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ABSTRACT

This report presents empirical data in support of the behavioral, demand-oriented theory of Ph.D. production. A close examination of the Ph.D. curricula of the English, Economics, and Chemistry departments at Berkeley, chosen as representative of the extremes of departmental behavior, demonstrates that requirements do differ substantially and in a way designed to affect Ph.D. production. Interviews with the doctoral students and faculty give a picture of the changes in curriculum in the last twenty years and the attitudes of both groups regarding factors perceived as affecting time to degree and attrition. The concluding section contains recommendations for university policy suggested by economic analysis. Emphasis is placed on shifts away from input measures, such as enrollment and student credits, toward use of output measures, such as number of degrees produced. It is suggested that graduate enrollment quotas should be reduced for those departments showing excessive attrition, allocating the positions released to departments indicating a willingness to produce and an ability to place more Ph.D.'s. It is recommended that applicants to doctoral programs be provided with detailed information on the probability of earning the Ph.D., mean time to degree, student support, and recent placement experience of the department. (Author)

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THE Ph.D. DEGREE AT BERKELEY:
INTERVIEWS, PLACEMENT, AND RECOMMENDATIONS

David W. Breneman

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January, 1971

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PREFACE

This is one of a continuing series of reports of the Ford Foundation sponsored Research Program in University Administration at the University of California, Berkeley. The guiding purpose of this Program is to undertake quantitative research which will assist university administrators and other individuals seriously concerned with the management of university systems both to understand the basic functions of their complex systems and to utilize effectively the tools of modern management in the allocation of educational resources.

This report is the third of three papers analyzing departmental variations in time to degree and attrition in 28 Ph.D. programs at the University of California at Berkeley. The first paper, "An Economic Theory of Ph.D. Production: The Case at Berkeley," developed a theory of departmental behavior to explain the differences in performance. The second paper, "The Ph.D. Production Function: The Case at Berkeley," examined the alternative hypothesis that differences in performance could be explained by variations in departmental resource inputs. Data on the supply and demand for Ph.D.'s was also included in the second paper. The present study reports interview results with graduate students and faculty, provides data on placement of Berkeley Ph.D.'s, and concludes with recommendations for university policy.

I. INTRODUCTION

Doctoral programs in the various disciplines differ markedly in both mean time to degree and in student attrition rates. A measure of the variation of student input to degree output in 28 fields at the University of California at Berkeley is provided in Table I of the second report, "The Ph.D. Production Function: The Case at Berkeley,"[1] while data demonstrating similar patterns of variation at other universities is presented in Joseph Mooney's study of attrition rates in the Woodrow Wilson Fellowship program.[2] In a previous report published by the Ford Foundation Research Program in University Administration, a theory of departmental behavior was developed to explain these differences in performance.[3] Academic departments were assumed to be engaged in prestige maximizing behavior, which reduced operationally to maximizing control over university resources and securing satisfactory placement for doctoral students. Since university resources are often linked to enrollments, departments were viewed as desiring large graduate enrollments, while determining the number of Ph.D. degrees to award according to the perceived demand for graduates in each field. Control variables that allow departments to regulate supply include curriculum organization, performance standards, dissertation requirements, allocation of financial support, information flows to students, and faculty effort.

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[1] David Breneman, "The Ph.D. Production Function: The Case at Berkeley," Ford Foundation Research Program, Office of the Vice President, Planning and Analysis, Berkeley, December 1970.

[2] Joseph Mooney, "Attrition among Ph.D. Candidates: An Analysis of a Cohort of Recent Woodrow Wilson Fellows," Journal of Human Resources, Winter 1968.

[3] David Breneman, "An Economic Theory of Ph.D. Production: The Case at Berkeley," Ford Foundation Research Program, Office of the Vice President, Planning and Analysis, Berkeley, June 1970. The reader should refer to this paper for a detailed statement of the behavioral theory.

TABLE I: SEVEN YEAR ENROLLMENT AND DEGREE TOTALS, UNIVERSITY OF CALIFORNIA, BERKELEY, 1961-67*

DEPARTMENT	*Column A* Ph.D. Degrees Awarded	*Column B* Ph.D. Student Years	Degrees per Student Year (Col A/Col B)	Student Years per Degree (Col B/Col A)
Entomology	79	397	.198	5.02
Chemistry	335	1802	.185	5.38
Chemical Engin.	75	404	.185	5.39
Electrical Engin.	175	1032	.169	5.90
Civil Engin.	129	763	.169	5.91
Physics	380	2438	.155	6.42
Zoology	94	634	.148	6.74
Botany	52	352	.147	6.77
Geology	37	270	.137	7.30
Biochemistry	63	469	.134	7.44
Geography	21	158	.132	7.52
Mechanical Engin.	94	716	.131	7.62
Psychology	162	1238	.130	7.64
Astronomy	32	246	.130	7.69
Spanish	18	150	.120	8.33
History	177	1517	.116	8.57
Mathematics	194	1680	.115	8.66
Classics	13	118	.110	9.08
German	24	219	.109	9.12
Bacteriology	17	157	.108	9.24
Economics	137	1316	.104	9.61
Anthropology	69	720	.095	10.43
Political Science	96	1026	.093	10.69
Physiology	24	267	.089	11.12
English	105	1374	.076	13.09
Sociology	57	753	.075	13.21
French	28	374	.074	13.36
Philosophy	27	507	.053	18.78

[a]Enrollment figures are understated for those departments that require doctoral students to first earn the M.A. degree - those student years are not recorded. Enrollments include both degree and non-degree winners.

*Source: Office of Institutional Research, University of California, Berkeley.

An alternative explanatory hypothesis to this behavioral theory is the production function approach. In this view, variations in departmental performance are "explained" by variations in resource inputs, with the implication that if all departments are given equal resources, the extremes of performance variation documented in Table I will be eliminated. Results bearing upon this hypothesis are presented in a separate report in this series,[4] together with data concerning the supply and demand for Ph.D.'s.

The present paper completes the presentation of empirical data in support of the behavioral, demand-oriented, theory of Ph.D. production. Part I provides information on changes in departmental curricula and reports the findings of interviews conducted with doctoral students and faculty in several Berkeley departments. In part II, a prestige index of colleges and universities is developed, and placement of Berkeley Ph.D.'s is ranked by that index. The data suggest that Berkeley departments typically have not provided Ph.D.'s for colleges and universities at the low end of the prestige scale. The concluding section contains recommendations for university policy.

[4] David Breneman, op. cit., December, 1970.

II. CURRICULUM DESCRIPTIONS AND INTERVIEW RESULTS

The two previous reports have presented a theory of departmental behavior and statistical evidence bearing upon the validity of that theory. The final phase of the research, reported here, involves a closer examination of five Berkeley campus departments: English, Economics, Botany, Chemistry, and Electrical Engineering, chosen to represent each of the five disciplinary groups in the Cartter Report. Section A will describe the Ph.D. curricula in three of those fields, demonstrating that requirements do differ substantially and in a way designed to affect Ph.D. production. Section B will report the findings of interviews conducted with doctoral students and faculty in the five departments.

A. Departmental Curricula

The major point regarding the effect of curriculum structure on Ph.D. success rates can be demonstrated by considering the fields of English, Economics, and Chemistry. These three disciplines encompass the extremes of departmental behavior encountered on the campus, and coincide closely with the theoretical discussion of departmental behavior.[5] Current departmental curricula will be described first, followed by information gleaned from interviews regarding curriculum change during the past 15-20 years.

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[5] See Breneman, David, "An Economic Theory of Ph.D. Production: The Case at Berkeley," op. cit. In the present chapter, English has been substituted for French because of the availability of Stark's data; much of the discussion regarding the behavior of a humanities department, represented by French in the earlier report, is applicable to English as well.

English

The brochure distributed by this department describes the program as follows:

> The Department of English admits only for the doctoral program, and has no separate M.A. program or degree. Students who meet Graduate Division requirements for the M.A. while progressing toward the Ph.D. may file for the M.A., but they will not necessarily fulfill both degree requirements simultaneously.
>
> The degree of Doctor of Philosophy requires the following: (1) completion of the Graduate Division residence requirement of a minimum of 4 units of letter grade course work per term for a total of six quarters; (2) satisfactory completion of the foreign language requirements; (3) successful completion of a course in the methods of literary scholarship and a two-quarter graduate seminar; (4) successful completion of the written Comprehensive Examination; (5) successful completion of the three-hour oral Qualifying Examination; and (6) a prospectus examination and dissertation upon an approved subject.[6]

The brochure expands on the requirements in considerable detail, a summary of which follows:

(1) The student is advised that two courses per quarter is the standard load, and is warned that he will be placed on probation[7] if his grades fall below a B average, or if he fails the foreign language requirement twice, or if he earns a grade less than B in an approved preparatory course for the foreign language examination. The student is given one quarter to rectify the conditions which led to his probation.

(2) The foreign language requirement is satisfied by demonstrated proficiency in:

(A) One ancient language (Latin or Greek), and

(B) One modern language (French, German or Italian).

(C) In addition, students must demonstrate *one* of the following:

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[6] "Graduate Study in English," Department of English, University of California, Berkeley, p. 1.

[7] Of the 28 Berkeley departments covered in this study, English is the only department with a *formal* probation procedure.

(i) Advanced knowledge of one of the five languages listed above (defined as knowledge of at least four authors in the original language and a general knowledge of the literary history and culture of that language);

(ii) Proficiency in a third of the five languages;

(iii) Knowledge of Anglo-Saxon:

(iv) Knowledge of linguistics.

