small (lower) GPA's prefer the reverse. We do not stratify our sample by ability. We have no work option and thus cannot attempt to replicate Miller and Radner's finding that within low ability groups the higher ability persons prefer work. Also, admission standards at all state system schools and even some private universities in Oregon are not so strict as to bar entrance to prospective students on the basis of ability alone.

The results of the logit estimation are summarized in Table 72. Overall, the conditional logit model correctly predicts the educational sector choice of 44.4% of the individuals in the sample. This result should be assessed in light of the fact that 33.3% correct "predictions" could be made by chance alone.

Table 72

Parameter Estimates of Conditional Logit Estimation

Variable	Coefficient	T-statistic
Cost-Aid Income	.032	.028
Ability Interaction	-1.229	-1.668
Mode Specific Dummy (Community College)	-.375	-.808
Mode Specific Dummy (State System)	-.169	-.433
135 observations	86 degrees of freedom	44.4% correctly predicted

The ability interaction variable has the expected sign and its t-statistic is significant at the 90% level. This is essentially the same result as Miller and Radner achieved although our specification is slightly different.[36] The mode specific variables are similar to intercept terms in a normal regression formulation.

The financial burden variable with aid included is totally insignificant. This apparent divergence from Miller and Radner's result may be due to any or all of the following factors.

1) The existence of financial aid tends to lessen the cost difference between the three school segment alternatives, thus making the difference in cost itself less important in the determination of an individual's college choice.

2) The estimation of financial aid available to low income students has no upper bound. The aid estimation equation for private university students, for example, is derived from a sample of independent students which included no persons of extremely low incomes. Thus, estimates of the amount of aid that a low income person could have received at a private university are extrapolations of the line fitted to existing private university students. If there is some upper limit of aid available, then the effective burden of higher cost schools could be seriously underestimated by our model.

3) Our estimates of financial aid may involve so much error in themselves that any use of them in the conditional logit estimation is hopeless. This argument could, of course, apply to Miller and Radner's parental income figures,

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[36] Our specification of the ability interaction variable is $(GPA_{sector} - GPA_{ind})^2$ The conditional logit model operates on the differences between an individual's variables for each pair of alternatives. Thus, in our model,
(footnote continued on page 189 beginning at the top of the page)

footnote 36 continued

$$\log\left(\frac{Pcc}{(1-Pcc)}\right) = a_1 b_1([GPA_{cc} - GPA]^2 - [GPA_p - GPA]^2) + \ldots ,$$

where P_{cc} = probability of choice of a community college, given that only community colleges and private universities are available.

a_i = parameter of mode specific variable (community college)

b_i = parameter of ability interaction variable

GPA_{cc} = average high school GPA of community college students

GPA_i = high school GPA of individual student,

note that

$$(GPA_{cc} - GPA_i)^2 - (GPA_p - GPA_i)^2$$

$$= (GPA_{cc}^2 - 2GPA_{cc}\ GPA_i + GPA_i^2) - (GPA_p^2 - 2GPA_p\ GPA_i + GPA_i^2)$$

$$= GPA_{cc}^2 - GPA_p^2 - 2GPA_{cc}\ GPA_i + 2GPA_{cc}\ GPA_i$$

$$= \{GPA_{cc}^2 - GPA_p^2\} - 2(GPA_{cc}\ GPA_i - GPA_p\ GPA_i)$$

Miller & Radner's academic interaction variable is:

$\frac{}{1000}$ where A_i = SAT score of individual
S_i = average SAT score of students at school in sector j.

Now $\frac{A_i S_1}{1000} - \frac{A_i S_2}{1000} = \frac{1}{1000}(S_1 A_i - S_2 A_i)$.

Thus Miller and Radner's academic interaction variable is similar to our ability interaction expect that

1) we use high school GPA as the measure of ability

2) our specification results in the unimportant constant term in the braces ({ }) above

3) Our specification has the opposite sign and thus, to show the same relationship found in Miller and Radner, we expect a negative parameter.

although it may be more serious in our model since our aid estimations change the relative position of the three choices for each individual. This compounds the error, implicit in Miller and Radner's use of parental income estimates, that an existing constant cost difference between sectors may be misspecified.

4) The model itself might be specified improperly. Conditional logit estimation is extremely expensive. Budget limitations precluded further experimentations with other specifications of this variable and with other variables which theoretically could be significant.

VI. SUMMARY AND CONCLUSIONS

The quality and quantity of data on Oregon students provides the opportunity for extensive investigation of post-secondary educational choice. These data describe a system of higher education which consisted of 41 institutions and 160,072 students (107,534 FTE) in 1974. In addition, there were 152 private vocational schools with over 26,000 students enrolled in resident and correspondence programs. As the reader knows, we were unable to include the PVS students in our analysis.

We analyzed three distinct data sets--time series, Student Resource Survey, and high school senior survey data--and the results were interrelated and complementary. These data were examined in a variety of ways, including the use of simple crosstabs, ordinary least squares regression, discriminant analysis, a non-parametric classification procedure, and conditional logit analysis. Each approach had its own particular place in the overall analysis and each was selected for a specific purpose. For example, the development and use of the non-parametric classification procedure was prompted by an empirical imperative. We had a good deal of important qualitative data that we sought to examine: a non-parametric technique was our only recourse. Alternatively, a scientific curiosity motivated our interest in conditional logit. It is a relatively new technique and seems especially promising in analysis of choice situations. Other researchers in this area have not had available the important information on student financial resources which we possessed. Since such resources clearly influence decisions about and between schools, we hoped our data would enable a fruitful use of this technique.

In this chapter we summarize the conclusions from each of our separate investigations. Some synthesis of results will also be undertaken.

A. Reviewing the Crosstabs

This report contains altogether 82 pages of information on selected crosstabulations of the SRS data. Most of these explore differences between students in the three institutional segments of Oregon higher education--community college (or two year public), state system (or four year public), and independent (or four year private). We also contrast recipients of BEOG's and SEOG's, taken together, with non-recipient students. The information in these pages is descriptive of Oregon higher education and it lays an important foundation for the later econometric results. The crosstabs evidence differences by segment that help us interpret our other work. These differences can be briefly summarized.

First, recall that the SRS sample was edited to produce 1,654 observations, accurately apportioned among the three institutional segments. Sectarian and part-time students (i.e. those taking less than nine credit hours) were omitted, as were all private vocational-technical school attendees. Beginning with basic demographic characteristics for this sample, we saw that 5.9% of independent students are attending school while married, compared to 16.4% of state system and 28.6% of community college students. In our edited sample of undergraduates (i.e. a sample biased toward younger students), 32% of the community college students were over 24 years old. This 25+ age group comprised only 14.7% and 4.4% of the state system and independent student bodies, respectively. The veterans numbered 26.9% at

community colleges--eight times their proportion at private schools and double their representation in four year public schools. The three segments were very close in sex composition: in our sample, between 55-57% of their students were male and 44-47% female. However, they were very different, as one might expect, in their proportion of out-of-state students. A full 96.2% of our community college respondents were residents of Oregon at the time of admission to their present school. Of our four year public school respondents, 85.7% were also from in-state. But only 43.3% of the private school sample were Oregon residents at admission.

