ECONOMICS OF EDUCATION

DEMAND AND SUPPLY IN U.S. HIGHER EDUCATION: A PROGRESS REPORT*

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Introduction

Higher education in the United States may be thought of as a giant "industry," in which (1) the "inputs" are students of various qualifications, the services of teachers, and all the other usual kinds of material and service inputs, and (2) the "outputs" are graduates (and drop-outs) of various qualifications. Even the category of "goods in process" has its analogy in the case of students who are part way through a particular educational program.

If this picture is at all appropriate, then we shall be led naturally to study the demand for outputs, the supply of factors, the technological relationships within the industry, etc. Note, however, that the "supply of student inputs" from the point of view of the education industry corresponds to what is usually regarded as the "demand for places" by potential students. Colleges and universities do not sell in any direct way their output of graduates in the market for educated labor, nor are they usually thought of as selling their places to students. Furthermore, the hypothesis of profit maximization is no doubt even less appropriate to the education industry than to most conventional industries.

The present paper is a progress report on a project designed to estimate various supply, demand, cost, and technological relations in U.S. higher education. The project has essentially six component parts: (1*a*) estimation of student-teacher and other input-output relationships at the college and university level for a cross-section of institutions and (1*b*) estimation of student-teacher input-output relationships at the discipline or department level for a few selected public institutions in California; (2) a model relating dollar costs to various measures of activity; (3) estimation of the demand for places by potential students as a function of cost of attendance, student family income, student ability, and school selectivity; (4) a study of the supply and pricing of places by private institutions; (5) estimation of the stocks of educated manpower, by age, sex, highest degree, and field of specialization, for a number of recent years; (6) a study of factors influencing the demand for educated manpower by the U.S. economy and thus for the output of the education industry. Of these, parts 1*a*, 3, and 5 are near completion, part 4 has only just begun, and the rest are at intermediate stages.

Our aim in this project is not only to add to the scientific description and understanding of the education industry but also to provide a set of related models that can contribute to the debate on policy issues. Effective policy analysis requires, of course, not just good projections based on the assumption of unchanging trends but also estimates of how policy instruments affect target variables. To illustrate the use of our models for policy purposes, we are applying them to several problems, including the estimations of (1) the resource requirements for universal two-year college attendance and (2) the effects of tuition increases and complementary financial aid programs in public institutions.

We should emphasize that there are a number of important topics with which this project does not deal, either because they are being intensively studied by others (e.g., the benefits of higher education, the supply of finance from sources other than tuition) or because we did not know how to tackle them with available data (e.g., the measurement of "quality" of inputs and outputs).[1] The main body of our paper is devoted to a description of some results from parts 1*a* and 3 of the project; i.e., on student-teacher input-output relations and on the demand for places.

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[1] For background papers on these and other topics, see *The Economics and Financing of Higher Education in the United States*, a compendium of papers submitted to the Joint Economic Committee of the Congress of the United States (U.S. Government Printing Office, Washington, D.C., 1969).

I. *Teachers and Students*

We first present some figures on the trends and dispersion of faculty-student ratios during the period 1952–64 for six different groups of institutions. We find, in particular, downward trends in this ratio in undergraduate colleges and in public universities, but upward trends in private universities (both nonsectarian and religious). The dispersion of the faculty-student ratios within groups declined in the undergraduate categories, but remained approximately stable in the university categories. Furthermore, there is a tendency for the ratio to decline most rapidly in schools with the highest ratio.

We then turn to a more detailed consideration of the relation between numbers of teachers and numbers of graduates and undergraduates, and various school characteristics such as faculty salaries, percent of faculty holding a Ph.D. degree, average SAT scores of entering freshmen, percent of students in teacher training programs, quality of graduate faculty, etc.

Faculty-Student Ratios in the "ACE Sample." Our first sample consists of 372 colleges and universities taken from a larger set of more than 900 institutions for which data were available[2] on numbers of faculty and students for the years 1952, 1956, 1960, and 1964. These 372 institutions included all those in the larger set that either were purely undergraduate institutions or had substantial graduate enrollment in each of the four years mentioned above but were neither purely graduate schools nor primarily religious or professional schools. Within the ACE sample these two groups will be called "undergraduate schools" and "universities," respectively; there are 259 undergraduate schools and 113 universities. For each of these institutions, and for almost every year, we have data on:

T = total faculty by highest degree attained,
S_u = number of undergraduate students enrolled,
S_g = number of graduate students enrolled.