(3) Students are urged to organize their course work toward preparation for the Comprehensive Examination, but language requirements (A) and either (B) or (C) must be completed before taking that examination.

(4) The Comprehensive Examination is nine hours in length, distributed over two days, and is "normally taken after the fourth quarter but no later than the sixth quarter."[8] The brochure states that: "The purpose of the Comprehensive Examination is to test the student's *comprehensive knowledge of the history of English and American literature from Chaucer to the present* (italics added) and of the techniques of literary scholarship and criticism."[9] The exam is graded "Pass with Recommendation to Proceed," "Pass without Recommendation," or "Not Pass," and may be taken twice only; re-examination requires taking the examination as a whole. At this point, the student meets with a graduate adviser to determine whether or not he may continue.

(5) If the student passes the Comprehensive Exam and is allowed to proceed, he must next complete the language requirements and begin preparation for the Oral Qualifying Examination, to be taken between the tenth and twelfth quarter. This three hour oral exam is conducted by six professors, and covers three areas:

(A) A period of literary history, such as English literature from 1350 to 1500, or from 1500 to 1600.

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[8] "Graduate Study in English," op cit., p. 3.

[9] Ibid., p. 4.

(B) A field that centers on questions of genre, form, style and literary tradition related to the student's special interests.

(C) The third field may focus on the proposed dissertation subject, or may be a subject corollary to the student's special interests.

(6) Assuming the oral exam is passed, the student prepares a dissertation prospectus if that has not been done prior to the oral, and discusses the proposal with a committee, seeking approval of the topic.

(7) The dissertation is completed and submitted. At the request of the dissertation committee, a final oral defense may be required before the degree is awarded.

Student comments on this curriculum description will be presented in the next section; for the present, the reader is asked to ponder the comprehensive nature of the program, the "chain-link" nature of the requirements, and the multiple points at which attrition may occur. By way of contrast, let us consider the other extreme represented by the Chemistry Department.

Chemistry

The description of the Degree of Doctor of Philosophy in this field is tersely presented in the catalogue as follows:

> It is assumed that an entering student who has already demonstrated command of several phases of chemistry is capable of preparing himself in other parts of these fields whenever it becomes desirable. His record in advanced undergraduate courses is accepted as partial evidence of his breadth of knowledge. He will be encouraged and expected to extend his knowledge according to his own needs by taking and auditing courses, both before and after advancement to candidacy. However, the graduate student has great flexibility in developing this course of activity. Graduate adviser approval can be obtained for almost any systematic program of scientific study to supplement thesis study and research.
>
> Because of the emphasis upon creativity in the graduate studies, the student is encouraged to choose a field of research activity and a specific research program under the direction of one of the members

> of the staff as soon as he feels ready to do so. Most members select their thesis areas and research director during their first quarter of residence. They are then immediately assigned desk and laboratory space so that they can begin their research program.[10]

The reader correctly gathers that formal course work and comprehensive examinations do not play a significant role in this field. In fact, the catalogue only lists 14 graduate chemistry courses devoted to specific topics.[11] The following description of the student's program was gained from student and faculty interviews.

Formal course work is minimal, the typical student taking between four and six courses during the doctoral program. These courses are generally taken during the first year, while the student serves as a T.A. and decides upon a research director. As soon as the student affiliates with a research group, he begins his dissertation research; as the catalogue notes, this often occurs during the first quarter, and invariably during the first year.

During the second year, the student takes an oral examination on his research project and results to date. The examiners have the option of asking the student more general questions, but this generally occurs only if the student makes an obvious error suggesting ignorance of the field. The only other formal requirement (besides the dissertation) is the written German language examination, which is administered by the Chemistry Department and may be repeated an endless number of times.[12]

Thus, in contrast to a typical humanities program such as English, we observe in Chemistry a curriculum designed with few formal requirements

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[10] Bulletin of the College of Chemistry, University of California, Berkeley, July 1, 1969, p. 19.

[11] Ibid., pp. 30-31.

[12] A doctoral candidate in the department observed that if a student had finished the dissertation but still had failed to pass the language requirement, a final German exam would be given which the student would definitely pass.

and virtually no hurdles in the path to the degree. Considerations of financial support aside, it should be clear that compared to Chemistry, earning a Ph.D. in English represents a tremendous feat of endurance.

Economics

The current curriculum in this department has been designed to enable a student to complete the degree in four years, although it is possible to finish in three. The program breaks down into two years of course work and two years devoted to the dissertation.[13] During the first year the student must pass an economic theory examination covering material presented in a two-quarter course. At the end of the second year the student must pass the three-hour written examination on his two fields of specialization. As with the theory exam, the material covered in the field examinations has been presented in courses during the year; the field exams can properly be considered giant final examinations. In addition, during the first two years, each student must take a one-quarter course in economic history, and a one quarter econometrics course which has a statistics prerequisite. There are no foreign language examinations required.

During the third year, the student explores dissertation topics with various professors, seeking both a topic and an interested professor to guide the research. As in the English department, no formal mechanism exists to insure that each student will secure an adviser; the system functions subject to the vagaries of personality, student aggressiveness, identification of mutual interests, and other chance factors. Assuming all goes well, the student prepares a dissertation prospectus, a rather detailed

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[13] "The Degree of Doctor of Philosophy in Economics," Department of Economics, University of California, Berkeley, 1969.

statement of 25-30 pages, outlining the topic, bibliography, research results to date, and special problems encountered. This document, after approval by the student's adviser, is distributed to a five man committee that conducts a three hour oral examination of the student's research proposal. This oral examination is to be taken by the end of the third year, with the fourth year spent completing the dissertation.

Thus, the Economics program falls between the extremes delineated by English and Chemistry. The department requires more formal course work than does Chemistry and the economics student begins his dissertation research at a later stage in the program than does the chemistry student. In addition, the economics student typically encounters more difficulty than the chemistry student in establishing a thesis topic and in securing a research adviser, since the procedures are not well established in Economics; it is not uncommon for economics students to flounder during the third year, making very little progress on the dissertation and failing to secure a thesis adviser, while this would be virtually impossible in Chemistry because of the different organizational structure.[14] On the other hand, the Economics curriculum is much more streamlined than the English program, with less formal course work, less inclusive examinations, the absence of language requirements, and the relatively early stage at which the student is free to concentrate solely on the thesis. Referring to degree-enrollment ratios in Table I, we note that Chemistry experienced an average of 5.38 student years per degree in the period 1961-67, Economics absorbed 9.61 student years per degree, and English 13.09 student years per degree; our analysis of the curricula in these three departments should render these figures understandable.

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[14] Details of departmental organization will be discussed in the next chapter.

An important element in the theory of departmental behavior developed is the argument that the curriculum represents one major control variable with which the department regulates the supply of new Ph.D.'s. Thus we expect to find that major curriculum changes affecting the output rate will follow significant shifts in the department's perceived demand for its product. Interviews with professors associated for many years with the three departments under discussion allowed us to reconstruct the perceived pattern of demand in these fields since World War II. Following this description, information regarding significant curriculum change will be presented, demonstrating the predicted response.

The demand for Berkeley Ph.D.'s in Chemistry has been very strong from the end of World War II until this year, when one Berkeley doctoral recipient was forced to take a job in the computer industry doing work unrelated to chemistry. Prior to this year, however, students generally received multiple offers, allowing ample choice among attractive alternatives, a true "seller's market." One Chemistry professor attributed the high level of demand to a national policy, generated by the Cold War, of expanding the country's stock of scientific manpower. Industrial demand was also prominent, with the need for scientists in research and development laboratories. Academic demand was also substantial as larger numbers of students clamored for scientific training. The professors stated that heavy demand for Chemistry Ph.D.'s produced the high level of graduate student support, as hypothesized in the previous chapter; one professor estimated that 90% of the department's support is provided by the Federal Government, while the Dupont corporation gives the department $40,000 each year to "improve graduate training." Other firms, such as Proctor and Gamble, also provide funds for student support.

Demand for English Ph.D.'s appears to have been steady during this

period with the greatest excess demand felt during the early 1960's. This field, having only an academic market, apparently followed the pattern indicated in Allan Cartter's supply and demand graph for college teachers, reproduced in the production function paper.[15] The disastrous job market encountered at the 1970 Modern Language Association meetings suggests that Cartter's predictions were substantially correct.

While both English and Chemistry experienced steady, if quantitatively different, patterns of demand, the field of Economics experienced a more significant rate of change of demand than either of the other two disciplines. An Economics professor recalled a growing, nationwide interest in economics beginning in the late 1950's. He attributed this largely to the increased relevance of the New Economics to public policy, culminating in the Kennedy-Heller years. In addition to "fine tuning" the American economy, many students were attracted to the field because of growing interest in economic development. Finally, the emergence of economics as the most technical, most scientific, of the social sciences increased its attractiveness.

The above descriptions are admittedly sketchy and subjective, but this is to be expected since the views represent memories of faculty members stretching over 20 years. Furthermore, it seemed appropriate to sample recollections of perceived demand, since departments would presumably be responding to that variable. Let us now examine instances of curriculum change that have occurred.

According to an English professor, there were "no essential curriculum changes in the doctoral program from 1945 to 1965." The changes instituted in 1965 were described as follows:

(1) Admission was restricted to the Fall Quarter and only Ph.D. aspirants were accepted, the separate M.A. program

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[15] See David Breneman, "The Ph.D. Production Function: The Case at Berkeley," op. cit.

being eliminated.