Of interest to state and local officials may be the fact that half of the Oregon students in our SRS sample attended a school in their own county. By segment the proportions of those doing so were 74%, community colleges; 25.3% state system schools; 44.2% private schools. Remember, though, that many students live in a community college district that embraces several counties. In this case they may go out of their county to attend a school in their C.C. district. In fact, 85.5% of our community college respondents were attending a school in their C.C. district.

Of interest to higher education officials in Oregon may be the surpising results on inter- and intra-segment transfers (Tables 13 and 14). The state system schools were receiving a larger proportion of transfer students, but more of these were from other state system schools than from community colleges. And the flow of students from two year to four year public schools was balanced by a nearly equal flow of students in the opposite direction. Only a tiny proportion of our community college and private sample had transferred to their present school from another school in the same segment.

Our examination of high school and college grades seemed to show that

Oregon's community colleges are providing increased access to post-secondary education. Among community college respondents, 30.4% had high school grade averages below 2.50. This means that they would not have met the (1974) minimum grade requirement for admission to the state universities, while 17.2% of them apparently fell below the 2.25 admissions standard (1974) at the state colleges. These differences in grades, and others which concern educational aspirations, turn up again in our discriminant analysis results.

We spent some time looking at the stated reasons for pursuing higher education: we predicted a relationship between the motives for school attendance and the sensitivity of demand to tuition changes. This relationship is not tested directly in our analyses, but we did find that consumption motives were much more prominent in the private segment and that this segment evidenced the most inelastic demand for education (to anticipate our regression results just a bit). This will be an interesting area for other researchers to explore.

A large number of the crosstabs presented cost and financial resource information by segment. To begin with, the SRS requested academic year budgets and we analyzed the responses in a number of ways. The three segments were very close on reported transportation, clothing, recreation, incidentals. However, total costs of schooling were greatly different--a mean of $2047 for community college students, $2546 in the state system, and $4097 for privates. The differences were attributable to segmental tuition levels. Thus while private school students tended to come from homes with higher average parental income (see footnote 22, p. 143), they maintained roughly the same school-year standard of living as did other students.

Turning to resources for schooling, we found that 10% of all under-

graduate students surveyed said they contributed nothing to their own support. (This figure includes 13.6% of the women and 6.9% of the men.) Alternatively, roughly 20% of all students were officially classified as self-supporting ("independent") students by their schools. Two thirds of the sample fell between these statuses: approximately one third said they contributed some toward their support but that the bulk came from their parents and another third said that they were primarily self-supporting.

If students were married, they typically received financial support from their spouse. However, the proportion of married students differed greatly by segment, as we have seen. To this support may be added that from parents. Far fewer parents of community college students contributed directly to school costs than did parents in other segments--25% for community college, 51% for state system, and 67% for private school students. Spouse and parental support together (i.e. "family support") helped to defray 47% of the total cost of schooling in the private segment, 36% in the state system and 30% in the community college segments. In turn, students across segments contributed rather uniformly to their own support: the total (mean) support available from employment and savings was $1356 for community college students, $1436 in the state system, and $1258 for private students.

The analysis of aid (i.e. non-personal) resources proved interesting. Students in private schools were disproportionately represented among the grant recipients and the borrowers. Tuition waivers and institutional grants emerged as a significant resource for these students, and they also reported a higher incidence of Federal grants. However, it was benefits that comprised the largest component of the financial aid package of community college students--both in terms of numbers of students reached and in

average dollars per beneficiary. When we summed aid from grants, benefits and loans, the differences between segments tended to wash out. In the total picture, aid dollars were important to a goodly number of students: about one half of all state system respondents received some kind of financial aid, while two thirds of both the community college and private samples did. Remember, too, that of those receiving some form of aid, 40% in the overall sample and 53% in the community college segment said they would either postpone or not attend school at all in the absence of aid. This speaks to the impact of aid on their enrollment decision, an effect which convinced us we should include financial aid as a variable in our regression analysis of enrollment demand over time. In addition, the presence of financial aid was seen to have an impact on their choice among segments and among schools within segments.

The SRS data was also used to learn more about Federal aid recipients: the 173 awardees in our sample were compared with 1192 respondents who reported receiving no BEOG or SEOG aid. The two samples were quite close in age and sex composition and in marital status. They differed somewhat when high school grades and degree aspirations were considered. However, a larger difference occurred with veteran's status: veterans were underrepresented in the aid sample.

The analysis of financial resources turned up sizeable differences. The mean parental income for recipients ($8907) was half that for the other group ($17,143). When we computed means for "family support" we got $726 for the aid sample and $1471 for the others. Considering the responses from those students who reported support from their own employment and savings, we derived a mean of $1598 for the non-recipients and $940 for the aided group. In all, we concluded that the BEOG and SEOG awards are going

to those Oregon students who have a lower level of personal resources available for schooling.

If our financial resource information is accurate, this "personal resource gap" is closed by a variety of state, federal and/or private aid monies. About half the BEOG/SEOG groups, compared to 20% of the non-recipients, reported taking out loans during the 1973-74 school year. The two groups were closer on benefits: 20% of the Federal aid sample reported benefit dollars while 27% of the other group did. Grants were the critical factor. The aid group (all of them grant recipients, by definition) received an average of $898 in grant monies. The average [illegible] award ($801) was about the same for the non-BEOG/SEOG group, but only 24% of them received such monies.

When total financial resources were examined, those of the aid group stood at 82% of those reported by the non-recipients. We then compared total resources with total costs and determined that the sample of non-aid students overrealized their financial needs by 20%, the aid group by 3%. The latter group confirmed how close to the financial edge they were when 62% said they would not have gone to their present school had they not had financial aid. In fact, 60% felt they would not be attending school at all, at present, without aid.

B. Examining the Decision Whether or Not to Attend College

We collected time series information on post-secondary enrollments, prices and eligible population, along with local and national economic conditions and alternatives to school. These were used to estimate an

equation representing demand for higher education in Oregon, during the period 1960-1974. The first set of equations dealt with freshmen enrollments. It was found that price increases negatively influence enrollment demand while growing per capita income, unemployment and eligible population affect enrollments positively. An institutional variable representing draft pressures, as measured by the number (in thousands) of 18-21 year olds in the Armed Forces, also appears to have positively influenced enrollments over the past fifteen years.

These results are consistent with economic theory which stresses the importance of opportunity costs in people's decisions among activity options. Opportunity costs in this model are represented by the unemployment rate and draft pressures. An increase in either of these variables represents a decrease in available alternatives and thus a reduction in the opportunity cost of college attendance. Although we had hoped to be able to include hourly earnings of Oregon production workers as a proxy for increasing opportunity cost, this was not possible because of the close relationship between per capita income and hourly earnings over time and the problem of multicollinearity which results.

The total equation (5.2) successfully accounts for most of the variation in enrollments over the period 1960-1974. However, we felt that the aggregation involved in looking at total freshman enrollments tended to obscure potential differences in the demand for various types of colleges. Our earlier work with crosstabs certainly pointed to differences among student bodies in the three segments. So we attempted to look at segmental demand equations based again on our time series data. This effort proved interesting insofar as the variables used to estimate demand retained

the hypothesized signs. However, collinearity among the "independent" variables was extreme and as a result of this violation of an important statistical condition of ordinary least squares estimation, confidence cannot be placed in the absolute size of the coefficents obtained. However, it is not illegitimate to consider their relative size from one segment to another. When we did this we concluded that enrollments at community colleges are more sensitive to changes in the explanatory variables than are enrollments at public or private four year schools. In the case of every variable, the coefficient, which is directly interpretable as an elasticity of demand, is substantially larger for the community college equation. This equation also worked fairly well--retaining significance in the coefficents on income, deferment pressures, and eligible population and accounting for most of the variation in freshman enrollment over the 1960-1974 period. Many of the crosstab results suggest reasons for these segmental differences in enrollment elasticities: differing motives for enrollment, varying financial resource and parental income levels, and diverse age and marital profiles which likely imply divergent family and economic responsibilities between student groups. Few researchers have had the data to investigate demand for education by institutional segment. Our results clearly indicate that there is a need for this kind of disaggregation in future work.