After further subdividing the undergraduate schools and universities into the standard control categories of public, private-nonsectarian (hereafter called private), and private-sectarian (hereafter called sectarian), we calculated the average and the standard deviation of each of the resulting six groups for each of the four years in our observation period (1952–64). The results are presented in Table 1-A.

[2] American Council on Education, *American Universities and Colleges*, 6th through 9th editions, 1952, 1956, 1960, 1964.

The mean faculty-student ratio clearly fell in each of the undergraduate groups, with the greatest decline (28 percent) in the public schools and the smallest decline (14 percent) in the private schools. The mean faculty-student ratio also fell slightly in the public universities but rose in the other universities. In both undergraduate schools and universities the private nonsectarian schools ended the period with the highest ratios and the public schools with the lowest; generally the private schools had the higher ratios throughout the period.

Of course, one suspects that the increases in the universities are due to the increased fraction of the total enrollment represented by graduate students. We shall have more to say on this later.

The variability of the faculty-student ratios, as well as their means, declined in the undergraduate school groups, but remained relatively constant in the university groups. We shall see below that, indeed, those undergraduate schools with the highest faculty-student ratios tended to suffer the most rapid decline. On the whole, there was considerable variation in the ratios, with the means roughly only two to four times the standard deviations. In 1964, the private universities had the lowest ratio of mean to standard deviation (1.9), whereas the sectarian undergraduate schools had the highest (4.5).

All in all, we have a picture of declining faculty-student ratios in undergraduate schools and in public universities and of increasing ratios in private sectarian and nonsectarian universities. The downward pressure on the faculty-student ratios seems most pronounced in the case of the public schools, both undergraduate and universities. Within each of the groups there is considerable variation in the faculty-student ratio. Our task will be to try to relate this to variation in institutional variables and, in the case of the universities, to changes in the undergraduate-graduate student mix.

The Relationship between Averages and Trends in the Faculty-Student Ratio. We have seen that there was a general decline in faculty-student ratios in the undergraduate schools between 1952 and 1964. To study this phenomenon in more detail, we measured, for each undergraduate school in our sample:

c_n, the average faculty-student ratio[3] over the period 1952–64;
b_n, the average rate of change in the faculty-student ratio, per four-year period.

[3] For schools for which there were missing observations, the averages were computed for the available observations.

TABLE 1-A

AVERAGES AND STANDARD DEVIATIONS OF FACULTY-STUDENT RATIOS

	Undergraduate Schools			Universities		
	Public	Private Non-sectarian	Private Sectarian	Public	Private Non-sectarian	Private Sectarian
Mean of a						
1952	.0939	.1016	.1031	.0833	.1111	.0782
1956	.0859	.0963	.0973	.0785	.1244	.0868
1960	.0742	.0934	.0859	.0777	.1263	.0845
1964	.0674	.0875	.0809	.0766	.1266	.0956
Standard deviation of a						
1952	.036	.031	.033	.030	.062	.039
1956	.039	.028	.030	.029	.072	.037
1960	.028	.031	.023	.029	.074	.037
1964	.027	.022	.018	.030	.066	.041
Number of institutions in group						
1952	45	51	162	51	46	13
1956	45	51	162	54	46	14
1960	44	51	162	54	46	14
1964	45	51	162	55	45	14

$a = T/S$.
T = total faculty.
S = total students enrolled.

Table 1-B shows the mean and standard deviation of c_n and b_n in each of the three control categories. We see that the public schools had the lowest average ratio and the highest rate of decline, whereas the private schools had the highest average ratio and the lowest rate of decline.

However, an examination of the relationship between b_n and c_n on a school-by-school basis shows that the relationship by group is reversed. Table 1-C gives the regressions of b_n on c_n (rate on average) within each of the three groups and for the undergraduate schools as a whole. In each case the coefficient of c_n is negative (although statistically not significant for the private-nonsectarian schools). There is considerable variation around the regression lines, as the low values of R^2 indicate. Nevertheless, it is clear that there was a tendency for schools with higher average faculty-student ratios to decline more rapidly.[4]

Input Coefficients. It is generally believed that graduate students take up more faculty time, per student enrolled, than do undergraduates. In the language of activity analysis, we might say that the training of undergraduate and graduate students are two different "activities," with different faculty input coefficients. This suggests the simple linear relationship:

$$T = a_u S_u + a_g S_g, \tag{I.1}$$

where, for a given school, at a given date, a_u and a_g are the faculty input coefficients for undergraduate and graduate teaching, respectively.