(2) Between 1965 and 1967 specific course requirements were reduced to three prescribed courses. The student would take many more than three courses, but greater flexibility was introduced.

(3) The three basic language requirements were retained, but the timing of examinations was made more flexible.

(4) The comprehensive exam was changed from a 1-1/2 hour oral to a nine hour written exam.

(5) The scope of the oral exam was narrowed, allowing one part to be devoted to the student's research interests.

The professor obviously felt that rather dramatic curriculum reform was embodied in these changes; the interviewers, after analyzing the actual substance of the changes, felt that their importance was somewhat exaggerated.

The motivation for altering the program appears to have been twofold:

(1) Berelson's criticisms[16] of unreformed doctoral programs coupled with the belief that the nation faced a shortage of English Ph.D.'s. Apparently, by 1965, several members of the department felt that demand was sufficient to warrant greater output; this suggests that the information-response lag in academia may be several years long.

(2) In order to qualify for the Ford Foundation Career Fellowship Program, the department had to agree to rationalize the program somewhat.

Organization of the Chemistry curriculum appears to have changed only marginally during the past 20 years. In fact, the major effect on time to degree was a lengthening of the average student's program from three to four years made possible, ironically, by the increased student financial support in the late 1950's. In the 1940's and early 1950's, most students relied

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[16] Berelson, Graduate Education in the United States, op. cit., pp. 234-242.

upon teaching assistantships for support, and these positions were generally limited to three years. Consequently, the student knew he must finish within that time, and the department cooperated by accepting less complex dissertations. The influx of federal money in the post-Sputnik era meant that students could be well supported for four years, and the department's response was to encourage more extensive research projects. Four years is the maximum desired by the department, however, and this policy is made effective by reducing a student's R.A. stipend by 25% for each year over four that he remains enrolled.

The only change in formal requirements mentioned by the professors (apart from increased dissertation emphasis) was the elimination of the second foreign language requirement in the middle 1960's. This change apparently occurred in response to student complaints.

By contrast to the minimal changes in English and Chemistry curricula, the program in Economics at Berkeley underwent a fundamental transformation during the early 1960's. The best way to explain the change is simply to describe the program that existed in the 1950's, which can be compared to the current curriculum described earlier. The reader will note that the old Economics curriculum is very similar in organization to the current graduate program in English.

Under the old program the economics student enrolled in course work for the first two years, covering five fields, Theory, Economic History, Statistics, and two optional areas. Only the statistics requirement was met by course work certification, however, and each student has to pass separate qualifying examinations in the other four areas. Furthermore, there was no guarantee that exam questions would be limited to material covered in the courses; the Economic History exam was particularly feared since the field

is so open-ended, and students were never certain that they had read enough. In consequence, most students continually put off the exams and spent the third year in preparation. Those who passed the written exams (many did not) then had to prepare for a traditional "German style doctor's oral," in which five faculty members quizzed the student for three hours on the same four fields covered in the written exam. Fear of this ordeal led to further procrastination, and, of course, there were two foreign languages to be mastered. Thus, work unrelated to the dissertation commonly occupied the student for 3-1/2 to 4 years, twice the current time. Having survived these hurdles, most students were forced by financial considerations to accept full time teaching positions, with the dissertation sandwiched in as other duties allowed. Not surprisingly, success rates in Economics at this time were very low.

The new curriculum emerged from hard-fought departmental battles during the late 1950's and early 1960's. One of the professors interviewed recalled during this period that those faculty members who resisted the change viewed themselves as the "good guys" because they were "upholding the standards;" while the faculty favoring liberalization were definitely the "bad guys" because their actions would presumably lead to a reduced quality Ph.D. When asked why the "bad guys" were willing to undertake a costly and disruptive battle for curriculum change, the professor responded by saying that, "Anyone looking at the old program could tell it was a lousy system." The interviewer commented that the English department, for example, still has a "lousy system" but no forces for radical change seem to have emerged in that department; therefore, how did the professor account for the differences in departmental response? The professor suggested that the English department may be "functioning somewhat like the American Medical Association to restrict supply, given the limited market." The interviewer

quickly agreed, stating that the professor had just summarized the basic theory being tested. The interviewer then stated that, consistent with that theory, he would interpret the major curriculum change in Economics as a departmental response to the rapidly improving market for economists. The professor promptly denied this. The reader is left to draw his own conclusions.

B. Interviews with Faculty and Students

The purpose of interviewing faculty and students in the five departments was simply to gain more understanding of the factors perceived by the participants as affecting time to degree and attrition. The theory of departmental behavior was not directly presented to the interviewees because we did not wish to bias the response; instead, the differences in departmental performance were described and interviewees were asked how they would explain the relative performance of their department. During the course of the faculty interviews, we focused upon the department's decision regarding the number of graduate students to admit, and, separately, upon the desired placement of the department's Ph.D.'s. In addition, we discussed the role of financial support and explored the technology of Ph.D. production in each field. We also looked for attitudes or expectations regarding the "proper" amount of attrition.

With students we explored the decision making process and probed for evidence regarding the amount of information available to students. Student attitudes regarding job placement were also discussed, as were the effect of different forms of financial support on progress to the degree. Finally, we looked for evidence regarding student morale; the theory implies that dissatisfaction should be greatest in the humanities - is this the case?

Specifically, we[17] interviewed two senior professors in each of the

[17] The interviewers were the author and Mrs. Hannah Kreplin, a Berkeley graduate student in Sociology.

five fields separately for an hour or more. The men were chosen for their knowledge of the program; in all but one instance, the professors had been members of the Berkeley faculty for 15 years or more. Students were interviewed in groups of three to five, representing different amounts of time in the program. Students were selected in consultation with the graduate secretaries in each field. We realize that interviewing small numbers of people is not without its scientific problems; however, the discussions produced a considerable wealth of information that could not have been gathered in any other way. Highlights of the interviews in each field follow.

Chemistry

From faculty interviews, a clear picture of the economy of a chemistry department emerged. A faculty member must publish in order to gain a reputation so that he may acquire research grants with which to support graduate students who help him produce more research so that larger grants can be acquired allowing more students to be supported, etc. - a true vicious circle. The department simply could not afford to have a nonproductive faculty member since each professor is expected to generate enough funds to support several students in a research group.

> *In this field, publish or perish is an understatement. I spend half my time supervising graduate students, making sure that the work gets done, and the other half in Washington begging for more money. My knuckles are raw from bowing and scraping in front of those agencies. I think it's a great tribute to our faculty that we manage to do as good a teaching job as we do under these circumstances.*

The economic pressure to publish felt by faculty members in this field has led to an efficient organizational adaptation in which faculty members suggest topics and provide guidance and the graduate students do the actual

research. The final product is published jointly under both names, with benefits flowing to both parties. The faculty member expands his publication list, thereby increasing his reputation and ability to earn more grants, while the student gains his Ph.D. and a first publication. Within the discipline the faculty member's name on the article serves as his endorsement of the student's capability, thus boosting the student's reputation and insuring acceptance of the article by professional journals. The student is thus a critical input into the faculty member's research production function, freeing the professor from the tedious work in the laboratory and allowing him to operate more productively as a source of research proposals and as a fund raiser.

> *Back in the early 1940's when I was a young assistant professor at Berkeley working 90 hours a week to get tenure, I actually did a research project by myself one summer and published it under just my name. So many people quizzed me about that at the professional meetings, questioning my sanity and so forth, that I learned never to make that mistake again, and haven't published solo since then.*

One can understand why course work is kept to a minimum - the student is simply much more valuable in the laboratory than in the classroom.

The departmental decision regarding the number of graduate students to admit has been dictated primarily by the availability of extra-mural faculty grants which support graduate students and their research; hence, external resources appear to be more important to the department than internal resources. However, the department is keenly aware of the workload measures used by the university's budget personnel:

> *Even though our students take very few formal courses, they're all enrolled for the maximum course load in 298's and 299's.*[18] *Believe me, we produce more than our share of student credit hours.*

[18]Research seminars and individual research for graduate students for which course credit is given.

The market's influence on departmental decisions governing the output rate of Ph.D.'s was brought out in several comments:

> *When we're considering a marginal student in an oral exam, we know that if we pass him he'll be able to get a job in an industrial lab somewhere and will probably be a damn good chemist, so we generally let such students through. Of course, if we had to place all our students in academic jobs, we'd have to change our requirements and eliminate marginal students. We couldn't let as many through.*

> *As far as prestige is concerned, we view a placement in Bell Labs, or at Dupont or General Electric, as very acceptable, almost as good as a top academic position. In general, however, we hope that our best students take academic jobs.*

Queried about the department's response to the currently worsened job market, one professor expressed uncertainty as to whether this was a temporary decline or represented a more permanent change. Should the decline be long-lived, he thought the department would reduce enrollments somewhat (although noting that this would be resisted by many professors), and that the curriculum would be revised to include more course work in order to train less specialized, more flexible chemists. The clear implication was that the product would be adapted to enhance its marketability.

Two other factors importantly related to student success rates emerged from the discussions. First, both professors stressed the value of the student's belonging to a specific research group, a place where the student could "hang his hat." This affiliation means that a professor is concerned with the student's progress from the beginning and provides a supportive group to bolster the student's confidence when the work becomes discouraging.