Because financial aid loomed large as a factor influencing enrollment, we undertook an extension of our time series analysis to include state and Federal financial aid. The equation (5.3) was estimated for total, undergraduate enrollments in all three segments. (Our Federal financial aid data did not permit a disaggregated investigation of demand by segment.) Financial aid turned out to be the most significant variable in

this formulation, had the expected positive sign and was inelastic with respect to enrollment demand, as we might expect. Our results for aid are suggestive only; they are far from complete as we were unable to incorporate data for benefits or for any insitutional or private grants and loans. These are important sources of aid--critical for private school students--and their omission means that our regression results underestimate the importance of aid.

In all, the inclusive set of regression results supports the belief that enrollment demand tends to be price inelastic and income elastic. In addition, the rate of unemployment, size of the military draft, number of high school seniors, and amount of available financial aid were all positively related to enrollment demand. However, of these, all but the variable representing eligible population had coefficents which were inelastic.

We sought to further understand the enrollment decision by analyzing the post-secondary plans of Oregon high school seniors. A non-metric discriminant technique was used with cross-sectional survey data, gathered from students graduating in 1975. We developed profiles of 4,000 students planning to attend an institution of higher education vs. some 4,000 choosing a non-school alternative. Eight variables were selected for use--high school G.P.A., parental occupational and educational levels, type of high school program, high school size and location. Using the differences in responses of the two classes of students, the non-metric model correctly predicted over 70% of the enrollment decisions made by these 8,000 students.

The best single predictor of intended college enrollment was the variable for grade point average. The results for this and the remaining variables seemed to confirm our general notions about the kinds of young people who are likely to enroll in college. Thus, the potential enrollee

would tend to have a high school grade point average of 3.25 or better; have parents of mid- to high socioeconomic status (as indicated by occupation and education levels); and be attending a larger, urban high school where he or she is enrolled in a college preparatory curriculum. An individual with lower grades and socioeconomic status, and attending a small rural high school is more likely to pursue an immediate work alternative than to continue schooling.

C. Looking Further at the Choice Among Institutions of Higher Education

We were intrigued by the differences between segments which surfaced again in the time series analysis. To look further at these differences we analyzed two cross-sectional surveys--the 1974 SRS and the 1975 survey of high school seniors. The results of traditional and non-parametric discriminant analyses of this data offered some interesting further comparisons of student characteristics among segments. The conditional logit analysis, meanwhile, provided additional information about the effect of financial aid on the choice between segments.

Discriminant analysis of the Student Resource Survey data revealed differences in the financial positions of students attending two-year and four-year public schools and private colleges (ranged from lowest to highest in terms of resources). Community college students reported average parental income and total resources below the sample mean, and appeared the most likely type of student to be receiving food stamps. Non-metric discriminant analysis of post-high school plans reaffirmed these patterns by demonstrating the likelihood of low parental occupational status and educational levels of students planning to enroll in community colleges.

Furthermore, students planning to attend schools in this less expensive segment reported that cost and distance were their primary choice considerations. Distance represents an important component of cost, not only in terms of dollar distance of commuting to school, but also as it offers the option of living at home and thus reducing direct expenses.

Academic ability (as measured by high school grade point averages) also appeared lower for individuals attending or planning to attend community colleges than it did for average students in the other two segments. Grade points of those planning to attend private schools were generally the highest of the three segments. This may be a reflection of relatively greater selectivity of certain private schools. These high ability rankings were found in conjunction with high parental income and socioeconomic status. Given greater ability to pay, cost and distance are less influential in the school decision process for those planning to attend a school in this segment. Individuals reporting that school reputation and characteristics (size, etc.) were the most important reasons for selection of their first choice school were likely to attend private colleges.

Academic aspirations also appeared to differ among choosers of the various segments.[1] Relatively high aspirations (i.e. plans for graduate study) were exhibited by those who tend to select the private schools, while an individual intending to obtain a bachelors degree was most likely to select a four-year public school. The low and uncertain aspirations of those selecting community colleges may reflect the different type of program offered by these schools (i.e. two-year and vocational or technical certification). This need not be the total explanation, however, since it is quite possible to obtain two years of undergraduate training at a community college and later transfer to a four-year school offering a

[1]Miller and Radner (1975) report a similar finding.

B.A. and more advanced degrees. A partial explanation of the stated lower aspirations may relate to the previously noted observation that students from working class families are likely to select community colleges. Recent sociological research has suggested that working class individuals may view their opportunity set as severely limited and these limitations may be rationally reflected in lower personal aspirations.[2]

Not all variables examined showed differences among segments. A sex variable, when included in the linear discriminant functions, did not serve to increase the power of discrimination among school types. Profiles of high school seniors who planned to attend versus those who planned to pursue other activities were developed separately by sex. The profiles were quite similar in nearly all the variables. However, the switch-over point (.5 posterior probability) for attending college occurred at a higher level of grade point average for women (greater than 3.25) than for men (greater than 3.00). Also, parental education levels appeared more important in predicting women's continuance of education than the same decision by men. It would be interesting to examine data from an earlier time period to ascertain if more definite patterns could be developed according to student's sex.[3]

Like Miller and Radner, who also included sex as a variable in some of their formulations, we found no notable differences in our results when our data was partitioned by sex of respondent. The two exceptions to this occurred when we examined educational aspirations and personal

[2]See Sennett and Cobb (1974). Also see footnote 10, Chapter V.

[3]The data on Oregon students which would allow us to do this is not available for years prior to 1972.

financial resources. In our SRS sample, 15% of the men and 7.3% of the women said they planned to obtain a Ph.D. And the proportion of married women who have such plans is tiny--2.2%, compared to the 8.1% of married men. When we examined means for family support we found that women students (except in the community college segment) received, on average, 25% more money from their families than did men. In all three segments women students reported less money available from their own employment and savings than did men. The differences between own support dollars ranged from 41% in the private segment to 65% in the state system segment. Clearly, there is a trade-off here between own support and family support.

The differences between men and women in terms of educational aspirations and in financial resources from their own employment undoubtedly reflect patterns of discrimination against women in the larger society--in role socialization and expectations and in labor markets. If this discrimination is compounded in the process of acquiring a college education, our data would not likely demonstrate it.

Distinguishing students who planned to or who were attending sectarian schools based on the information available proved quite difficult. These students appear to combine low parental income with high cost educational institutions--in other words, they present an anomaly and confound our quantitative techniques. This pattern apparently evidences a desire to purchase a specialized product, for which public education is not a close substitute. Students choosing to attend church-related schools tended to identify parents' wishes and school characteristics relatively often as their choice criteria. Cost was chosen as an important reason by only one individual in a sample of over a hundred persons! Although indivduals

choosing this segment were different in certain aspects of their profiles, there is substantial segmental overlap in certain characteristics such as socioeconomic status and grade point averages. As a result, sectarian students are most difficult to detect. There were also some similarities between two- and four-year students attending public schools, and between those who plan to attend four-year public versus private schools. Neither the model based on the SRS, nor the one estimated on post-high school plans, however, has much difficulty distinguishing private school students from those choosing community colleges.