Direct estimation of equation (I.1), either from time series on individual institutions or from cross-sections of groups of institutions, has not produced satisfactory results. The data are simply not consistent with the hypothesis that, in general, for any one school the input coefficients are more stable than the ratio of undergraduates to graduate students. Nor have we yet found any convincing a priori classification of schools into groups with similar coefficient values.

The dispersion of faculty-student ratios among universities with the same graduate-undergraduate ratio is very large. For example, among private nonsectarian universities in which the

[4] That this is not just another example of the "regression fallacy" is shown by Table 1-A which indicates that the variance of the faculty-student ratio is actually declining over the period.

TABLE 1-B

AVERAGES AND TRENDS OF FACULTY-STUDENT RATIOS FOR UNDERGRADUATE SCHOOLS

	Public	Private Nonsectarian	Private Sectarian	All
Mean c_n	.080	.095	.092	.090
Standard deviation c_n	.030	.025	.022	.025
Mean b_n	$-.009$	$-.003$	$-.007$	$-.007$
Standard deviation b_n	.011	.009	.010	.010
Number of schools	45	51	162	258

c_n = mean faculty-student ratio over the period 1952–64, for school n.
b_n = the average rate of change in the faculty-student ratio, per four years, for school n.

percentage of graduate students was roughly between 20 and 30 in the year 1966 (including, e.g., Adelphi University, Carnegie Institute of Technology, and the University of Rochester), the faculty-student ratio varied between .43 and .07 (i.e., the student-faculty ratio varied between 2.3:1 and 14:1).

We might suppose that the "crude" numerical input coefficients, a_u and a_g, depend upon the quality of the inputs and outputs, and possibly on other school characteristics as well.

Unfortunately, we have no accepted measures of the quality of inputs and outputs. However, it seems reasonable to suppose that schools with the same selectivity, tuition, faculty salaries, etc., will tend to have the same quality of inputs and outputs, or at least that the variation in quality among schools with similar characteristics is smaller than among schools with widely differing characteristics. This suggests that we try to estimate the relationship between the crude input-output coefficients and various school characteristics.

For each school, let W and Z be two vectors of measurements of various school characteristics (there may be some characteristics common to both vectors), and assume that the input coefficients depend upon these characteristics:

$$a_u = h_0 + h\cdot W, \quad a_g = k_0 + k\cdot Z, \tag{I.2}$$

where h_0 and k_0 are parameters, h and k are vectors of parameters, and

$$h\cdot W = \sum h_j W_j, \qquad k\cdot Z = \sum k_j Z_j.$$

Combining equations (I .1) and (I .2), and adding a constant term (c) yields, for each school, the equation:

$$T = c + (h_0 + h\cdot W)S_u + (k_0 + k\cdot Z)S_g. \tag{I.3}$$

The constant term, if different from zero, could reflect the presence of increasing or decreasing returns to scale. Equation (I.3) could also be applied to schools without graduate students, to examine how variation in the faculty-student

TABLE 1-C

REGRESSION OF b_n ON c_n: $b_n=\alpha+\beta c_n$

	Public	Private Nonsectarian	Private Sectarian	All
α, Constant term	.00185 (.42)	.00072 (.14)	.00138 (4.61)	.00677 (2.96)
β, Coefficient of c_n	$-.131$ (-2.54)	$-.0437$ ($-.81$)	$-.226$ (-7.16)	$-.148$ (-6.05)
R^2	.13	.01	.24	.13
Number of observations	45	51	162	258

NOTE: Numbers in parentheses are t statistics.

ratio is associated with corresponding variation in school characteristics.

We have estimated the parameters of equation (I.3) for different sets of data,[5] different groupings of schools, and different sets of school characteristics. Space limitations do not permit a presentation here of the many regressions together with the many qualifications and reservations we would have to state concerning the specific formulations and numerical results. Nevertheless, the following qualitative relationships are suggested by the estimates.

There is a tendency for a higher percentage of faculty with the Ph.D. degree to be associated with lower undergraduate input coefficients, holding other variables constant. Since the other variables include average faculty salary for the school and since Ph.D.-holders typically command higher salaries than non-Ph.D.-holders, this would be a natural consequence of economizing with a given salary budget.