Secondly, it was very apparent that the faculty expect and want the students to succeed; we were told that if there were any doubt concerning the ability of an applicant to earn the degree, he would not be admitted. Thus, the faculty does not expect a high attrition rate, an expectation that becomes self-fulfilling.

The Chemistry students' description of the program was virtually identical with the faculty description. The students agreed that there was only one critical test - the ability to perform research adequately.

> *We don't sweat course work or exams or the German requirement. The only thing that matters to the faculty is what we produce in the lab. The students who are asked to leave are the ones who spend a year trying to do research and make no progress.*

When asked about student response to the worsening job market, it was observed that students are beginning to stay in Berkeley for a fifth year. By working as a T.A., the student can avoid the 25% pay reduction accorded R.A.'s; furthermore, it was noted that several faculty members have not reduced student pay if the research being done is useful. We asked the first year student whether the worsening market had affected his decision to enroll:

> *I don't give a damn about the poor market - who knows what it will be like four years from now? I just don't think about it because I'm doing what I want to do now. I want to teach when I finish, and I figure something will be available then.*

Asked for their attitude toward the joint authorship of research, the students responded favorably, indicating that it was, "a help in establishing a scientific career." Departmental organization into research groups was strongly supported for giving the student a sense of belonging. Morale in the department appeared to be very high.

We noted an interesting tendency for students to refer to their research directors as "the boss."

English

We began both faculty interviews by inquiring into department policies regarding graduate enrollments; we wanted to know how faculty explained the growth of the department to 492 graduate students during the 1965-66 academic year. The first professor was not aware of any conscious policy regarding departmental size. He had noticed, however, a tendency for enrollment growth to correspond rather closely to increased faculty size. He did not express an opinion regarding the direction of causality.

The second professor offered numerous explanations. He stated that the department had established objective criteria for admission and felt obligated to accept all qualified applicants, noting the absence of physical constraints such as laboratory space and facilities that would restrict enrollments. Next, he observed that English professors display near "missionary zeal" regarding the teaching of their subject, seeing their duty as rescuing the country from "cultural barbarism and illiteracy." Presumably, this made it harder for the department to reject applicants. Finally, he commented:

> *In reality, I suspect our growth had a lot to do with the way the University keeps its books - you know, that weighted enrollment formula. While this was never overtly discussed when considering applicants, I know we all had in the back of our minds the knowledge that more graduate students meant more faculty. I'm sure most department members would never admit this, but I think you should adopt a behavioral approach - don't go by what we say, but by what we did.*

This professor felt that the department had gotten far too large in terms of both students and faculty.

> *What sense of community can you have when the chairman's annual cocktail party for faculty, teaching assistants, and wives is*

> *attended by over 250 people? Why, we have to rent space off campus just to house the affair . . . There are assistant professors who have been in the department for two or three years whose names I don't even know. It's a bit embarrassing when I pass them in the hall.*

He felt the department would be much better off if graduate enrollments were reduced to a number small enough so that all students could be supported. The loss of faculty positions that such a policy would entail was viewed as an acceptable cost, perhaps even a move in the right direction. "Perhaps we could regain a feeling of community."

The other professor did not express a desire for such substantial change. Shocked by the worsening job market, he indicated that the department was aiming for a steady state enrollment of 340 Ph.D. students, with 75-100 new doctoral students admitted each year. When asked how many Ph.D.'s the department would want to award annually when in that steady state, he indicated that:

> *With the new program we hope to reduce attrition to an acceptable level and award 30-40 Ph.D.'s each year.*

Note that these figures imply an attrition rate in excess of 50%, and yet the professor clearly indicated that such performance would be viewed by the English faculty as optimal. The pronounced difference between faculty expectations in the English and Chemistry departments certainly helps to explain why attrition rates differ so markedly. Of course, it is the fundamental argument of this thesis that these divergent faculty attitudes are a reflection of the different markets being served.

The English graduate students described the program as, "A series of hurdles accompanied by continual anxiety and humiliation." A third year student stressed the "... feeling that you are not fully accepted by the department until you've neared the end of the program." A second year student

stated that "The feeling in this department is, they're out to fail you." She noted that during the first year in the program she met few of her fellow students, largely because the intense competition was not conducive to friendships.[19] And yet the students were stunned when shown the data from Stark's study; they had no idea that so few students actually earned the Ph.D.

The students described the Comprehensive and Oral Examinations as the major obstacles in the program. The open-ended nature of the Comprehensive exam coupled with the awareness that the department would fail some of the students made that exam a particularly frightening experience. Although the brochure states that the students must take the Comprehensive between the fourth and sixth quarter, the students knew several people who had managed to postpone the exam until the seventh or eighth quarter for fear of failure. (In keeping with the theory of departmental behavior, such behavior on the students' part may be perfectly rational given the all-or-nothing nature of the investment; an extra quarter's study is well spent if it makes the difference between passing and failing. Faculty attitudes are critical, for if the students know a certain number will be flunked, the incentive is to expand study time and minimize that risk.)

The language requirement was not viewed as a direct cause of attrition, although it was felt that the Latin requirement does contribute to the "disgust" which finally causes some people to leave the program. The forced study of Latin is apparently viewed by many students as highly irrelevant; one student commented that:

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[19] In an attempt to overcome student estrangement and isolation, the graduate students this year formed the English Liberation Front (ELF). Much of the activity of ELF will be devoted to curriculum criticism and pressure for reform. The Latin requirement has been the first item to come under attack. One of the students commented that the group was addressing the problem of "having the faculty treat us like children."

The faculty has preserved the Latin requirement because they view it as a hurdle which demonstrates the high quality of the Berkeley graduate program in English.

An advanced student argued that the department was constantly comparing its program to that of Yale and Harvard (the English departments ranked number one and two ahead of Berkeley in the Cartter Report), trying to outdo those two schools in the rigor of the doctoral program.

The Oral examination was viewed as somewhat less an ordeal now that the student's area of interest occupies a larger portion of the exam. The students still characterized the exam as sadistic, marked by pettiness and competition among faculty members.[20] Fear of the exam and the belief that a number will fail at that point does result in some postponement beyond the prescribed tenth to twelfth quarter.

In general, the English students expressed considerable bitterness toward their graduate experience. The faculty seem distant and unfriendly, large portions of the curriculum seem pointless and irrelevant, and the students express concern over their continually uncertain status in the department.[21] Financial problems are also a contributing factor; for example, the second year student had applied for a T.A. position next year and had been named an alternate, but the department will not tell her in what order she appears on the list. She expressed reluctance to borrow more money for a degree ". . . which gets farther and farther away." One suspects that the willingness of humanities students to borrow is considerably reduced

[20]The reader will find the novel, Doctor's Oral, by George R. Stewart, a retired professor of English at Berkeley, very amusing and relevant to this point. Although this book was written in 1939, one wonders whether much change has occurred in the intervening 31 years.

[21]During the past year, the author has talked informally with Ph.D. students in other Humanities and Social Science departments, including ilosophy, French, German, and Political Science, and has encountered milar expressions. The English department is certainly not unique.

by the perception that the investment is very risky and replete with random factors over which the student has no control. The nature of the Ph.D. curriculum in English, and the humanities in general, with all the attendant uncertainties, may greatly reduce the value of an option to borrow, needlessly compounding the financial difficulties facing humanities students.

One of the great ironies in the University that emerged from the interviews is the relatively inhumane graduate experience provided by the humanities departments, while the "cold, impersonal, technocratic" sciences are generally characterized by a much more decent, human, graduate program.

Economics, Electrical Engineering

Interviews with students and faculty in these two fields did not disclose any information that was inconsistent with the basic theory;[22] therefore, we shall limit the discussion to a few relevant quotations.

An economics professor observed that the Berkeley department became one of the "Big Five, along with Harvard, Yale, M.I.T., and Chicago," during the late 1950's. Slightly predating this move into national prominence, new placement procedures were introduced, designed to make the market for Berkeley Ph.D.'s nationwide.

> *I wanted to see the department become one of the best, so I personally started the new placement program by writing to several hundred schools. It was essential that we begin placing some students back East in the Ivy League and also in the Big Ten. We had to go beyond just serving the Western state colleges.*

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[22] This does not mean that all participants necessarily agreed with the theory; however, the behavior of both departments was perfectly consistent with the model, and no significant alternative explanations were offered. By contrast, the Botany department does represent a partial counter-example, and will be discussed in some detail.

When asked if he were implying the existence of an important link between the quality of student placement and a department's reputation, the professor's response was simply, "Isn't that obvious?"

This professor explained the curriculum revisions of the late 1950's, early 1960's, as the result of faculty concern over a program that was taking six to eight years to complete. He did not recall graduate students as a source of pressure for change:

> *You must realize that graduate students in the 1950's were very meek animals, unlike the present. There were grumblings about the program, but rebellious activity was limited to scribbling Marxist slogans on the walls of the T.A. office. We didn't have a graduate coordinating committee, and students played no role in formulating curriculum policies.*

Asked why the faculty was motivated to make these changes, the professor referred to the evolution of economics from an historical to a scientific discipline; he also noted the increased popularity of economics associated with this change and the concomitant growth in demand for Ph.D.'s.

One gathers that several factors were impinging upon the Economics department in the late 1950's.