VII. POLICY IMPLICATIONS AND RECOMMENDATIONS

First, the policy minded reader is cautioned that in drawing implications and recommendations from this study, the structure and limitations of the data should be kept in mind. For example, some parts of the time series analysis deal with freshman rather than total enrollments. Further, in the case of community colleges "lower division collegiate" enrollments were studied. These are (freshman and sophomore) enrollments in coursework which is comparable to that offered by four year public and private schools--coursework carrying credits transferable to these institutions. Thus, the time series does not address the question of the changing mix of vocational-technical, night school, non-credit, and academic coursework in community colleges over time. An adequate study of this and related questions would require data on private vocational and technical schools as well as on the changing composition of student bodies and course offerings at both two and four year schools. However, we did estimate an equation for total enrollment and compared it with both our work (on freshman enrollments) and the work of others. When examining and using the regression results, then, the reader should note the particular dependent variable being employed as well as the data qualifications which apply to the equation.

The discriminant analysis based on Student Resource Survey information also applies to a limited population. The community college sample does, in this case, include individuals enrolled in vocational or technical coursework as well as those earning college transfer credits. However,

the responses included are those of resident undergraduate students taking nine or more hours of classwork, thus excluding part-time individuals in all segments. Additionally, as before, the portion of the student body enrolled in community college evening courses such as pottery making, judo, folk dance, etc. (officially referred to as non-reimbursable students for budgetary purposes) is not captured in this analysis. These data criteria are the same for the crosstabulations and conditional logit analysis, both based also on SRS data, except that the samples used here are not limited to Oregon residents.

We do not consider the various emphases of the data used to be a weakness of the study. However, in interpreting the results it is necessary to keep in mind the population from which the data is drawn and to which the subsequent analysis thus pertains.

A. Prices, Equity, and Efficiency: Some Policy Implications of the Regression Elasticities

The enrollment demand equations estimated on time series data confirm the theoretical belief in the relevance of certain economic and institutional factors in determining educational choice. Of the variables used in our formulations, some are more accessible to certain groups of policy makers than are others. For example, the Oregon State Board of Higher Education has direct control over the level of tuition in the state system schools and can influence the size of the eligible student pool through manipulation of entrance requirements. Likewise, local school boards can affect price and eligibility considerations at community colleges. As administrators at many individual schools around the country have realized,

they can also affect enrollments at their institutions by altering enrollment procedures and class hours for groups that have not traditionally attended college--middle-aged housewives or workers, for example. Thus while our equations included a variable for the eligible pool of attendees based only on high school graduates, the size of this potential pool is also amenable to some purposeful manipulation. Unfortunately, the remaining regression variables are considerably less tractable to policy at the state or local level. We are talking about per capita income, military draft policies, unemployment, and to some extent financial aid. This puts higher education in a relatively vulnerable position, as the last seven years have clearly shown.

We intend to talk about federal policy, in the specific matter of financial aid, later in this section. But for purposes of the present discussion we will confine our attention to the one factor most manipulable by state and local officals--tuition and fees.

Our regression results lend support to an already large body of evidence (Jackson and Weathersby:1974) that enrollment demand is price inelastic. The price responsiveness of enrollments should be of particular relevance to policymakers in this period of increasing stringency in the financing of higher education. Tuition and fees are a policy tool which is directly accessible to the state decision makers. The own price inelasticity of enrollment demand suggests that if tuitions are increased, ceteris paribus, total revenues collected will increase even though enrollments will be negatively affected. This effect is predicted for all three of the institutional segments in Oregon, although its magnitude would vary

by segment. Simply noting this effect, however, does not address some of the important distributional issues. Who are the students whose enrollment will be discouraged by higher prices?

The cross-sectional analysis, together with segmental equations, sheds some light on this question. The students with the most elastic demand are those with the lowest income and financial resources at hand. They tend to come from families of low socio-economic status as reflected by parental occupations and educational levels. These individuals are the least likely to attend college in the first place (ceteris paribus), and also the most likely to report cost as their most important decision criterion. To the extent that higher education contributes to individual economic and social mobility, increased prices (reduced access) without an offsetting increase in financial aid to low income individuals, can be expected to contribute to the maintenance of the existing class structure.[1]

It is possible, of course, for price increases to work in a manner which would tend to redistribute income in the direction of greater income equality. This would occur to the extent that financial aid is provided to lower income students to offset a general price (tuition) increase. Proponents of full-cost tuition pricing appear to have just this role in mind for financial aid.[2] An efficiency criterion forms the basis for their

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[1]It is not the purpose or intent here to enter the debate regarding the varying value or contribution of education to individuals.

[2]See Christopher Jencks, et al., Education Vouchers: A Report on Financing Education by Grants to Parents, prepared by the Center for the Study of Public Policy, Cambridge, Massachusetts, March, 1970; and John E. Coons, William H. Clune III, and Stephen D. Sugarman, Private Wealth
(Footnote continued on next page)

concern that the present differentials between the relative prices of school segments are quite arbitrary and destructive of the proper allocative role of competitive pricing. They suggest that all public schools charge tuitions that represent the full cost of instruction.[3] However, a change to full-cost pricing would have large distributional effects. And a concomitant concern for equity moves the full-cost tuition proponents to an advocacy of a greatly expanded program of need-based financial aid to individuals. In this way access to higher education would not be contingent upon family or personal income, while choice among schools would not reflect the inefficiency now occasioned by state subsidized prices.

In this context it is interesting to look more closely at relative segmental prices of Oregon schools, currently and historically. Table 73 displays annual levels of tuition and fees by segment, adjusted by the consumer price index, for 1960-1974. The real (weighted) price of community college attendance has fallen 29% overall during this period, having

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2 Cont. and Public Education, Cambridge, Massachusetts: Harvard University Press, 1970, for a detailed analysis of the equity and efficiency implications of full-cost pricing coupled with vouchers in the public schools. The 1972 Report to the Board of Higher Education, State of Illinois, by the Commission on the Financing of Higher Education, examines the implications to the State's students and schools of a move to full-cost pricing and increased, need-based aid to individuals in higher education.

[3] This cost can be calculated in several ways, combining varying components of gross institutional budgets. However, a kind of consensus has evolved about what items should rightly be included in "instructional cost," and by this definition the segmental tuition levels in Oregon schools evidenced the following relationships to total instructional cost in 1973: community college tuitions, 17.5%; state system tuitions, 25%; private school tuitions, 81%. (Source: HEGIS data for Fiscal Year ending 1973.)

declined in ten of the fifteen years examined. During this same time, state system tuitions have increased overall by 35%, in real terms, while actually falling in eight particular years. Meanwhile the real price of an education at a private school in Oregon has increased by 77%.