Our results thus far suggest a tendency in some cases for higher average faculty salary to be associated with higher input coefficients. If this is in fact the case, it indicates that "richer" schools use their additional funds both to pay higher salaries and to increase the faculty-student ratio.

There is also some tendency for universities with "higher quality" graduate schools to have higher graduate input coefficients. Here, a quality index was constructed by combining the school's ranking in the Cartter Report with a ranking by number of enrolled graduate NSF Fellowship holders. Finally, there is evidence for increasing returns to scale in the undergraduate institutions and for undergraduate teaching in the private universities.

These suggested relationships must be treated as tentative, pending further exploration of the data. Although certain institutional variables seem to have consistent effects on the input coefficients, we are not satisfied that we have quantitatively identified separate input coefficients for graduate and undergraduate teaching activities. One should be cautioned against extrapolating this effect beyond the range covered by our sample.

II. *The Demand for Places*

Our approach to the estimation of the demand for places in institutions of higher education has thus far focused on the decisions by individual graduating high school seniors between going and not going on to college, and their choices among available institutions, or institution-types. We are dealing, therefore, with a demand more like that for houses or automobiles rather than for butter or beer, in the sense that the choice is among a small number of discrete alternatives rather than different quantities of a divisible good.

We imagine that each high school senior—hereafter called a "student"—faces a set of alternative choices. This set includes various types of institutions of higher education as well as the alternative of not going to any such institution. Our statistical model is designed to relate the relative frequencies of choices to the characteristics of the individual student and his alternatives. For actual estimation purposes we have available data for a sample of students included in the SCOPE study.[6] The availability of data and the results of experiments with different formulations led us to concentrate on the following variables (whose precise definitions are given below):

A_i an ability score for student i;
I_i a measure of income for student i;
S_j a measure of the "selectivity" or "quality" of alternative j;
C_{ij} the out-of-pocket dollar cost to i of going to j (set equal to zero for the alternative "no school").

We assume that the probability that student i chooses alternative j is a function of these variables, and the set of alternatives open to i, which we shall denote by J_i. We assume further that this functional relationship can be expressed in terms of two intermediary variables, to which (for the convenience of discussion) we have given the names "intellectual affinity" and "cost-to-income ratio" defined respectively by:

$$X_{ij} = \frac{A_i S_j}{1000}, \qquad Y_{ij} = \frac{C_{ij}}{I_i}.$$

The particular functional relationship is a generalized form of logit analysis. For each i and j, define f_{ij} and F_{ij} by:

$$f_{ij} = aX_{ij} + bY_{ij},$$
$$F_{ij} = e^{f_{ij}}$$

where a and b are parameters to be estimated. The conditional probability, P_{ik}, that student i chooses alternative k from the set J_i of alternatives open to him, given the values of the vari-

[5] In addition to the ACE data already mentioned, we had access to 1966 HEGIS data made available through the Carnegie Commission on the Future of Higher Education.

[6] SCOPE (School to College: Opportunities for Postsecondary Education), Center for Research and Development in Higher Education, Univ. of California, Berkeley.

ables X_{ij} and Y_{ij}, is assumed to be determined by the equation:

$$P_{ik} = \frac{F_{ik}}{\sum_{j \in J} F_{ij}} . \tag{II.1}$$

Note that this implies that the "odds" for any pair of alternatives, j and k, are equal to the ratio (F_{ij}/F_{ik}), and the logarithm (to the base e) of these odds is equal to $(f_{ij}-f_{ik})$, or

$$a(X_{ij} - X_{ik}) + b(Y_{ij} - Y_{ik}).$$

The method of estimating the parameters a and b from data on a sample of students i is due to McFadden.[7]

We now turn to the definitions of the explanatory variables. "Ability" was measured by a test included in the SCOPE study, converted into "equivalent" SAT scores. "Selectivity" of an institution was measured by the average SAT score of entering freshmen, or an imputed average score for a category of "comparable" institutions (see remarks below on aggregation).

The cost C_{ij} was our estimate of the sum of tuition, living, and transportation costs, based on information that included knowledge of the locations of the institution and the student's home. In particular, we tried to take account of whether a given student could or could not be a commuter at a given institution. Unfortunately, we have thus far been unable to obtain data on the financial aid actually obtained by the students in our sample.