(1) the changing nature of the field, with greater emphasis on mathematical techniques rather than institutional analysis. As one professor commented, "Our model was shifting from Harvard to M.I.T."
(2) A realization that the demand for economists was increasing rapidly, in both academic and government-industrial markets.
(3) A desire to place more students nationally as a sign that the department "had arrived."

Is it any wonder that, in the face of these pressures, a curriculum responsible for high attrition rates and excessive time to degree would be viewed as anachronistic?

Interviews in Electrical Engineering tended to confirm the theory

almost precisely. One outspoken professor, having heard the topic described, burst out immediately:

> *The differences between departments that you mention are obviously caused by differences in demand. We're teaching useful, relevant material in our department, and so we have a strong demand for our Ph.D.'s, both in industry and in the universities. Our students have valuable options with the M.S., and wouldn't stand for a lot of trivia in the Ph.D. program that wasted their time. Graduate students in the humanities have no right to expect financial support since those subjects are basically useless. No wonder they can't get jobs.*

He commented on the "insanity" of an institutional incentive system that rewards departments for building up huge enrollments, regardless of whether degrees are ever awarded.

> *The result is that a medieval corporation like the English department packs in graduate students by the hundreds and then tries to keep them around forever because there aren't enough jobs. I'm sure that this crazy system has a lot to do with the student unrest at Berkeley - who can blame students in those departments for rioting?*

Regarding placement of the Electrical Engineering department's Ph.D. candidates, the professor indicated no preference for academic or industrial positions; the main concern is that students perform well in whatever position they accept. One professor mentioned the importance of feedback from industries employing the department's Ph.D.'s; apparently the Berkeley professors are very concerned that their students not be out-performed by graduates of competing Electrical Engineering Departments.

> *I think it would be really sick if more than half of our Ph.D.'s went into teaching each year. After all, we train our students to perform a useful service to society, and we don't want them all merely instructing others.*

One professor commented that the Mathematics and Physics departments had foolishly allowed their curricula to become so academic that industry was

becoming increasingly less interested in hiring Ph.D.'s from those departments.

> *The last 30 years have witnessed a tremendous broadening and deepening of the engineering curriculum, allowing our doctoral students to compete very effectively with students trained in the pure sciences. At this point, I think our students have the edge over applied math students when it comes to industrial positions.*

The interviewer commented that the job market for Ph.D. electrical engineers was reported to have worsened dramatically this year, and asked what the department's response would be if the decline proved long-lasting. The professor smiled and said, "We'd simply have to enforce stricter standards and flunk a few more out."

Botany

The Botany department proved particularly interesting because, unlike the other four, this department deviated from the model in one significant respect. Whereas most Berkeley departments experience graduate enrollment increases of 200% or more during the 21 year period under study, graduate enrollment in Botany increased by only 40% from 47 students in 1948-49 to a high of 66 enrolled during 1965-66. In keeping with this reduced growth rate, faculty size grew slowly from 10 to 16 during the same period. Interviews with faculty members indicated that this atypical growth pattern represented an explicit policy decision by the department. How do botanists explain this un-Berkeley-like behavior?

Both professors expressed a feeling that handling Ph.D. students is a "personal and difficult matter; to do a proper job, no faculty member should supervise more than five students." In addition, an upper limit on graduate enrollments of approximately 60 is viewed as critical if the department is to

maintain a sense of community; in fact, one professor felt that the department was much more closely knit years ago with 10 faculty and 40 students than now with 16 faculty and 55 students.

> *A few years back, students and faculty mingled easily as colleagues in the coffee room. Now, we have to invite the students in to relax - it takes longer for them to feel at ease.*

Other factors cited as affecting graduate enrollments were:

(1) laboratory space - the department wants every graduate student to have his own station at which to work;

(2) financial support - enrollments have been limited to the number of fellowship, T.A., and R.A. positions the department can secure, thus providing near 100% financing.

(3) the job market - enrollments have been kept at a figure that assures the department's ability to market its Ph.D.'s in suitable positions.

One professor observed:

> *Until very recently, the University has pushed departments to increase graduate enrollments. Many faculty members in other departments figure that, 'The more students I have, the more famous I'll be.' In Botany, we have consciously resisted this pressure.*

The department does not suffer from a lack of applications, receiving 50-75 each year from qualified applicants. The top 20-25 are ranked, and admitted incrementally until 8 to 15 have accepted. Interviews with faculty and students made clear the department's desire to have virtually all students graduate, i.e., the faculty rarely ask a student to leave. As a consequence, morale appears to be very high in this department. Students feel accepted and know that decent work will be rewarded by continued financial support and ultimately by the degree. Unlike the English students, the Botany students did not display evidence of alienation or bitterness toward the department; one student commented, "We have very little to complain

about, really."

One interesting difference between Botany and Chemistry emerged. Although the Botany professors currently have outside grants totalling one third of a million dollars, very few students are employed as research assistants on a professor's grant. Instead, each student is encouraged to pursue his own research interests, aided, but not employed by, faculty members. Student research in Botany is generally published, therefore, under just the student's name. It was clear that one of the Botany professors felt this procedure to be ethically preferable to that employed by the Chemistry department.

The interviewers were agreed that in terms of sensible departmental organization and quality of graduate experience, the Botany department would be top ranked among the five disciplines studied. However, one simple change, an enrollment increase from 55 to 150, would surely produce a situation in Botany as depressing as in English. Only a third of the students would be supported, creating the attendant uncertainty and distress; enrollments would exceed the number dictated by market demand, generating a need for high attrition rates; anxiety levels would rise, and the collegial spirit would be destroyed, since many students would fail to complete the program. Or, to turn the comparison around, one can imagine many of the problems of the English department vanishing if enrollments were reduced to a level sensibly related to available financial support and market demand. Thus, how do we explain the different policies adopted by these two departments?

An hypothesis that is consistent with the theory of departmental behavior suggests itself. We assume each department's objective to be prestige maximization, and we note in the Cartter Report that Berkeley's Botany department is ranked number one. In the field of Botany, therefore, a faculty of is sufficiently large to be accorded the highest quality ranking; thus,

the Botany department has no need to expand, for the goal of maximum prestige is capable of attainment at a faculty size that coincides with a rational graduate student enrollment. Effective competition for national ranking in this field may require a faculty of 50-60 professors. Should that be the case, graduate student enrollment would be allowed to rise as high as necessary to justify the desired faculty size. In the case of the English department, this may involve many more graduate students than market conditions warrant; high attrition rates would be the expected result. This hypothesis suggests an intriguing line of further research into the relation between faculty size and quality rankings in the various fields.

III. PLACEMENT OF BERKELEY Ph.D.'s

In outlining the theory of departmental behavior, it was hypothesized that departments at Berkeley are not interested in producing Ph.D.'s for all segments of the academic market, but operate instead to produce a number that can be placed reasonably well within the prestige system. Underlying this view was the assumption that quality of doctoral student placement reflects positively or negatively upon the prestige of the producing institution; it was argued that if a department "over-produced" to the extent that significant numbers of its placements were in inferior quality schools, the department's reputation would suffer. These assertions are open to empirical test, the purpose of this section.

We suggested that conceptually one could categorize the colleges and universities in this country into five prestige classes, ranking them symbolically ++ , + , 0 , - , and -- .[23] The argument was made that Berkeley departments control their output so that the vast majority of placements will be made within the first three groups; placements in the - and -- categories would be avoided by not over-producing. To give meaning to these classifications, we turn here to David Brown's publication, Academic Labor Markets.[24]

For his own purposes, Brown produced a Prestige Index, by which he ranked 1,121 U.S. colleges and universities. With numerous caveats, he proposed the following eight factors as measuring elements of academic prestige:[25]

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[23] Breneman, David W., "An Economic Theory of Ph.D. Production," op. cit.

[24] Brown, David, Academic Labor Markets, op. cit.

[25] Ibid.

(1) Percentage of faculty with Ph.D.'s;
(2) Average compensation (salary and fringe benefits) per faculty member;
(3) Percentage of students continuing to graduate school;
(4) Percentage of students studying at the graduate level;
(5) Number of volumes in library per full-time student;
(6) Total number of full-time faculty members;
(7) Faculty-student ratio;
(8) Total current income per student.

Every school was ranked from 1 to 1,121 on each factor, and an average rank, or composite rating, was computed for each institution. The schools were then broken into six groups, labeled A - F; the number of schools in each group is presented in Table II:[26]

Table II

Number of Colleges and Universities in Each of Brown's Prestige Groupings*

Group	No. of Institutions
A	28
B	47
C	134
D	201
E	283
F	428
Total:	1,121

*Source: Brown, Academic Labor Markets, [1965].

[26]Brown, op. cit.,

On the basis of the eight factors, group A is the most prestigious, group F the least prestigious.

Brown's classification was accepted for the present study, with one major change. The ++ category in our conceptualization was reserved for universities ranked 1 through 10 in each field by the Cartter Report, for it was felt that the very highest prestige accrues to placement in such schools. Brown's "A" ranking included colleges such as Amherst and Swarthmore, which, while prestigious in their own way, do not have the status of graduate oriented, research institutions. Consequently, Table III sets forth the definitions of our proposed prestige rating system:

Table III

Definition of College and University Prestige Groupings*

Group	Definition	No. of Institutions
+ +	Top 10 Cartter Report schools in each field.	10
+	Brown's groups "A" and "B" plus schools ranked 11-20 in Cartter Report.	65 (approximate)
0	Brown's groups "C" and "D".	335
-	Brown's group "E".	283
- -	Brown's group "F".	428
	Total:	1,121

*Source: Cartter Report, [1966], and Brown, Academic Labor Markets, [1965].