TABLE 73

Weighted Average Annual Tuitions and Fees (Real Terms)
In Three Institutional Segments

YEAR	COM. COL.	4-YR PUBLIC	PRIVATE
1960	$ 276	$ 299	$ 810
1961	280	296	853
1962	276	322	954
1963	270	354	985
1964	262	349	1074
1965	229	343	1120
1966	215	333	1202
1967	204	363	1289
1968	211	350	1304
1969	202	369	1442
1970	205	351	1441
1971	215	415	1461
1972	218	408	1483
1973	209	423	1486
1974	197	405	1435

Shifts in relative prices can be expected to result in changing segmental enrollment patterns. Although we were unable to estimate cross

price elasticities due to extreme collinearity among the prices, theory suggents that a price increase will prompt some consumers to purchase substitute goods. A declining price for one good (e.g. community college education) will cause subsitution in favor of that now relatively less expensive good and away from the now relatively more expensive alternatives. It seems clear that the very substantial differences in relative prices between segments at any particular point in time as well as the changing relative prices (in favor of the new two-year schools) account for some measure of the enormous growth in community college enrollments in Oregon. Thus, more than a change in taste or the availability of a newly differentiated product is evidenced by these growing enrollments. In the setting of public school tuition and fees, the State has encouraged a shift in enrollments away from the four-year and to the two-year public institutions.

These secular changes in relative prices between segments also have distributional effects. Since students attending four-year public schools tend to have higher parental incomes and less elastic demand, increases in prices for that segment will tend to have a less regressive effect than would equivalent increases for the community colleges. Thus, decreases in prices for the community college segment will tend to be relatively progressive in their distributional impact. None of this is intended to suggest that one particular policy of pricing be exercised over another. Our purpose is to help make explicit the efficiency and equity implications of the secular changes in relative segmental prices in Oregon. In historical terms, there have been distributional effects of pricing policies in the state's educational system. Were these effects intended?

The remaining variables in the regression analysis deserve some further interpretation. The present general economic downturn, through its reduction in student ability to pay, is expected to have an additional dampening impact on enrollments. This effect should prevail although in the individual enrollment decision during any one term, reduced work options may cause some people to enroll in school. The draft variable can be expected to operate neutrally during the present use and maintenance of a volunteer army. However, our results suggest that historically there has been a positive net influence on enrollments due to an increase in size of the Armed Forces (i.e. a deferment effect). Thus, the decline in deferment pressures partially explains the recent decline in the rate of growth in higher education enrollments. It is possible that should the United States begin a military build-up in South Korea, the Middle East, or some other area of unrest, this variable might again exert positive pressure on enrollments.

It is tempting to turn the results of the foregoing data analysis to very specific policy use--for example, to predict the potential changes in segmental enrollments attendant upon some specific planned tuition change. This temptation should be resisted. It would be naive and quite illusory to employ the coefficients developed in the work in this specific and mechanical way. This is not only because of the collinearity problems which do influence the reported segmental results. In undertaking regression analysis it must be assumed that no major structural changes have occurred in the period under study. In using the results of such an analysis for purposes of prediction, we are further assuming that none will

occur in the near future. But in some years unpredictable changes in tastes will occur as may alterations in the economic climate or in the structure of the educational marketplace. Such changes as well as changes in variables not included in the model will likely not be captured by the researcher's analysis.

It is far more productive to reflect on what can be learned from the general relative differences between institutional segments and student populations, as developed in this analysis. In this context, the exact size of the coefficients does not interest us, but their direction and relative size does. We have tried to use them to draw profiles of the institutional segments which will make general policy impacts more obvious. There is nothing mysterious nor overly complex about the micro-economic questions of efficiency and equity in the financing of higher education. There is no reason why legislators and other policy makers should not deal with these concepts explicitly in deliberations about educational financing. We know that there is some sentiment in Oregon for legislative consideration of full cost pricing and voucher financing. We would like the debate over these financing alternatives to begin, and hope that our report will be of service in it.

B. Federal Financial Aid Policy

It seems to us that there are two basic questions the answers to which should inform financial aid policy at the Federal level. First, are the aid programs reaching the population for which they were intended? This question really breaks down into two parts. Does the recipient population

exclude groups that should be in it, and if so which? Second, how are the educational choices of individuals affected by the receipt of financial aid? We intended to examine the characteristics of the BEOG/SEOG applicant and recipient populations in Oregon, in order to provide answers to both parts of the first of these two general questions. However, Oregon officials told us that the U.S. Office of Education would not authorize release of the applicant files to us. A distinctly less satisfying alternative was to analyze SRS data for those respondents who were BEOG/SEOG recipients. This we did and some things were learned thereby, although far less than had our first course of action been allowed.

First of all, we can only provide a very general answer to questions about characteristics of the recipient population. The most important characteristic is that Oregon recipients need their grant monies to enable them to attend school. Three factors converge to make this clear.

1. For recipients, personal resources at hand are relatively low, about one-half those of the non-recipient sample.

2. Personal resources of recipients could not likely be called upon further to fill the apparent cost-resource gap. For example, in the absence of aid, only 3% to 5% of recipients reported that they would further utilize such personal resource alternatives as additional assistance from parents or additional school year and/or summer employment. Meanwhile 60% said that they would not attend school at present, implying that personal resources could not be stretched any further to enable attendance in the absence of aid.

3. Federal grants and state scholarships are the largest source

of (non-personal) financial aid for the recipient group we studied. These aid monies are substantial enough that they nearly close the cost-resource gap for those receiving them. (Loans help too.) All of this evidence suggests that the delivery of BEOG/SEOG aid dollars to Oregon students has been efficient.

Future research might examine the allocative process more intensively. For example, are there high schools, communities, counties or regions of a state (or regions within the U.S.) which are underrepresented in the applicant or recipient populations? If so, is this a problem of access to information about Federal grants? Additionally, a comparison might be made between BEOG/SEOG recipients and those receiving state or institutional grant monies, where the determination of need is based upon CSS (College Scholarship Service) evaluation of applicant financial forms. Our tentative impression is that this latter recipient group has higher parental income, on average, than do the Federal aid recipients. Is this intended, or a consequence of the process by which "need" is defined in each of the two cases (i.e. BEOG vs. CSS need criteria and evaluation)?

Remember, however, that a part of our results took a very broad look at financial aid in Oregon. The financial aid regressions (Section V-3) estimated level of <u>total</u> aid for approximately 500 financially independent students. The overall results were reassuring: they suggested a strong relationship between need and the receipt of aid. The coefficient on personal income was negative and very significant. This tells us that the lower a student's personal income (from all sources), the higher was the level of financial aid received. The relationship was a strong one for all three segments.

We have discussed, in other parts of this report, the impact of aid on the attendance decision of individual students. The crosstabs bore out the precariousness of school attendance for aid recipients and disclosed a substantial impact on the choice between schools due to aid offers. (Most recipients said they would not be attending their present school without the offer of aid.) This result is further enforced by the time series analysis wherein financial aid turned out to have the most significant coefficient in our equation estimating total higher education enrollments, 1960-1974. Obviously the bulk of the enrollments over this period were of students who were not receiving aid (hence the inelasticity of the coefficient). But we may interpret the significance of the coefficient to mean that for those who did receive funds from the rapidly growing aid programs, the impact on this enrollment decision was very important.