The measurement of income posed special problems. All of the students in the SCOPE study were asked to estimate their parents' annual income. For a subset of the students, there were income reports from the parents as well. The data showed very poor agreement between the figures reported by students and their parents. Therefore we experimented with estimating parent-reported-income from student responses (available for all the students); these variables included parents' occupation, parents' education, parents' employment status, and the student's estimate of parental income. This resulting measure is called here "predicted income," whereas the figure given by the parents (when available) is called "reported income." Within the sample of "reporters," the income prediction equation explained 45 percent of the variance in parent-reported income.[8]

We also experimented with a measure of income that might be more related to "ability to pay." For this purpose we chose the concept of "discretionary income" used by the College Scholarship Service in evaluating need for financial aid.[9] This measure is a function of a family's net income before taxes and the number of dependent children.

Combining the two dichotomies, reported versus predicted and total versus discretionary, we had four different measures of income with which to experiment.

For the results given in the present paper, our sample included approximately 190 students in each of two states, California and Illinois. The sample from each state was itself made up of two subsamples, corresponding to whether the parents did or did not report income. The parameters a and b of the conditional probability function were estimated separately for each subsample and for each measure of income available for that subsample (yielding six sets of estimates for each state).

In order to make the data collection and the estimation feasible with our limited resources, we aggregated institutions into "school types"; Table 2-C shows the types that we used and their typical characteristics. Finally, for each student in the sample, our estimate of the set J_i of school types for which he was eligible was based upon his ability score, the selectivity of the school type, and, in the case of public institutions, a direct verification of the individual's eligibility.

Tables 2-A and 2-B give the estimates for California and Illinois, respectively. We note first that in all cases the estimate of b, the coefficient of the "cost-to-income ratio" is negative (as we would expect) and significantly different from zero (statistically). Furthermore, between states there is reasonably good agreement between corresponding estimates for the two subsamples ("parent-reporters" and "parent nonreporters"), using of course only the predicted measures of income. In each of these four cases the b coefficient

[7] D. McFadden, "The Revealed Preferences of a Government Bureaucracy," Technical Report No. 17, Project for the Evaluation and Optimization of Economic Growth, Dept. of Economics, Univ. of California, Berkeley, Nov. 1968 (mimeographed).

[8] For a more detailed discussion of our procedure and problems see L. S. Miller, "Predicting Family Income in the SCOPE Sample," Carnegie Commission Project Working Paper, Dept. of Economics, Univ. of California, Berkeley.

[9] See *Manual for Financial Aid Officers*, College Scholarship Service, 1967, Chap. 5 and Appendix B. Our conversion of total income to discretionary income is based on tables in J. E. Nelson, *Student Financial Aid Administration, Requirements, and Resources at the University of California*, Part II, pp. 7–9, and Appendix F, pp. 4–5.

TABLE 2-A

DEMAND FOR FRESHMAN PLACES IN HIGHER EDUCATION INSTITUTIONS: 1966 CALIFORNIA HIGH SCHOOL SENIORS

Sample	Problem	(Ability×Selectivity)/1000	Cost/Predicted Income	Cost/Discretionary Predicted Income	Cost/Reported Income	Cost/Discretionary Reported Income
I	1	$-.321\times10^{-2}$ $(.586\times10^{-2})$	-11.39 (2.45)			
	2	-0.848×10^{-2} $(.589\times10^{-2})$		$-.848$ (.218)		
II	1	$.129\times10^{-1}$ $(.532\times10^{-2})$	-9.77 (1.73)			
	2	$.738\times10^{-2}$ $(.523\times10^{-2})$		$-.832$ (.176)		
	3	$.113\times10^{-2}$ $(.507\times10^{-2})$			-3.74 (1.10)	
	4	$.565\times10^{-3}$ $(.478\times10^{-2})$				$-.689$ (.191)

SAMPLE I: Sample of students whose parents did not respond to SCOPE parent questionnaire (96 observations).

SAMPLE II: Sample of students whose parents did respond to SCOPE parent questionnaire (96 observations).

Figures in parentheses are standard deviations of the corresponding estimates.

for the parent nonreporters is somewhat larger in magnitude than the corresponding coefficient for parent reporters, indicating that the choices of the nonreporter students were more sensitive to cost differences (relative to their family incomes) than were the choices of reporter students.

Within the sample of reporters in each state, if we use discretionary income, then the estimates of b are about the same whether we use predicted or parent-reported income. However, the use of total income leads to estimates that are about twice as large for the case of predicted income as for the case of parent-reported income.