It is not feasible to reproduce the list of all 1,121 schools; the interested reader is referred to Brown's book.[27] To give an idea of the

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type of school included in each category, a few examples will be provided:

+ +	Refer to Cartter Report for each field - generally the well-known universities such as Harvard, Yale, Princeton, Michigan, etc.
+	Amherst, Swarthmore, Williams, Wellesley, Rochester, University of California at San Diego.
0	Antioch, Colorado College, George Washington University, University of Colorado, Kansas, Rutgers, Ohio State, Temple.
-	University of Alabama, Arizona, Butler, Central Michigan, Clemson, East Texas State, Elmira College, University of San Francisco, Southern Oregon.
- -	Abilene Christian, California State Polytechnic, Brigham Young, University of Dayton, DePaul, Florida A&M, Golden Gate College, Slippery Rock, Memphis State, Seton Hall, Washburn University.

Data on first academic position taken by Berkeley doctorates was gathered from the National Academy of Sciences, "Survey of Earned Doctorates."[28] New Ph.D.'s fill out the two page survey when the thesis is filed, and the Graduate Dean forwards the survey to the National Academy of Sciences in Washington, D.C. Beginning with fiscal year 1967, the computerized data lists the name of the first academic employer or postdoctoral institution; thus, data on two years' placement (1967,1968) was available for the 28 departments. A total of 466 academic appointments were listed; of these, 74 new Ph.D.'s remained at Berkeley, presumably for post-doctoral work.

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[28] National Academy of Sciences, op. cit.

These 74 were excluded from the ratings. The remaining 392 were ranked according to prestige groupings described in Table III. Results for the total placements are presented in Table IV. Comparing the number of placements in each category to the number of schools in each prestige group (Table III), we note that nearly half (47.5%) of Berkeley's graduates accepted first positions in schools ranked either ++ or + , although these two categories encompass only 75 colleges and universities. Furthermore, of the 423 institutions listed as -- schools, only 12 secured the services of a Berkeley Ph.D. The 410 schools representing ++ , + , and 0 categories employed 86.5% of the Berkeley graduates entering academia; the fact that only 49 Berkeley doctorates (12.5%) accepted positions in one of the 711 institutions carrying a - or -- rating suggests that the departments have not been interested in serving this sector of the market.

Table IV

Number of Berkeley Academic Placements in Each Prestige Grouping, 1967, 1968*

Group	No. of Placements	% of Total
+ +	85	21.7%
+	101	25.8
0	157	40.0
-	37	9.4
- -	12	3.1
Total	392	100.0%

*Source: National Academy of Sciences, "Survey of Earned Doctorates," Computer Tape for University of California, Berkeley.

Table V contains the "box score" for each department's academic placements for 1967, 1968. It is interesting to consider the placements made by a department such as History in light of the theory of departmental behavior. We assumed that the best students (from the department's perspective) currently receive the doctorates and the best jobs. It was argued that each additional degree awarded would go to a student who could be placed no better, and possibly worse, than the previous students. If one accepts this argument based on quality stratification, then we see that the History department was producing Ph.D.'s in 1967 and 1968 in sufficiently large numbers that five students were placed in negative (-) prestige schools. The logic of the argument of departmental behavior implies that if the department had produced more Ph.D.'s, they would have been forced to accept jobs in - or even - - schools. Our argument is that departments have not wanted to award the Ph.D. to large numbers of students who would carry the Berkeley name and reputation into the poorer quality sectors of the academic world.

Our understanding of academic placement may be enhanced by examining the positions accepted from 1962-63 to 1969-70 by the graduates of Berkeley's English department. Information was gathered from the annual departmental reports of the Committee on Placements.[29] Table VI lists the schools where jobs were taken, by prestige grouping.

The comments that accompany the committee reports are suggestive. The May 1966 report, filed at the end of the 1965-66 market, states:

> 28 ABD's or Ph.D.'s registered with this committee. 17 have accepted full-time appointments. Several have secured part-time positions in the Bay Area or have decided to remain at Berkeley for one more year as Associates, Fellows, or without

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[29] Department of English, University of California, Berkeley, "Report of the Committee on Placements," provided by the English Department, 1962-1970.

TABLE V

Prestige of Berkeley Departments' Academic Placements, 1967, 1968*

Anthropology		Chemical Eng.		Entomology		Mathematics		Psychology	
++	6	++	1	++	2	++	14	++	2
+	5	+	2	+	0	+	13	+	4
0	4	0	4	0	2	0	15	0	5
-	2	-	0	-	0	-	1	-	2
--	1	--	0	--	1	--	2	--	0
Astronomy		**Civil Eng.**		**French**		**Mech. Eng.**		**Sociology**	
++	2	++	2	++	0	++	1	++	4
+	1	+	4	+	1	+	2	+	2
0	3	0	8	0	4	0	5	0	2
-	0	-	0	-	0	-	1	-	1
--	0	--	0	--	0	--	2	--	1
Bacteriology		**Classics**		**Geography**		**Philosophy**		**Spanish**	
++	1	++	1	++	0	++	1	++	0
+	1	+	0	+	2	+	1	+	0
0	1	0	2	0	4	0	4	0	0
-	0	-	0	-	1	-	0	-	2
--	0	--	0	--	0	--	0	--	0
Biochemistry		**English**[a]		**Geology**		**Physics**		**Zoology**	
++	1	++	12	++	0	++	11	++	0
+	4	+	17	+	2	+	6	+	1
0	2	0	22	0	5	0	8	0	3
-	0	-	9	-	2	-	1	-	0
--	0	--	0	--	0	--	1	--	0
Botany		**Economics**		**German**		**Physiology**			
++	2	++	4	++	0	++	0		
+	2	+	7	+	2	+	1		
0	4	0	13	0	2	0	1		
-	1	-	4	-	2	-	1		
--	0	--	1	--	0	--	0		
Chemistry		**Elec. Eng.**		**History**		**Pol. Sci.**			
++	15	++	1	++	2	++	0		
+	8	+	1	+	6	+	6		
0	10	0	5	0	12	0	7		
-	0	-	0	-	5	-	2		
--	2	--	0	--	0	--	1		

*Source: National Academy of Sciences, "Survey of Earned Doctorates," Berkeley tape.

(a) Includes 1966 placements, provided by department.

institutional support.[30]

We note in Table VI that the quality of placement in 1965-66 was quite good, with only one student going to a negatively ranked school. Apparently the eleven students who withdrew from the market (possibly after consultation with major professors) did so to avoid accepting a position in "Academic Siberia." The hope would be for better placement in next year's market.

The next comment appears in the interim report, dated February 11, 1969.

> Thirty-nine ABD's registered with this committee, which also assisted half a dozen Ph.D.'s already in the field. As of this date fourteen people have accepted positions for the fall of 1969 . . . The following persons have made no arrangements for next year yet. Some have decided to remain and finish their dissertations; others have no choice. We would appreciate your calling our attention to any positions you hear of.[31]

A list of 25 students follows, with dissertation title and adviser.

On June 7, 1969, the final report was filed. The committee notes that: "There were very few positions secured after the interim report of February 11, 1969."[32] Five additional students secured jobs, resulting in the 19 placements listed in Table VI, under 1968-69. Presumably the other 20 students chose to remain in the pipe-line for another year. Tracing their names to the next interim report of January 20, 1970, we find that six of the 20 had accepted positions, another six had received no offers for the second straight year, and the remaining eight are not accounted for. One speculates that they may have been victims of a deteriorating job

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[30] Ibid.

[31] "Report of the Committee on Placements," op. cit.

[32] Ibid.

TABLE VI

Placement of Berkeley English Ph.D.'s, 1962-63 to 1969-70, by Prestige Groupings*

1962-63

++	+	0	-
Harvard (2)	Virginia	Rutgers	Hunter
Stanford	Amherst		
Princeton	U.S.C.		
Indiana	UCLA (2)		

1963-64

++	+	0
Yale (2)	Reed (2)	Texas
Columbia (2)	Williams	Bucknell
Indiana (2)	Smith	Rutgers
Cornell	Dartmouth	
	Stoney Brook	

1964-65

++	+	0	-
Columbia	UCLA	Carleton	McGill.
Indiana	Tufts	Mich. State	
	Pomona	Texas	
	UC-Santa Cruz	Massachusetts	
	UC-Irvine	Colorado	
	St. John's		
	UC-San. Barbara		
	Wellesley		

1965-66

++	+	0	-
Harvard	Virginia	Kansas	Boston U.
Princeton	UC-Riverside	Buffalo	
Chicago		Kentucky	
Columbia		New Mexico	
Yale		Illinois (Chicago)	
Wisconsin			

Unranked

McGill
Victoria (2)
Univ. of British Columbia

(continued on next page)

TABLE VI (continued)

1966-67

++	+	0	-
Chicago	Washington (2)	U. of Pacific	Hunter (2)
Cornell	Minnesota	Kansas	Boston U.
Wisconsin	M.I.T. (2)	Buffalo (2)	San Jose State
Indiana	Pennsylvania (2)	Massachusetts	
	Tufts		
	Michigan		
		Unranked	
		Univ. of British Columbia	

1967-68

++	+	0	-
Stanford	UCLA (2)	Nebraska (2)	Boston (2)
Wisconsin	Williams	Texas	Harpur-SUNY
	Washington	Colorado (2)	Richmond-CUNY
	Pennsylvania	Rutgers	San Diego State
	Pittsburgh	Penn. State	San Jose State
	Dartmouth	Mich. State	
	UC-Santa Cruz	Temple	
		Buffalo	

1968-69

++	+	0	-
Columbia	Illinois	Temple	Connec.(2)
Yale	UC-Riverside	Penn State (2)	Indiana
Chicago		S.M.U.	Northern
		Colorado	Villanova
		Hawaii	
		Buffalo	
--		Fresno State	
		Rutgers	
CSC at Dominguez Hills			

1969-70[a]

++	+	0	-
UC-Berkeley (Rhetoric)	Minnesota	Texas (2)	San Francisco State
Harvard	UCLA	Rutgers	
Indiana	Illinois (2)	Buffalo	

Note: Ten other students had received at least one offer and were still negotiating.