We have cited the relatively low personal resource levels of BEOG/SEOG recipients and the importance to them of aid, both in their decision to attend school and their choice between institutions. A further characteristic of the programs themselves interests us. As the reader of this report will know, many financial aid programs are institutionally based (e.g. College Work Study, National Direct Student Loans). Alternatively, the federal grants are given directly to individual applicants, to be used at the institution of their choice. This characteristic provides a great deal of flexibility. The flexibility, in turn, makes BEOGs and SEOGs a potentially powerful component in a financing system which stresses equity and efficiency. Efficiency considerations suggest that education

be priced at or near full cost. While a concern for equity directs our attention to the differential impacts of such a pricing policy--students with relatively low resource levels will be harder hit and likely prohibited from school attendance. A program of direct aid to individuals allows us to address our equity concerns directly and easily. A move to full cost pricing would greatly increase the cost-resource gap and, thus, the level of "need" for many students. Federal grant programs are structured to respond to this new and substantially higher level of individual need. The necessary programmatic change would be a much higher level of funding. But if Congressional support for these grant programs increases, and we hope it does, then the ability of policy makers to transform higher education financing will be enhanced.

C. The Funding of Future Research

The establishment of Educational Coordinating Councils in each state greatly increased the ability to carry out coordinated educational planning and research. We think the Councils can play a very important role in these areas. Unfortunately, there is no apparent process or structure to facilitate research between states. This sometimes results in duplicative effort and in activities that amount to inventing the wheel over and over again. For example, in the last several years a number of state Councils received NIE money to carry out basic data gathering projects on higher education. Reading through the eventual reports issued by each, one is struck by the similarity in problems, frustrations, and shortcomings experiences in each state's efforts. Some of this could surely have been

prevented had there been more shared information between states. An alternative approach would be to allocate money to a position within the NIE hierarchy, to be filled by someone who would act in a consultative capacity to state Councils or individual researchers, such as ourselves, who were undertaking research on higher education demand, financing, etc. There are a great many research mistakes that need not be repeated and positive lessons that should be. Several obvious lessons are suggested by our research on educational demand, for example.

1. Data on private vocational school students should be included in any time series or cross sectional study of demand for education.

2. Such studies should also include financial aid as a factor influencing demand for education; the omission of this variable in all studies to date causes a crucial inadequacy.

3. Sectarian school students should probably be separated from the non-sectarian; both are usually lumped together as private school students.

4. Student-reported data on parental income is of questionable reliability. Miller and Rodner's results were also plagued with this problem. However, we dissent from the prevailing notion, in the professionaly financial aid community, that students cannot accurately report their own costs and financial resources.

5. Information from high school seniors on what they are going to do after graduation is reliable and can be used for predictive purposes.[4]

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[4] The population of Oregon high school seniors is surveyed each Fall regarding their post-graduation plans. A follow-up survey is conducted one year later. The rate of consistency between plans (which are given in some detail) and actual behavior is about 80%.

This contradicts sociological findings on the inconsistency between what people say they are going to do at some future point and what they actually do.

In sum, NIE could play an important role in the coordination of research on education. Such a role is necessary and in its absence there is wastefully duplicative research at the state level.

We have a final research concern. The last year has seen an acceleration in the number of federally-funded research efforts which involve the use of conditional logit analysis. Our experience with this technique has convinced us of two things.

1. It is a powerful new approach to the study and prediction of individual choice. Obviously, there are a great many research situations where its use is compelling. The choice between schools, modes of transportation to work, occupational choice itself, etc.--each is amenable to a logit analysis.

2. The successful use of logit is highly dependent upon one's data. We find it difficult to imagine that any set of data is really adequate for the requirements of this technique unless it was collected specifically for a logit analysis. This is because it is necessary to have extensive information on a respondent's evaluation of alternatives in the choice situation being investigated. That is, of all the distinct options available to the chooser, which are under consideration and what are their characteristics? A logit analysis is complex, expensive, and fussy. It is also compelling because the technique can be so powerful. We hope that future projects proposing to employ a logit analysis are very critically

scrutinized in review by granting agencies. The major concern should be whether or not the researcher shows an understanding of the unusual data requirements of logit. Then the structure of the data itself should be assessed for closeness of fit with the technique's requirements. Professor Dan McFadden, University of California at Berkeley, or one of his assistants, could be helpful in these kinds of assessments.

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APPENDIX A

SCHOOLS INCLUDED IN 1974 STUDENT RESOURCE SURVEY

APPENDIX A

SCHOOLS INCLUDED IN 1974 STUDENT RESOURCE SURVEY

Community Colleges

Blue Mountain
Central Oregon
Chemeketa
Clackamas
Clatsop
Lane
Linn-Benton
Mt. Hood
Portland
Southwestern Oregon
Treasure Valley
Umpqua

State Schools

Eastern Oregon State College
Oregon College of Education
Oregon Institute of Technology
Oregon State University
Portland State University
Southern Oregon State College
University of Oregon
University of Oregon--Dental
University of Oregon--Medical

Private Schools

Columbia Christian
Concordia
George Fox
Judson Baptist
Lewis and Clark
Linfield
Marylhurst
Collegio Cesar Chavez
Mt. Angel Seminary
Multnomah Bible
Museum Art
Northwest Christian
Pacific
Reed
University of Portland
Warner Pacific
Western Baptist Bible
Western Conservative Baptist
Western Evangelical
Willamette

Proprietary Schools

Northwest College of Business
United Electronics
Salem Business College
Portland Secretarial School
Oregon Career Institute
Bassist
University Beauty College
The Bryman School
A'arts School of Beauty
Commerical Driver Training
North Pacific Dental/Medical
Trend Systems
Western Business University
Montavilla Beauty
Medford Beauty

APPENDIX C

COUNTY GROUPINGS

APPENDIX C

COUNTY GROUPINGS

Coastal Counties

Clatsop
Columbia
Coos
Curry
Lincoln
Tillamook

Portland Area Counties

Clackamas
Multnomah
Washington

Willamette Valley Counties

Benton
Lane
Linn
Marion
Polk
Yamhill

Eastern Counties

Baker
Crook
Deschutes
Douglas
Gilman
Grant
Harney
Hood River
Jackson
Jefferson
Josephine
Klamath
Lake
Malheur
Morrow
Sherman
Umatilla
Union
Wallowa
Wasco
Wheeler

APPENDIX D

VARIABLE WEIGHTS--GO VS. NO/GO

NON-METRIC MODEL

APPENDIX D

VARIABLE WEIGHTS--GO VS. NO/GO
NON-METRIC MODEL

1.	High School Grade Point Average	.13821
2.	High School Program	.13798
3.	Father's Education	.13034
4.	Mother's Education	.12756
5.	Father's Occupation	.12453
6.	Area	.11617
7.	Mother's Occupation	.11269
8.	High School Size	.11251

APPENDIX E

POSTERIOR PROBABILITIES OF SEGMENTAL NON-METRIC MODEL

APPENDIX E

POSTERIOR PROBABILITIES OF SEGMENTAL NON-METRIC MODEL
(Tables not included in Text)

Level	Posterior Probabilities			
	Com. Col.	4-yr Pub.	Private	Sectarian
Father's Occupation				
1. Skilled Labor	.388	.317	.189	.107
2. Semi-skilled Labor	.310	.310	.172	.207
3. Farm Labor	.333	.444	.222	.000
4. Small Business	.344	.338	.266	.052
5. Office Worker	.306	.210	.419	.065
6. Manager	.333	.303	.281	.082
7. Commission Sales	.271	.370	.309	.049
8. Professional	.198	.317	.396	.090
9. Non-earner	.356	.322	.271	.051
Mother's Occupation				
1. Skilled Labor	.435	.348	.217	.000
2. Semi-skilled Labor	.402	.268	.232	.097
3. Farm Labor	.000	1.000	.000	.000
4. Small Business	.387	.387	.226	.000
5. Office Worker	.347	.298	.266	.089
6. Manager	.282	.359	.359	.000
7. Commission Sales	.333	.333	.333	.000
8. Professional	.225	.355	.348	.072
9. Non-earner	.600	.200	.133	.067
10. Homemaker	.301	.314	.287	.098