The "intellectual affinity" variable does not turn out to be as significant as we had expected. In the three cases in which a was significant, it was estimated to have similar positive values. It is interesting to note that these a's were always found in conjunction with the predicted measure of income. Indeed, only one of our six specifications had both variables significant in both states: Sample II, Problem 1.

Thus, our most satisfactory estimates in both states were for the reporter samples, where predicted income rather than parent-reported income was used to compute the variable "cost-to-income." If we look at the variables that enter the income-prediction equation (see above), we see that predicted income might well be a good index of social and educational status, even though it was originally designed purely for income prediction purposes.

It should be remembered that our cost variable does not reflect the actual financial aid received

TABLE 2-B

DEMAND FOR FRESHMAN PLACES IN HIGHER EDUCATION INSTITUTIONS: 1966 ILLINOIS HIGH SCHOOL SENIORS

Sample	Problem	(Ability×Selectivity)/1000	Cost/Predicted Income	Cost/Discretionary Predicted Income	Cost/Reported Income	Cost/Discretionary Reported Income
I	1	$.165\times10^{-1}$ $(.582\times10^{-2})$	-13.32 (2.04)			
	2	$.107\times10^{-1}$ $(.572\times10^{-2})$		-1.051 (.193)		
II	1	$.103\times10^{-1}$ $(.545\times10^{-2})$	-9.33 (1.61)			
	2	$.337\times10^{-2}$ $(.538\times10^{-2})$		$-.560$ (.128)		
	3	$.448\times10^{-3}$ $(.526\times10^{-2})$			-4.58 (1.19)	
	4	$-.650\times10^{-3}$ $(.499\times10^{-2})$				$-.536$ (.137)

SAMPLE I: Sample of students whose parents did not respond to SCOPE parent questionnaire (91 observations).

SAMPLE II: Sample of students whose parents did respond to SCOPE parent questionnaire (90 observations).

Figures in parentheses are standard deviations of the corresponding estimates.

by the student; therefore, estimates of b are probably biased downward in absolute value and our estimates of a may also be biased to the extent that financial aid is correlated with ability.

It may help the reader to interpret these results if we give a few illustrations of predicted choice probabilities, based upon California Sample II, Problem 1. Here the estimates of a and b are 0.129×10^{-1} and -9.78, respectively, and we use predicted income. Consider a high school senior from a family with a $6,000 annual income, whose ability corresponds to an average SAT score of 550, and who lives in an area where he could attend a public junior college, state college, or university and still live at home. He has open to him a range of 11 choices, including "no school." These choices, together with the corresponding predicted probabilities, are shown in Table 2-C. For example, the probability of "no school" is predicted to be .35, and the probability of choosing the local campus of the public university is .15. Table 2-C also shows choice probabilities for students from families with $12,000 income and ability score 450. Note that the ranges of choice are not the same in all cases.

Equation (II.1) can also be used to calculate the changes in the choice probabilities that would be associated with a change in one or more of the explanatory variables. For example, for a student with income $6,000 and ability score 650, an increase in the cost of going to the local public university of $100 would decrease the predicted probability of that choice by approximately .037, which is more than a 10 percent decrease in the

TABLE 2-C

PREDICTED PROBABILITIES OF CHOICES FOR SELECTED CALIFORNIA STUDENT TYPES

Income of i Ability of i School type k	Cost C_{ik}	Selectivity S_k	\$6,000 550	\$12,000 550	\$6,000 650	\$12,000 450
No school	0	374	.35	.22	.35	.30
Public junior college, local	290	430	.21	.18	.22	.24
Private medium cost junior college	2,200	430	.01	.04	.01	.05
Private high-cost junior college	3,200	430	.00	.02	.00	.02
Public state college, local	400	519	.18	.17	.18	.22
Public state college, not local	1,300	519	.04	.08	.04	.10
Private medium cost college	2,200	519	.01	.04	.01	.05
Private high-cost college	3,200	519	.00	.02	.00	.02
Public university, local	540	564	.15	.15	.15	
Public university, not local	1,440	564	.03	.07	.03	
Private university, high cost	3,200	564	.00	.02	.00	
"Superior" private university, high cost	3,200	625			.00	

probability (this is based on the above parameter estimates).

In our further work, we shall look at student samples from two other states, Massachusetts and North Carolina, and experiment with refinements of our various measurements for all four states.