*Source: Berkeley English Department reports of the Committee on Placements.

(a) Interim Report, January 20, 1970.

market.

The interim report of January 1970, lists 12 students with definite positions and another 10 with offers still in the negotiating process. An additional 16 students are reported as not having received any offers as of that date. One wonders why the students without offers were not lowering their sights and accepting jobs in the less attractive schools. One possible explanation might be that by 1969-70, very few schools in the lower prestige categories had positions open. Three considerations render this feasible. First, most of the schools in the last two categories are smaller than the institutions in the first three groups, and thus would not employ as many professors; Brown indicates that these last two groups employed 40% of the total faculty in 1963.[33] Secondly, although Berkeley was not supplying these schools during the 1960's, there were more than 80 other universities producing English Ph.D.'s during the decade. Many of these departments were probably very happy to place their students in the less prestigious colleges. During the eight year period from 1960-61 to 1967-68, 5,171 English Ph.D.'s were awarded in this country, the numbers increasing from 400 in 1960-61 to 977 in 1967-68. The less prestigious colleges must have been able to employ their share of these new doctorates. Finally, figures from the Cooperative College Registry, a market clearing house for 315 colleges primarily from the lower prestige groupings, support the contention. Reporting in the January 23, 1970 issue of Higher Education and National Affairs, the Cooperative College Registry stated that Ph.D. registrants were at new high, and jobs at a new low, in their 315 institutions.[34] Figures for the field of

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[33] Brown, op. cit., p. 336.

[34] American Council on Education, Higher Education and National Affairs, Washington, D. C., January 23, 1970, p. 5.

English supplied by the Cooperative College Registry showed 72 openings in 1968, with 165 Ph.D. applicants; in 1970, 69 openings were reported against 372 applicants.[35] This evidence, together with Cartter's projections, suggests that the Berkeley department may have to cultivate actively colleges that were scorned in the 1960's if it is to market even 20 Ph.D.'s a year in the 1970's.

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[35]Data supplied to the author directly from the Cooperative College Registry.

IV. RECOMMENDATIONS FOR UNIVERSITY POLICY

Having developed and tested an economic theory of departmental behavior, a final task remains. A social scientist who concentrates upon a subject night and day for several months incurs an obligation, if he thinks the topic worthwhile, to develop recommendations for improvement of the system studied. Consequently, this concluding chapter will incorporate two sets of recommendations. In the first section, policy changes suggested by economic analysis will be presented, while the final section will be reserved for the author's personal recommendations.

A. Recommendations Suggested by Economic Analysis

Economists have just begun the difficult task of analysis required for efficient resource allocation in institutions of higher education.[36] One of the major obstacles to analysis is the absence of an accepted, operational specification of the outputs and activities of colleges and universities.[37] Consequently, economic analysis of higher education has not attained a level of sophistication sufficient to justify an economist's assertion that policy implications flow unambiguously from this analysis. However, with regard to the subject of this dissertation, certain economic principles are relevant and do point toward definite changes.

Schultz, in the paper mentioned in footnote 36, comments that:

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[36] An excellent article that discusses many of the difficulties is Theodore W. Schultz, "Resources for Higher Education: An Economist's View," Journal of Political Economy, May/June, 1968, pp. 327-357.

[37] In an attempt to stimulate thought on this subject, the Western Interstate Commission on Higher Education in conjunction with the American Council on Education and the Center for Research and Development in Higher Education at Berkeley conducted a National Invitational Seminar on "The Outputs of Higher Education - Their Proxies, Measurement and Evaluation," Washington, D.C., May 3-4, 1970.

> In 1959-60, U.S. "direct" expenditures for higher education minus auxiliary enterprises and capital outlay plus implicit interest and depreciation of physical property came to about $4,350 million, but the earnings foregone by college and university students exceeded this figure. Yet we omit these earnings foregone in our planning and financing approach to higher education.[38]

He continues by making several observations, two of which are directly relevant to the present study:

> ...(2) it is simply impossible to plan efficiently when over half of the real costs are treated as "free" resources:
>
> (3) there is no incentive to economize on the time of students in educational planning under existing circumstances.[39]

Further on in the paper, Schultz adds this additional comment:

> How, then, can we strengthen the tendency toward a more efficient allocation of resources? The required changes in organization to achieve this objective are fundamentally of two parts, namely, better economic incentives and better information for those who make the allocative decisions.[40]

The three factors mentioned by Schultz (recognition that student time is not a free good, better incentives, and better information) are critically related to the "inefficient" functioning of various departments documented in previous chapters.

Not only do most Berkeley departments treat student time as a free good,[41] but, in addition, the incentive system reinforces this behavior.[42] By linking

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[38] Schultz, op. cit., p. 333.

[39] Ibid., p. 333.

[40] Ibid., p. 341.

[41] The exceptions might be departments such as Chemistry, where student time is an input to a professor's research production function, thereby entering the professor's cost function.

[42] Described in Breneman, op. cit.

state resources mechanically to a weighted enrollment formula, the University and most academic departments have responded "rationally" by producing large numbers of enrolled student years. This type of "backward" incentive system that rewards resources on the basis of input rather than output is often encountered in the public sector; for example, hospital resources are often linked to the production of patient bed-days (an input measure) rather than to the health of the people served. Two factors appear responsible for this peculiar method of resource allocation:

(1) it is often simpler to define and quantify input measures (enrolled student-years, patient bed-days) than output measures (educated men, healthy people);

(2) the implicit assumption is made that public agencies will convert the inputs into outputs in a reasonably efficient and public spirited manner, not allowing parochial agency interests to interfere with the accomplishment of public objectives.

Hopefully, this discussion has demonstrated in one instance the naiveté embodied in point (2).

This discussion leads to recommendation number one:

> The basis for internal university resource allocation should be shifted away from input measures such as enrollment or student credit hours, and toward greater use of output measures such as number of degrees produced.

This policy would reduce the department's positive incentive to admit large numbers of graduate students just to gain the associated resources. However, the proposed policy alone may not be sufficient, for no direct cost is imposed upon departments that persist with high attrition rates. To remedy this, we proposed recommendation number two:

> The Dean of the Graduate Division should monitor the performance of each department, reducing the graduate enrollment quotas of

departments that continue to display excessive attrition, allocating the positions released to departments that indicate a willingness to produce and an ability to place more Ph.D.'s.

Several comments are in order regarding the possible effects of these two recommendations.

First, a critic might argue that rewarding resources on the basis of degrees produced will have the effect of turning departments into diploma mills, thereby reducing the value of a Berkeley degree. Although this is ultimately an empirical issue, we would argue that other forces are operating to prevent this from happening. Should a department award the Ph.D. degree indiscriminately, regardless of the student's qualifications, the value of the degree would plunge, carrying the department's reputation with it. The best graduate students would tend to avoid Berkeley, knowing that the degree had lost its value; in addition, many faculty members would not want to be associated with a department known as a diploma mill. In short, a department's reputation is inseparably linked to the quality of its graduate program, and we should not expect departments to abolish their standards in response to an altered incentive system. However, we might expect the faculty to respond by eliminating outmoded, irrelevant requirements that do not affect quality yet needlessly create attrition. Furthermore, since student enrollments alone would no longer generate resources, the departments should adjust the number of students admitted more closely to the number of degrees to be produced. Without a need for high attrition rates, the way should be clear for more sensible curriculum design.

Second, some might argue that the "imbalance" of student financial support places the humanities at a disadvantage, rendering the Philosophy department incapable of producing as many Ph.D.'s as the Chemistry department. The economist can only respond that the greater financial support in Chemistry

indicates that the nation values chemists more highly than philosophers and is willing to pay to have chemists produced. The philosopher may find the national values offensive, but until the demand for philosophers increases, financial support will remain "unbalanced."

A more telling criticism would be the denial that degrees represent the appropriate or the only output measure. It might be argued that a student who spends several years enrolled before leaving without a degree also represents an output and should not be accorded zero value. If one could deny or disprove this criticism, then the recommendations advanced above would be unassailable on economic grounds, for the new policies would result in the same or greater output being produced with less input, an unambiguous gain in efficiency. However, as mentioned earlier, output measures represent one of the weak points in micro-economic analysis of higher education; hence, such criticisms cannot simply be dismissed. The following points in defense of degrees as an output measure are offered, with the knowledge that the issue remains open:

(1) The author believes that the vast majority of students who seek the Ph.D. do so in order to enter the type of professions open only to holders of the degree. If this is so, then the student who fails to earn the degree would not view the time spent in graduate school as representing a meaningful output.