Level	Posterior Probabilities			
	Com. Col.	4-yr Pub.	Private	Sectarian
Why Attend College				
1. Consumption Reasons	.249	.315	.353	.082
2. Investment Reasons	.342	.316	.256	.085
High School Size				
1. Less than 100	.355	.319	.223	.102
2. 100 - 299	.322	.284	.297	.097
3. 300 - 499	.335	.306	.289	.068
4. 500 or more	.207	.420	.293	.080
Father's Education				
1. Less than H.S.	.386	.343	.199	.072
2. H.S. Graduate	.423	.255	.223	.098
3. Business or Techn.	.313	.388	.224	.075
4. Some College	.253	.346	.313	.088
5. College Graduate	.218	.355	.355	.073
6. M.A. - Ph.D.	.159	.312	.447	.082
7. I don't know	.500	.293	.121	.086
Mother's Education				
1. Less than H.S.	.421	.262	.243	.075
2. H.S. Graduate	.354	.320	.235	.090
3. Business or Techn.	.343	.353	.284	.020
4. Some College	.281	.272	.341	.106
5. College Graduate	.178	.375	.370	.077
6. M.A. - Ph.D.	.143	.367	.429	.061
7. I don't know	.509	.208	.151	.132

Level	Posterior Probabilities			
	Com. Col.	4-yr Pub.	Private	Sectarian
Area (County Groupings)				
1. Coastal	.362	.277	.287	.074
2. Willamette Valley	.345	.304	.231	.120
3. Portland	.298	.276	.357	.068
4. Eastern	.298	.426	.200	.075

Variable Weights

Educational Aspiration	.116
Reason for Choice	.115
Father's Education	.105
H.S. Grade Point Aaerage	.100
Father's Occupation	.097
Mother's Education	.097
Area	.097
Why Attend College	.091
H.S. Size	.091
Mother's Occupation	.090

APPENDIX F

MEANS AND STANDARD DEVIATIONS

DISCRIMINANT MODEL VARIABLES

APPENDIX F

MEANS AND STANDARD DEVIATIONS
DISCRIMINANT MODEL VARIABLES
(non-standardized data)

	Community Colleges	4-year Public	4-year Private	Grand Means
Variable		**Means**		
1. Food Stamps	.86567	.90633	.95000	.90153
2. Veteran	.82090	.93165	.93333	.90662
3. Parental Income	13399.2	16363.8	18274.3	15883.9
4. High School GPA	3.01	3.32	3.43	3.26
5. Total Resources	2558.8	2736.0	4139.7	2838.7
6. Distance	28.6	77.2	37.0	62.1
7. In-County	.71642	.21266	.41667	.34805

Variable	Standard Deviations		
1. Food Stamps	.34228	.29173	.21978
2. Veteran	.38488	.25267	.25155
3. Parental Income	9486.59	11423.25	9378.89
4. H.S. GPA	.57127	.46585	.47748
5. Total Resources	1837.14	1474.23	1406.03
6. Distance	62.62	75.49	55.88
7. In-County	.45242	.40970	.49717

APPENDIX G

NON-TECHNICAL DISCUSSION OF MULTICOLLINEARITY

APPENDIX G

NON-TECHNICAL DISCUSSION OF MULTICOLLINEARITY[1]

The statistical problem of multicollinearity arises when one of the assumptions underlying the multiple regression procedure is violated. This assumption is that the explanatory variables are not correlated with one another. It is often the case with economic variables that this assumption cannot strictly be met. Such items as incomes, prices, employment, population and interest rates tend to move together, particularly over time. In such cases it is difficult for a statistical technique to determine how much of a change in the dependent variable is attributable to each independent variable, since these independent variables are interrelated.

To take an extreme example, assume that we wish to examine the following relationship:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2$$

where $X_1 = \alpha X_2$, i.e. X_1 and X_2 are perfectly correlated. Thus for every change in X_2 there is a predictable change in X_1. The ordinary least squares technique could not be applied in such a case. There is no way of determining how much of a change in Y should be attributed to X_1 and how much to X_2, and therefore the coefficients cannot be estimated. The independent variables move together and it is not possible to distinguish their individual effects.

The less extreme case is where there exists some correlation among the explanatory variables. The ordinary least squares technique can be applied but interpretation of the results must take note of potential difficulties. Calculation of the standard error (which is used in

computing the t-statistic) involves use of terms representing the correlation among independent variables. If such correlation is high, the resultant standard error can become large. Standard errors that are large, relative to the size of the parameters, result in small t-statistics. Thus, when multicollinearity is present the estimates obtained may be unreliable, and often a crucial variable may be thought unimportant when judged by statistical guidelines (e.g. t-statistics).

Solutions to the problem of multicollinearity are sparse.[2] In economic analyses, variables considered theoretically important are generally retained in the equations estimated, despite the statistical difficulties. Multicollinearily does not lead to biased estimates, although it does reduce our confidence in the absolute size of the coefficients and standard errors of the correlated variables. Thus unless the problem is quite severe, it does not negate the validity of the results obtained.

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[1]Technical descriptions of multicollinearity can be found in standard econometric texts, including Johnston (1972) and Theil (1971).

[2]Two possible solutions are (1) the creation of a new variable which is a composite scale of the highly intercorrelated variables and use of this new variable in the equation; and (2) use of only one of the variables which are interrelated, i.e. the exclusion of some of the variables from the equation.

APPENDIX H

FURTHER DISCUSSION OF NON-METRIC DISCRIMINANT ANALYSIS

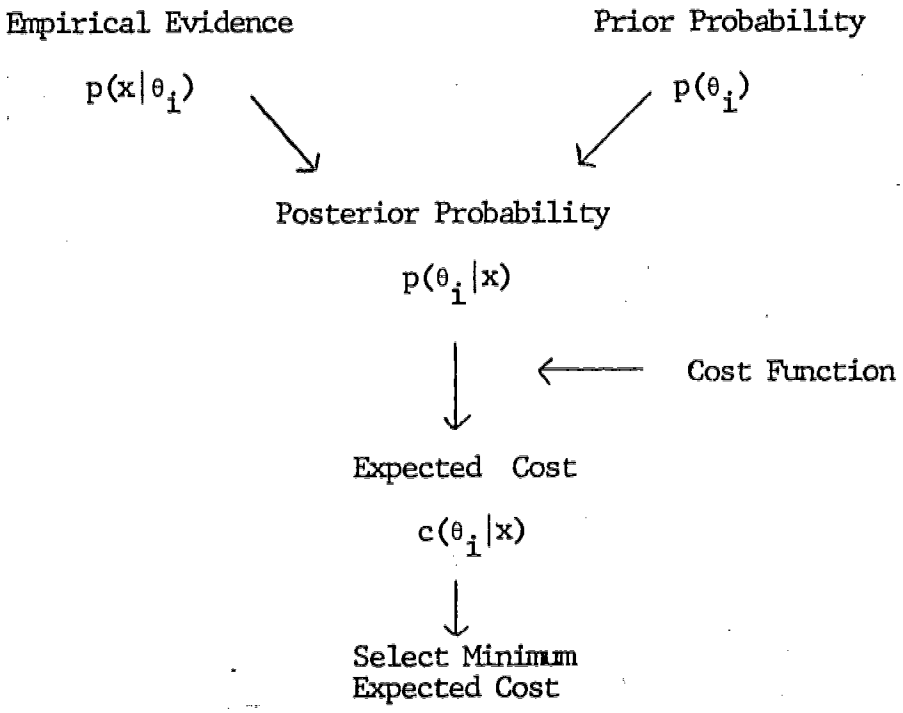
APPENDIX H

FURTHER DISCUSSION OF NON-METRIC DISCRIMINANT ANALYSIS[1]

The non-metric discriminant analysis technique is an application of Bayesian decision theory, a simplified description of which is shown as Table 74.[2]

TABLE 74

LOGIC OF BAYESIAN DECISION THEORY



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[1]This discussion will follow Reinmuth (1975) on the model and Wonnacott and Wonnacott (1970) on decision theory.

[2]Page 50 contains the statement, "Discriminant analysis involves no theory of individual decision making." This is true also of non-metric discriminant analysis. Bayesian decision theory, in the non-metric context, explains the classification choice of the researcher (i.e. the desire to minimize the cost of being wrong), not the method by which the individual student, for example, makes his or her school decision.

The classification technique combines empirical evidence on the membership of the classes (or groups) and prior probabilities of class membership in order to obtain the posterior probability of belonging to each group. A cost function is then applied to these posterior probabilities, yielding an expected cost of classification for each group.[3] The discriminant group with the minimum expected cost is then selected. The parameters of the model are estimated using the sample data, and then each observation (item) is classified using those parameters.

In order to explain in more detail, we shall use the following notation:

θ_i -- the ith group or class, $i = 1,2, \ldots, t$;

x_{jk} -- the kth level of variable j, $j = 1,2, \ldots, p$; $k = 1,2, \ldots, r$

n_{ijk} -- the number of sample items in the kth level of variable j in class i

n_{jk} -- the number of sample items in the kth level of variable j

n_i -- the number of sample items in class i

n -- the total number of sample items

The n sample items on which the model is estimated are divided into t mutually exclusive groups or classes, $(\theta_i, i = 1,2, \ldots, t)$. Each item is described by a set of characteristics (variables x_j), where there are several possible values (levels or categories) for each variable (x_{jk}). For instance, a student may be described by the type of high school program (x_1), which contains levels "college preparatory," "vocational technical," and general or combined"--(x_{11}, x_{12}, x_{13}).

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[3]Cost functions are also referred to as loss, regret or risk functions.

The conditional probability of variable x_{jk} occurring given class θ_i, is known from the sample frequencies of the data at hand. The prior probability that class θ_i will occur (i.e. $p(\theta_i)$) is obtained from previous knowledge, estimates contained in other studies, subjective evaluation or si-ply from the sample data being used. By Bayes' Law it is known that the posterior probability that an item belongs to class θ_h given that this item possesses characteristic x_{jk} is then given by

$$(A.1) \qquad p(\theta_h|x_{jk}) = \frac{p(x_{jk}|\theta_h)\ p(\theta_h)}{\sum_{i=1}^{t} p(x_{jk}|\theta_i)\ p(\theta_i)}$$

where,

$$p(x_{jk}|\theta_i) = \frac{n_{ijk}}{n_i} \quad , \quad \text{for each} \quad i = 1,2, \ldots, t$$

and,

$$p(\theta_i) = \frac{n_i}{n} \quad , \quad \text{or is specified from previous knowledge.}$$

In order to determine the class into which the item is to be classified, a cost function must be associated with each possible classification choice. Therefore, a matrix of comparative costs is specified as in Table 75.

In general, the entries in this matrix are c(h|i), that is the cost of classifying an item as belonging to class h, given that it actually belongs to class i. When h = i, the classification cost is zero, since no error has been made. In the simplist case where no misclassification is considered more serious than another, all off-diagonal elements would equal one while all diagonal elements would equal zero. Otherwise, comparative costs would be entered.

TABLE 75

MATRIX OF COMPARATIVE COSTS

Class θ_i	Classified As 1	2	. . .	t
1	C(1|1)	C(2|1)	. . .	C(t|1)
2	C(1|2)	C(2|2)	. . .	C(t|2)
.	.			.
.	.			.
.	.			.
t	C(1|t)	C(2|t)	. . .	C(t|t)

Thus, the expected cost of classifying an item with characteristic x_{jk} into class θ_h would be

$$(A.2) \quad C(\theta_h|x_{jk}) = \sum_{i=1}^{t} C(h|i)\, P(\theta_i|x_{jk}).$$

Such a cost exists for each possible class, and for each characteristic of the item to be classified. It is then necessary to sum the costs associated with each of the descriptive characteristics of the observation. The expected cost of classifying a particular sample item into class h is,

$$(A.3) \quad C(\theta_h) = \sum_{j=1}^{P} C(\theta_h|x_{jk}).$$

Therefore, final classification costs are obtained by summing the costs associated with each of the item's descriptive characteristics ($j = 1,2, \ldots, p$). Such an expected cost is calculated for each class,

and the class with the nimimum expected cost is selected as the appropriate one for the sample item.

A shortcoming of Reinmuth's formulation of this model results from the equal weightings given each variable. Thus, the model does not take into consideration that some variables may prove to be better class predictors than others. To take account of this possibility, we made a simple extension of the non-metric technique presented above, for use in the project analysis. The procedure is the same through equation (A.2), in which the expected cost of classifying an item with characteristic x_{jk} into class θ_h is calculated. At this point in the revised model, the number of sample observations which would be correctly classified by each variable individually (i.e. not in conjunction with any other variable) is determined, based upon the minimum cost criterion.[4] The total number of correctly classified observations is obtained, and the percentage of this total correctly classified by each variable singly is calculated. This percentage is then used as a weight reflecting the relative performance of the variables included. These weights are utilized in the calculation of the expected cost of classifying a particular sample item. Equation (A.3) is thus modified to

$$(A.4) \quad C(\theta_h) = \sum_{j=1}^{p} C(\theta_h | x_{jk}) \cdot w_j$$

where w_j is the weight given variable j.

$$(A.5) \quad w_j = \frac{\sum_{k=1}^{r} n_{ijk}}{\sum_{j=1}^{p} \sum_{k=1}^{r} n_{ijk}}$$

where n_{ijk} represents the number of observations in the k^{th} level of variable j in class i. As before, k is the level index and j is the variable index. Here, i represents the class with the minimum expected cost of classifying an item with characteristic x_{jk}.

Suppose, for example, that using the minimum cost criterion in a three variable model, variable one correctly classified 15 observations; variable two, 25; and variable three, 10. The weights would then be as follows: $w_1 = .3$, (i.e., $15/(15 + 25 + 10)$), $w_2 = .5$, $w_3 = .2$. The weights, of course, sum to one, with the variable that singly performed most accurately (variable two) receiving the heaviest weighting. The remainder of the previous description of the non-metric model given above applies to this revised model.

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[4]The number correctly classified by each variable alone would be the same as if the original procedure were performed, but with only one variable rather than a set of variables included in the model.