(2) An economist might suggest a study to calculate the rate of return to time spent in graduate school before dropping out. However, difficulties of interpretation abound, and the author doubts that such a study would yield meaningful results. Consider, for example, an individual who spends three years unsuccessfully studying for a Ph.D. in French prior to becoming a stockbroker. Could a study determine unambiguously the rate

of return to those three years spent in graduate school? Considering the large opportunity cost of those years, such a study might very likely demonstrate a negative rate of return, thereby reinforcing the position assumed in this study. However, suppose the study found that graduate school dropouts do earn substantially more than B.A. holders without graduate work, rendering the rate of return positive. Could other causal factors be controlled sufficiently to allow us to argue reasonably that income differentials are attributable to the years spent in graduate school? Perhaps pessimism regarding the value of yet another rate of return study should not be expressed, since such studies do keep economists employed; however, the author seriously doubts that research results of this type would be useful in deciding wise public policy regarding graduate school enrollments.[43]

(3) The author believes that the major cost of the policy measures recommended would be the denial of admission to a number of potential graduate students. In essence, we would be foreclosing for many students the opportunity to come to Berkeley and fail. Of course, certain departments at Berkeley, such as Botany, currently follow a policy of turning away qualified applicants; thus the new policy would not be without precedent. However, there is a cost associated with denying admission to qualified students, and administrators might reasonably decide that as a public institution, the University should accept as many qualified graduate students as resources allow, knowing full well that a large number will never graduate. The unsuccessful students will at least have had the opportunity to try.

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[43] An article demonstrating the difficulties of interpreting relations between earnings and graduate education is Orley Ashenfelter and Joseph D. Mooney, "Graduate Education, Ability and Earnings," Review of Economics and Statistics, February 1968, pp. 78-86.

This position, which approximates current policy, calls forth recommendation number three:

> Applicants to doctoral programs at Berkeley should be provided with detailed information regarding the historic performance of the department. The potential student should also be told the statistical probability of earning the Ph.D. and also the mean time to degree as experienced by students in the department. Resources available for graduate student support should be itemized, as well as the basis for their allocation. The department's recent experience in placing its Ph.D.'s should also be mentioned.

One purpose of this recommendation is to provide the potential student-investor with the information necessary for intelligent decision-making. If the would-be student knows that only one out of ten students earns the Ph.D., that the mean time is seven years, that only one-third of the students are supported, with no guarantee from year to year, and that one third of last year's Ph.D.'s could not find jobs, his decision to enroll will be based upon a more informed evaluation of the risks, the costs, and the benefits than at present. Furthermore, explicit publication of such information should increase the pressure on departments to reform.

B. Personal Recommendations

In the previous section we discussed certain features of the University that are responsible for the inefficient use of student time, and recommendations were made to improve the incentive system and to increase the information available to students. In this final section, further recommendations based on the author's own value judgments will be presented. In order to avoid repetitious use of such phrases as, "The author believes ..." or "The author would argue that ...," all such qualifying phrases have been eliminated in this final section.

In our earlier discussion of the theory of departmental behavior,[44] we discussed the departments' enrollment decision, based upon the desire for maximum resources, and the output decision, based upon market demand. Of the two, the output decision is more sensible, since there is little purpose in producing Ph.D.'s who cannot gain satisfactory employment in work related to their training. Thus, the fourth recommendation:

> Administrators should accept the departments' output decision regarding the number of Ph.D.'s to produce as the basis for planning, and suitably scale the department's graduate enrollments to that figure. The number of Ph.D.'s awarded in recent years should be viewed as a "revealed preference" of each department's desired output, based upon the department's assessment of the market demand for its doctorates. Enrollment quotas should be reduced to a size consistent with each department's desired output.

For example, Berkeley's Philosophy department has awarded approximately five Ph.D.'s annually in recent years. A look at the national output figures

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[44] See Breneman, "An Economic Theory of Ph.D. Production: The Case at Berkeley," op. cit.

of philosophy Ph.D.'s[45] indicates that Berkeley has produced its share of the market, and furthermore, there is no indication that a shortage of Ph.D.'s in philosophy exists. Therefore, it would seem more sensible to reduce graduate enrollment in philosophy to 30-35 doctoral students, rather than maintain the current enrollment of approximately 100 and try to goad the department into producing 15-20 Ph.D.'s a year. Similarly, the English department averages approximately 20 Ph.D.'s a year; this output would warrant an enrollment of 120-140 doctoral students rather than 400. Changes in these enrollment figures would be allowed whenever a department indicated a desire to produce more Ph.D.'s. Thus, departments would have the freedom to set their own output rates, and would receive an enrollment sensibly related to that output. A similar system could be established for M.A. degrees.

Several benefits would flow from this procedure. With reduced enrollments, departments would no longer have an incentive to create high attrition rates. This would make possible a dramatic improvement in the functioning of departments such as English, French, German, and Philosophy. Students would gain a sense of security, and faculty, no longer forced to serve as executioners, could drop the psychologically protective stance of distance and unapproachability. Students who failed to perform satisfactorily would still be asked to leave the program; however, faculty would have an incentive to minimize such occurrences. Reduced graduate enrollments in several Berkeley departments would undoubtedly be, psychologically, the most healthy and, economically, the most sensible reform one could suggest.

In addition to the improved mood, a second benefit from reduced graduate enrollments would be the increased proportion of graduate students financially

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[45] See Breneman, "An Economic Theory of Ph.D. Production: The Case at Berkeley," op. cit.

supported. This would further reduce the uncertainty currently expressed by many humanities graduate students. Also, the knowledge that the department was not planning to fail a certain number of students should increase the willingness to borrow, further alleviating the financial problems.

Critics of this recommendation to reduce the size of graduate programs at Berkeley often advance a version of Say's Law: "The Supply of Ph.D.'s will create its own demand." The argument assumes that Ph.D.'s will never be unemployed; if traditional jobs are not available, individuals with doctorates will be hired to do work formerly done by M.A. holders, and so forth. It is suggested that doctoral recipients in English, History or French may have to start teaching in junior colleges or even in high schools, but that demand in these markets will be present as soon as supply is available. Even if junior colleges and high schools do emerge as a new source of demand[46] (and this is an empirical question, not an obvious truth), critics who adopt this line of argument never seem to question the desirability of such a development. Surely a moment's consideration suggests that the traditionally trained, research oriented Ph.D. is not the ideal man for most high school and junior college positions.[47] An unthinking determination to produce ever more Ph.D.'s on the grounds that people with doctorates will

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[46] Interviews with hiring officials in several Bay Area junior colleges have been conducted during July 1970 by Lucian Pugliaresi, a staff member of the Ford Foundation Research Program in University Administration, University of California, Berkeley. The vast majority of the junior college officials have expressed no interest in hiring Ph.D.'s, for they believe that current doctoral training is inappropriate to the teaching needs of the junior college.

[47] In a recent address, Dr. Lyman Glenny stated:

> As we look toward the next decade, it would be tragic, if not disastrous, for the surplus products of our research-oriented graduate schools to end up teaching in the junior and community colleges as the National Research Council and the National Science Foundation would have them do. These are institutions which require the highest caliber of teaching, attracting as they do students with a very wide range of interests and abilities.

Dr. Lyman Glenny, "Doctoral Planning for the Seventies: A Challenge to the

never be unemployed represents a more unimaginative and wasteful response by the University. This discussion leads to a fifth and final recommendation:

> Departments should be encouraged to discover unfilled needs for training and to create new programs to fill those needs. Resources released by the reduction in graduate programs suggested earlier should be re-directed toward programs for which a need exists.

For example, in many technical fields, a need may exist for retraining programs for people who have been away from the University for 15-20 years. If the University were to develop programs designed to acquaint individuals in mid-career with recent developments in the discipline, employers might be willing to finance a year's additional education for select employees.

In the humanities, departments might seriously explore the manpower needs of junior colleges, and design new programs, such as the Doctor of Arts in Teaching, to train people for such positions. The focus within the University should be on greater flexibility, allowing each department to serve multiple markets with programs rationally designed to meet the needs of each market. Departments that are unwilling or unable to develop new constituencies should be reduced in size.

A further objection to reduced graduate enrollments might be the argument that many departments need graduate students to serve as teaching assistants, there being no economic substitute for this inexpensive source of labor. The language departments, in particular, use graduate students extensively in the instruction of undergraduates. In the French department[48]

States," Opening Address, Annual Meeting of the Southern Regional Education Board, Houston, Texas, June 1970, p. 19.

[48]For a complete discussion of the economy of the French department, see Breneman, "An Economic Theory of Ph.D. Production: The Case at Berkeley," op. cit.

for example, graduate students are supported as T.A.'s for several years until, their usefulness expended, they are either failed in the Oral examination or set adrift with little prospect of completing the dissertation. The sensitive reader will have realized that the system described is profoundly immoral, if one accepts Kant's Categorical Imperative:

> Every man is to be respected as an absolute end in himself; and it is a crime against the dignity that belongs to him as a human being, to use him as a mere means for some external purpose.

The behavior of the language departments may represent an extreme case in which this principle is violated, but the weighted enrollment formula invites all departments to enroll graduate students "for some external purpose." Thus, on moral as well as economic grounds, one can urge the abandonment of that particular incentive system. With regard to the need for T.A.'s, if a department requires teaching personnel in excess of the available graduate students, the University should hire people with M.A.s, rather than lure in more graduate students with the promise of a Ph.D. never to be received.

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